Mental distress and podoconiosis in Northern Ethiopia: a comparative cross-sectional study

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Background: The stigma, deformity and disability related to most neglected tropical diseases may lead to poor mental health. We aimed to assess the comorbidity of podoconiosis and mental distress.

Methods: A comparative cross-sectional study was conducted in 2012, including 346 people with podoconiosis and 349 healthy neighbourhood controls. Symptoms of mental distress were assessed using the validated Amharic translation of the Kessler-10 scale (K10). A linear regression analysis was conducted to identify factors associated with mental distress.

Results: The mean K10 score was 15.92 (95% CI: 15.27 to 16.57) in people with podoconiosis and 14.49 (95% CI: 13.85 to 15.12) in controls (average K10 scores 1.43 points higher [95% CI: 0.52 to 2.34]). In multivariate linear regression of K10 scores, the difference remained significant when adjusted for gender, income, alcohol use, age, place of residence and family history of mental illness. In the adjusted model, people with podoconiosis had K10 scores 1.37 points higher than controls (95% CI: 0.64 to 2.18). Other variables were also associated with high K10 scores: women had K10 scores 1.41 points higher than men (95% CI: 0.63 to 2.18). Those with family history of mental illness had K10 scores 3.56 points higher than those without (95% CI: 0.55 to 6.56).

Conclusions: This study documented a high burden of mental distress among people with podoconiosis compared with healthy controls. Taking this finding in the context of the high stigma and reduced quality of life, we recommend integration of psychosocial care into the current morbidity management of podoconiosis.

Keywords: Elephantiasis, Ethiopia, Mental distress, Mental health disorders, Neglected tropical disease, Podoconiosis

Introduction

Podoconiosis is a form of elephantiasis that predominantly affects barefoot subsistence farmers in areas of red volcanic soil.[1] It has been identified in Africa, South America and Asia,[2–7] and it is estimated to affect approximately one million people in Ethiopia alone.[8] In Ethiopia, prevalence estimates range from 2.8 to 7.4% in endemic areas.[2,3,9–14] Podoconiosis is characterised by bilateral swelling of the lower legs with mossy and nodular changes to the skin, and causes considerable disability.[1] Although the aetiology is not fully understood, current evidence suggests genetic susceptibility[15] and the role of mineral particles from irritant volcanic soils.[9,16] Podoconiosis follows a chronic course causing progressively increasing disability with continued exposure to irritant soils. However, early stage disease can easily be treated by foot hygiene, bandaging and shoes.[17,18] To date, podoconiosis interventions are only found in a few endemic areas[19] and the disease is poorly understood by many of Ethiopia's healthcare professionals.[20]

Podoconiosis is one of the neglected tropical diseases (NTDs), a group of conditions found in tropical areas and related to poverty. NTDs affect approximately one billion people worldwide.[21] Similar to other NTDs[22], podoconiosis causes chronic disability and morbidity rather than death.[9] In addition to the high burden of disability, the social, economic and psychological sequelae are significant.[19,23,24] These include isolation, exclusion from community events,[25] and barriers to employment, education and marriage.[23] These are key activities for both social and economic well-being. The economic costs of the condition are also high, with direct treatment costs equivalent to US$143 per patient per year, and total costs estimated to be US$16 million per annum in one zone in southern Ethiopia.[19] In addition, the physical challenges of the condition contribute to large productivity

losses.[19] Podoconiosis is often poorly understood and affected individuals face severe stigma.[24] This is similar to other diseases that cause deformity, such as lymphatic filariasis and leprosy,[21,26] and as with these conditions, stigma is likely to compound the psychosocial effects of the condition.

The bidirectional association between mental health problems and both chronic communicable diseases, such as HIV/AIDS and TB, and non-communicable diseases and disabilities, has been well established.[27,28] The presence of mental ill-health increases all-cause mortality; depression leads to a 1.7 times higher chance of dying from any cause.[27] Mental ill-health has been shown to increase the risk of non-communicable diseases such as stroke, diabetes and cardiovascular disease.[27,28] The reasons for this include: the direct biological effects of mental disorders; the tendency for those with mental illness to engage in risk behaviours such as smoking, drinking, eating unhealthily and avoiding exercise; common risk factors for the two sets of conditions; and poorer access to and quality of healthcare interventions.[27]

NTDs, including podoconiosis, share many of the characteristics of the chronic diseases discussed above. Studies have also shown a strong association between NTDs and mental ill-health.[29] The prevalence of depression found in some NTDs is extremely high, with prevalence in populations of lymphatic filariasis between 37% and 97%, and in leprosy between 12.5% and 76%.[29–36] In addition to the physical disability and disfigurement, stigma is a major contributor to susceptibility to mental ill-health in people with NTDs and has been shown to exacerbate social exclusion and isolation, and lead to increased stress, and feelings of despair and shame.[29] A number of qualitative studies have found common characteristics among those affected by NTDs, including embarrassment or shame, sadness, grief and distress, loneliness and social isolation.[37–40] These studies have also found that many individuals admitted to thoughts of suicide.[37–40] In addition, feelings of stigmatisation and fears of rejection were expressed, and many of those studied had low self-esteem and a negative body image, which has been previously shown in podoconiosis.[23]

Several studies to date have documented the social impact of podoconiosis, often related to negative perceptions of impairments.[20,24,25,41–44] Analysis from the same study population indicated high stigma and reduced quality of life among people with podoconiosis.[41,45] However, this analysis will focus on the association between podoconiosis and mental distress. We hypothesised that people with podoconiosis would have a higher burden of mental distress (any form of emotional suffering, including stress and strain due to podoconiosis or other life events) than the general population in this area of rural Ethiopia due to the impact of disability and social challenges faced by people with podoconiosis.

Materials and methods

Study area and study population

The study took place in Dembecha district, part of the West Gojjam zone of the Amhara regional state of northern Ethiopia, which has a population of 142 118. The district is split into 29 kebeles (the smallest administrative unit), of which 25 are rural and 4 are urban. Approximately 14% of the population live in urban areas. The largest ethnic group reported in Dembecha is Amhara (99.8%), and Amharic is spoken as a first language by 99.9%. The majority of the inhabitants of this region are Ethiopian Orthodox Christians (98.5%) the other 1.5% are Muslim.[46]

Podoconiosis has been found to be prevalent in this area. In November 2011, a baseline survey prior to establishing a podoconiosis treatment service in the area screened 51 017 individuals and identified 1704 cases of podoconiosis giving a prevalence of 3.4%.[13] Prior to 2010, no podoconiosis care or support services were available near Dembecha. A podoconiosis programme was established by International Orthodox Christian Charities (IOCC) in June 2010, 45 km from Dembecha in the town of Debre Markos. In 2011, the Debre Markos podoconiosis project expanded to six satellite sites, including Dembecha. These sites offer on average 3 months of training in self-care, including foot hygiene, bandaging and use of shoes, and referral for treatment of secondary infections, wound care, minor surgery (in a minority), manual lymphatic drainage therapy and the provision of subsidised shoes.

Seven kebeles within Dembecha district were selected for the study. These were chosen on the basis of having the highest prevalence of podoconiosis in the baseline survey, in order to give the largest possible population to sample. The study was nested within the 2011 survey, with people with podoconiosis identified previously and their neighbours without podoconiosis as controls.

Study design

The study was a questionnaire-based comparative cross-sectional study.

Outcomes

The primary outcome was mental distress, measured by the continuous Kessler scale.[47,48] Mental distress was chosen rather than a specific psychiatric diagnosis as it has previously been shown to be a more socially and culturally valid concept in Ethiopia.[49,50] Mental distress in this study was defined as any form of emotional suffering including stress and strain due to podoconiosis or other life events. Secondary variables measured were age, gender, education, marital status, place of residence, income, self-defined co-morbidity, alcohol and substance use, family-history of mental illness, stigma and podoconiosis stage. These were selected as they had been found to be factors associated with differences in mental distress in previous studies.[51,52]

Measures

Two pre-validated tools were used to assess variables. The Kessler-10 (K10) scale[47,48] was used to assess mental distress in all participants and the podoconiosis stigma scale was used to assess felt and enacted stigma within people with podoconiosis only. Enacted stigma includes the experience of discrimination such as abuse, loss of employment or prejudicial attitudes, while felt stigma is the perceived fear of enacted stigma. In addition, demographic and social variables were assessed using a questionnaire adapted from previous studies. This section included factors found to be associated with mental illness in previous studies, as discussed above. These included the use of khat, a mild stimulant leaf traditionally chewed in Ethiopia that has been associated with depression.[53,54]

The K10 scale[47,48] is a screening tool that measures mental distress. Higher mental distress scores indicate an increased probability of having depression or an anxiety disorder. There are 10 questions, each scored out of five on a Likert scale. The Amharic translated version has previously been validated in Ethiopia for assessing depression by comparing results with psychiatric assessment.[49] It has a sensitivity of 84.2% and specificity of 77.8% and used in relation to postnatal depression, depression in HIV and TB, and common mental disorders.[49,55,56] Previous studies have found excellent internal consistency of the scale, with a Cronbach's alpha of between 0.90 and 0.93.[49,55,56]

The podoconiosis stigma scale was developed specifically for people with podoconiosis in Ethiopia, and has been previously validated.[57] It has four independent sections which assess felt and enacted stigma for patients and communities, and which are designed to be used together or separately. Only the patient scales were used for this study. The piloting of this scale found it had excellent reliability, with a Cronbach's alpha of 0.955 for patient felt stigma and of 0.937 for patient enacted stigma.[57]

Sample size

Sample size was calculated using Epi-Info version 7.0 to give 80% power to detect a 10% difference between the two groups with 95% CI, based upon a 22.7% prevalence of mental disorder in the general population, as found in a previous study in Ethiopia.[58] It was calculated that 315 participants were needed in each group. The final target sample size was 694 to take into account a predicted 10% non-response rate. The final sample size used was 695 participants, including 346 people with podoconiosis and 349 controls.

Participant selection

The affected group was selected based on the population of people with podoconiosis identified in the aforementioned survey. Fifty people with podoconiosis from each kebele were selected. This was a near-total sample. Random selection was not practically possible due to the wide distribution of inhabitants within each kebele, so convenience sampling was used, and the first 50 people with podoconiosis from each list who could be found were selected. The controls were non-affected individuals neighbouring the cases. An attempt was made to match controls to cases based on age and gender, as these have been consistently shown to be strongly associated with levels of mental distress[52,59] and quality of life.[60,61] However, some of the data collectors found this was impossible in certain cases, leading to the matching protocol being inconsistently implemented. The exclusion criteria used were that those under 15 years and those with severe illness (bed ridden or unable to respond to questions because of the illness) were excluded.

Data collection

Data collection was conducted over 5 days between 3 and 7 May 2012. The data were collected by seven local nurses, one per kebele, who were familiar with the local area, had relevant medical background knowledge and were fluent in Amharic, the participants' main language. The questionnaires were used in structured interviews. The data collectors received 1 day of training. This covered the basics of podoconiosis and the staging techniques (as nurses were unfamiliar with the condition); the objectives of the study and its possible impacts; the details of the questionnaire to ensure common understanding; taking informed consent; matching criteria and sampling techniques; and an opportunity to practice administrating the questionnaire followed by a debrief. In addition, there were three supervisors overseeing the data collection process, two of whom were fluent in Amharic. Each day, the supervisors had contact with all data collectors to answer any queries, and they reviewed all of the questionnaires for missing data and inconsistencies. In addition, the supervisors checked the reliability of the data collectors by re-testing a number of participants. Checks demonstrated that the answers were broadly the same, and the reliability of the data collection was not considered to be a problem.

The questionnaires were piloted before the study. The pilot used seven people with podoconiosis and four controls within the nearest large urban area, Debre Markos. The translation and understanding of the questionnaire was checked, and a few minor corrections were made to the wording of questions and overall layout to clarify meaning.

Data analysis

Data analysis was performed using Stata SE-11 (College Station, TX, USA). Data were first checked and cleaned. Missing values on the scales were replaced with the average of that item. Five questionnaires were excluded due to incomplete data.

Descriptive analysis of the social and demographic characteristics and the degree of comparability between the case and control groups was investigated. When comparing simple frequencies, the χ^2 test was used to establish significance; when comparing means, t test was used. Mean scores of the two scales were compared.

K10 scores were treated as continuous variables and a multivariable linear regression model was used to explore factors that may be associated with K10 scores. Variables were included in the model according to conceptual background knowledge and cross-tabulations (i.e. disease status, age, gender, education, marital status, place of residence, monthly income, the presence of other health problems and family history of mental illness). Since the use of tobacco and khat were negligible, these variables were excluded from the modelling. Stigma was excluded from the multivariate analysis as it was only measured for cases and not controls. The model was developed by adding one variable at a time and the impact of the addition of each variable in the model was determined by likelihood-ratio test. The variables contributing significantly to the model were retained, including diseases status, gender, age, place of residence and family history of mental illness. Since alcohol use and income were consistently found to be associated with mental distress, they were also included in the final model. All these variables remained in the final model and were adjusted for one another. Those with p-values less than 0.05 were considered significantly associated with K10 scores. The reliability coefficients of the two scales were also assessed.

Regulatory approval and ethical issues

Ethical approval was sought and obtained from both the Research Governance and Ethics Committee of Brighton & Sussex Medical School, and the Amhara Regional Health Bureau that governs

the study area. Written consent was obtained from the participants. Written informed consent was sought from all participants, with those who were unable to sign leaving a thumbprint instead. When individuals aged <18 years were encountered, consent was obtained from their parents or guardians. Data collectors were trained in key ethical issues, including how to ensure informed consent, as part of their initial briefing. All questionnaires were anonymised and identifiable information stored separately from the research data. Electronic data was kept on a password-protected computer.

Results

Demographics of groups

All those in the study were Amhara in ethnic origin. However, there were some significant differences between the podoconiosis and healthy control groups. The podoconiosis group contained significantly more illiterate individuals (χ^2=4.980, df=1, p=0.013); more individuals in the lower income quintiles and lower average income (χ^2=31.160, df=4, p<0.0001); and fewer married individuals (χ^2=27.338, df=1, p<0.001). These characteristics have been associated with mental health status in the past (Table 1).[62]

There were no significant differences between the two groups in terms of family history of mental illness. Additionally, major overall risk behaviours for mental distress were similar between cases and controls, including alcohol and khat use. However, people with podoconiosis were slightly less likely to drink daily (Table 2). The use of khat and tobacco is extremely rare in this community, and reported family history of mental health disorders was also uncommon. No individuals interviewed perceived themselves to have mental health issues. There were significantly more 'other' health problems (reported by participants) in the people with podoconiosis group, including chronic illnesses such as arthritis and headache as the most prevalent additional conditions among people with podoconiosis.

All the scales exceeded the minimum internal consistency reliability standard (0.70) required. The Cronbach's alpha for Kessler scale was 0.94, while it was 0.84 and 0.92 for felt and enacted stigma scales, respectively.

Mental distress and podoconiosis

The mean K10 score was 15.92 (95% CI: 15.27 to 16.57) in people with podoconiosis and 14.49 (95% CI: 13.85 to 15.12) in healthy neighbourhood controls (average K10 scores 1.43 points higher [95% CI: 0.52 to 2.34]).

Although not linear, there was a significant difference (p<0.001) in the mean K10 scores across podoconiosis disease stages. Although the sample sizes were small, a higher mean of K10 score was found in the most severe disease stage (data not shown in table).

The ten K10 items were dichotomised into two groups: those with the symptoms (little or more) and those without (none). Except for one item, a significantly higher (p<0.05) proportion of people with podoconiosis had symptoms compared to healthy controls, as presented in Table 3.

In univariate linear regression of continuous K10 scores, people with podoconiosis had K10 score 1.43 points higher than healthy controls (95% CI: 0.52 to 2.34). The difference remained significant when adjusted for gender, average household income, alcohol use, age, place of residence and family history of mental illness: in the adjusted model, people with podoconiosis had K10 scores 1.37 points higher than healthy controls (95% CI: 0.64 to 2.10). Other variables were also associated with high K10 scores: women had 1.41 point higher K10 scores than men (95% CI: 0.63 to 2.18). Family history of mental illness was associated with higher K10 scores, those with family history of mental illness having K10 scores on average 3.56 points higher than those without (95% CI: 0.55 to 6.56). Individuals who drank alcohol 1 to 4 times per week (beta coefficient of the linear regression model [β]=−6.78; 95% CI: −7.81 to −5.75) and five times or more (β=−10.31; 95% CI: −11.37 to −9.24) had lower K10 scores than those who did not drink or drank once per month (Table 4). The model explained 36% of the variation. On separate analysis among podoconiosis patients, women had 2.85 point higher K10 scores than men (95% CI: 1.55 to 4.15).

The association between podoconiosis, mental distress and stigma is noteworthy. Our data indicates that all forms of stigma and mental distress showed a weak but positive and significant association (Table 5).

Discussion

Demographics

The people in the podoconiosis group and control group were relatively similar with respect to age and gender, which are major determinants of mental distress.[59–61] The sociodemographic characteristics also broadly reflected what is known about the local population from census data,[46] although those sampled were slightly older than would be expected.

However, there were a number of important social characteristics that varied significantly between the two groups. These were occupation, income, literacy and education, and marital status. Income, education and literacy have all been shown to be associated with the mental distress in the general population.[52,63] Podoconiosis has been shown to affect these factors, which could explain the differences between the groups. For example, podoconiosis could limit income-generating activities due to disability, which could account for the lower income of this group, especially among farmers.[19] People with the condition have also reported difficulties in finding marriage partners and increased rates of divorce, particularly women.[23] Barriers to employment and higher education due to stigma have also been reported.[23] Many of these factors have also been established in other NTDs.[29]

Mental distress and podoconiosis

The evidence from this study for an association between podoconiosis and increased risk of mental distress is clear. People with podoconiosis were found to have a higher score of mental distress than the healthy controls in the study. After adjustment for other important variables, the difference in K10 scores diminished slightly, but mean scores remained significantly higher in people with podoconiosis than those without.

This association is similar to findings in studies that have demonstrated the relationship between mental distress and NTD disease status. Many studies have looked at leprosy, which

Table 1. Basic characteristics of the study groups, people with podoconiosis and healthy controls, Northern Ethiopia, 2012

Variable		Podoconiosis cases (%)	Healthy controls (%)
Gender	Male	139 (40.2)	149 (42.7)
	Female	207 (59.8)	200 (57.3)
Age (years)	Mean (SD)	45.74 (13.190)	44.63 (12.903)
	Range	15–80	15–85
	15–24	10 (2.9)	16 (4.6)
	25–34	63 (18.2)	58 (16.6)
	35–44	79 (22.8)	95 (27.2)
	45–54	92 (26.6)	77 (22.1)
	55–64	75 (21.7)	76 (21.8)
	65+	27 (7.8)	27 (7.7)
Village	Yechereka	50 (14.5)	50 (14.3)
	Adis Alem	55 (15.9)	57 (16.3)
	Lejat	43 (12.4)	43 (12.3)
	Sazuri Dimela	48 (13.9)	49 (14.0)
	Wad	50 (14.5)	51 (14.6)
	Yetsed	50 (14.5)	48 (13.8)
	Anigut Yedegera	50 (14.5)	51 (14.6)
Area of residence	Rural	339 (98.0)	339 (97.1)
	Urban	7 (2.0)	10 (2.9)
Occupation	Farmer	252 (72.8)	266 (76.2)
	Traders	36 (10.4)	30 (8.6)
	Employee (government/NGO/private)	6 (1.7)	7 (2.0)
	Daily labourer	21 (6.1)	14 (4.0)
	Housewife	0	11 (3.2)
	Student	4 (1.2)	4 (1.1)
	Jobless	16 (4.6)	11 (3.2)
	Other	11 (3.2)	6 (1.7)
Ethnicity	Amhara	346 (100.0)	349 (100.0)
Literacy	Literate	81 (23.4)	112 (32.1)
	Not literate	265 (76.6)	237 (67.9)
School attendance (of literate)	No formal school	46 (56.8)	48 (42.9)
	Primary (grade 1–6)	27 (33.3)	41 (36.6)
	Secondary (grade 7–12)	8 (9.9)	23 (20.5)
Household income (Birr/month)	Mean (SD)	285.14 (206.42)	384.3 (263.38)
	Min-Max	0–1500	0–1500
	1st quintile (poorest)	86 (24.9)	53 (15.2)
	2nd quintile	77 (22.3)	69 (19.8)
	3rd quintile	79 (22.8)	54 (15.5)
	4th quintile	56 (16.2)	82 (23.5)
	5th quintile (richest)	48 (13.9)	91 (26.1)
Marital status	Married	198 (57.2)	265 (75.9)
	Unmarried	30 (8.7)	31 (8.9)
	Divorced	63 (18.2)	34 (9.7)
	Widowed	55 (15.9)	19 (5.4)

may have more stigma attached to it for historical reasons and through a different profile of symptoms, including neuropathic pain.[30–33,35,36] In another study that examined lymphatic filariasis, which has a very similar presentation to podoconiosis, prevalence of depression was found to be around 70%.[34]

The linear regression analysis revealed a number of other factors to be significantly associated with mental distress. These were family history of mental illness, female gender and alcohol use. Many studies have shown familial associations for a range of mental disorders, including depression and schizophrenia, with

Table 2. Risk characteristics of the study groups, Northern Ethiopia, 2012

Variable			Podoconiosis cases (%)	Healthy controls (%)	p-value[a]
Alcohol	Ever consumed alcohol	Yes	335 (96.8)	331 (94.8)	NS
		No	11 (3.2)	18 (5.2)	
	Currently consumes alcohol	Yes	321 (92.8)	326 (93.4)	NS
		No	25 (7.2)	23 (6.6)	
	Current consumption (last 30 days)	Never	30 (8.7)	33 (9.5)	0.001
		Once	28 (8.1)	28 (8.0)	
		1–2×/week	155 (44.8)	146 (41.8)	
		3–4×/week	81 (23.4)	52 (14.9)	
		Daily	51 (14.7)	90 (25.8)	
Khat	Ever chewed khat	Yes	0 (0.0)	1 (0.3)	NS
		No	346 (100.0)	348 (99.7)	
	Currently chew khat	Yes	0 (0.0)	1 (0.3)	NS
		No	346 (100)	348 (99.7)	
Cigarettes	Ever smoked cigarettes	Yes	1 (0.3)	1 (0.3)	NS
		No	345 (99.7)	348 (99.7)	
	Currently smoke cigarette	Yes	0 (0.0)	0 (0.0)	NA
		No	346 (100.0)	349 (100.0)	
Family history of mental health problems		Yes	6 (1.7)	4 (1.1)	NS
		No	340 (98.3)	344 (98.9)	
Physical health condition other than podoconiosis		Yes	64 (18.5)	29 (8.3)	<0.001
		No	282 (81.5)	320 (91.7)	
Health conditions		Arthritis	17 (4.9)	3 (0.9)	
		Eye or visual condition	3 (0.9)	2 (0.6)	
		Asthma	0	2 (0.6)	
		Hypertension	2 (0.6)	1 (0.3)	
		Headache	13 (3.8)	2 (0.6)	
		Cancer	0	1 (0.3)	
		Tuberculosis	4 (1.2)	1 (0.3)	
		Other	25 (18.5)	16 (4.6)	
Patients who perceive themselves as mentally ill		Yes	0 (0.0)	0 (0.0)	NA
		No	344 (100.0)	349 (100.0)	
Mental distress, mean (SD)			15.92 (6.18)	14.49 (6.01)	<0.001[b]
Stigma mean (possible ranging from 0 to 96)			30.7	NA	

NA: not applicable, NS: not significant.
[a] p-values are χ^2 test unless stated.
[b] t test.

implicated genetic and social factors.[52] There is a large amount of evidence that women have much higher rates of mental distress than men,[64] with up to twice the risk of depression. This is believed to be due to socio-economic factors and intimate partner violence.[59,65,66] On separate analysis among people with podoconiosis, women had higher K10 scores than men. This may indicate that women with podoconiosis are disproportionately affected compared with men, and may have implications for screening podoconiosis patients for mental illnesses.

In contrast, the finding with regards to alcohol is unexpected. It is generally thought that drinking alcohol either causes, or is a symptom of, mental distress, although this really applies to excessive consumption.[67,68] Therefore, the finding that abstainers have worse mental distress is unusual. Reverse causality may explain this paradox: alcohol is considered locally to worsen mental health problems, so those who identify themselves as psychologically unwell are likely to stop drinking. The other possible explanation could be that we measured alcohol use instead of abuse. As can be seen from the results, local alcohol use in the study area is universal. The frequency of use might only imply access in terms of affording to use frequently, rather than abuse. Therefore, future research in the areas should consider measuring abuse rather than frequency of use.

The relationship between mental distress and podoconiosis disease stage is not a linear one, with the middle stages having the lowest levels and increasing levels through stages four and five. The sample was not sufficiently large enough to assess this relationship adequately. However, seven out of eight of the people

Table 3. Kessler 10 scale items comparison among people with podoconiosis and healthy controls in Northern Ethiopia, May 2012

Kessler 10 scale items	Podoconiosis cases		Healthy controls		p-value[a]
	None (%)	Little or more (%)	None (%)	Little or more (%)	
Tiredness for no reason	48.0	52.0	61.6	38.4	<0.001
Nervousness	57.8	42.2	71.9	28.1	<0.001
Nervous nothing could calm down	65.0	35.0	77.1	22.9	0.001
Feelings of hopelessness	59.0	41.0	73.4	26.6	<0.001
Feelings of restlessness or fidgets	61.3	38.7	71.3	28.7	0.006
Being so restless could not sit still	61.6	38.4	65.9	34.1	NS
Depressed mood	54.9	45.1	66.8	33.2	0.002
Feeling everything an effort	58.1	41.9	67.0	33.0	0.018
Feeling sad and unable to be cheered	57.2	42.8	65.9	34.1	0.023
Feeling worthless	56.9	43.1	67.3	32.7	0.006

NS: not significant.
[a] Significant at p<0.05.

Table 4. A linear regression analysis of Kessler 10 scores and factors associated in people with podoconiosis and healthy controls in Northern Ethiopia, May 2012

Variable	Unadjusted coefficient (95% CI)	Adjusted coefficient (95% CI)[a]	p-value
Disease status: healthy neighbour	Reference group	Reference group	
Disease status: people with podoconiosis	1.43 (0.52 to 2.34)	1.37 (0.64 to 2.10)	<0.001
Sex: male	Reference group	Reference group	
Sex: female	2.53 (1.62 to 3.44)	1.41 (0.63 to 2.18)	<0.001
Age in years: <45	Reference group	Reference group	
Age in years: 45–64	−0.44 (−1.40 to 0.50)	−0.36 (−1.12 to 0.39)	NS
Age in years: ≥65	2.09 (0.32 to 3.85)	0.46 (−0.95 to 1.87)	NS
Place of residence: rural	Reference group	Reference group	
Place of residence: urban	0.34 (−2.62 to 3.30)	−1.61 (−3.94 to 0.73)	NS
Family history of mental illness: no	Reference group	Reference group	
Family history of mental illness: yes	4.38 (0.55 to 8.20)	3.56 (0.55 to 6.56)	0.021
Alcohol use: none or once per month	Reference group	Reference group	
Alcohol: 1–4 weekly	−6.82 (−7.87 to −5.78)	−6.78 (−7.81 to −5.75)	<0.001
Alcohol: ≥5 weekly	−10.64 (−11.70 to −9.58)	−10.31 (−11.37 to −9.24)	<0.001
Monthly income: £[b]	−0.003 (−0.005 to −0.0013)	−0.0001 (−0.002 to 0.001)	NS

NS: not significant.
[a] Adjusted coefficients were controlled for all other variables in the table.
[b] Monthly income was treated as a continuous variable in the model.

with stage five podoconiosis had mental distress, and this suggests that there may be an association between mental distress and the most severe stages of podoconiosis, perhaps due to the higher degree of disability and deformity experienced, as has been documented in other forms of lymphoedema.[34] The association might also be due to reverse causality: mental distress may lead to further neglect of lymphoedema. The correlation between mental distress and stigma is noteworthy. We expected strong correlation between stigma and mental distress. However, there

was weak but positive correlation between stigma and mental distress. Therefore, there is a need for further study to see the clear association between stigma, disability and mental illness.

The findings of our study are in accordance with the sum of the evidence. However, it is important to note that this would not constitute proof of causation. Litt's model for the relationship between NTDs and mental health conditions would seem to apply to podoconiosis.[29] The fact that many of those factors which were shown to increase mental distress have also been found to be

Table 5. Showing the correlation between the domains of stigma and Kessler 10 scale among people with podoconiosis Northern Ethiopia, May 2012

		Kessler 10	Overall stigma	Felt stigma	Enacted stigma
Spearman's rho (correlation coefficient)	Kessler 10	1			
	Overall stigma	0.307[a]	1		
	Felt stigma	0.346[a]	0.898[a]	1	
	Enacted stigma	0.212[a]	0.923[a]	0.628[a]	1

[a] Significant at $p < 0.001$ (two tailed).

exacerbated by podoconiosis supports this. However, one can argue the existence of reverse causality as well. The risk of having podoconiosis is largely mediated by shoe wearing, contact with soil and foot hygiene. Suffering from mental distress is likely to lead to poverty and social exclusion in addition to neglect of personal hygiene and clothing, including footwear, which will greatly increase an individual's risk of podoconiosis.

Strengths and limitations

There were a number of possible limitations to the study. There were some difficulties with matching, as the criteria could not always be fulfilled with neighbourhood controls. However, the demographic data show that the groups were not significantly different in respect to key characteristics, so lack of matching is unlikely to have introduced an important bias. The use of nurses as data collectors has both advantages and disadvantages. They have good medical and local knowledge, but they may have introduced some power inequalities or misunderstandings, as participants may have known they were associated with their healthcare in a different context. Finally and most importantly, possible cultural differences in mental distress in Ethiopia must be taken into account. However, the use of a scale that focuses on specific symptoms diminishes this issue, and the K10 has been validated in comparison to diagnosis by local psychiatrists.[49]

Despite these limitations, the study had a number of important strengths which add weight to the conclusions drawn. The size of the sample was shown to be large enough to demonstrate the association using a power calculation, so any association seen was unlikely to be due to chance. Additionally, despite the difficulties with sampling described above, the final study groups were broadly comparable in terms of basic demographic characteristics. Another strength of this study, compared to previous NTD studies, was the inclusion of a control group, so that the background level of mental distress was documented and the risk attributable to podoconiosis could be established. Finally, the study also used internationally and cross-culturally validated tools to assess the variables.

Implications

This was the first study to examine mental distress in podoconiosis, and one of only a few to do so for any NTD. The current evidence may serve as a baseline to advocate change in practice with regards to podoconiosis and mental distress. The results indicate the importance of incorporating psychosocial services into existing morbidity management packages of podoconiosis. This is not just due to the psychological health needs of people with podoconiosis, but also to help improve the outcomes of podoconiosis treatment, as mental distress has been shown to affect treatment, for example by reducing adherence with treatment regimens.[27] Most podoconiosis services in Ethiopia are currently stand-alone services provided by NGOs but the Regional Health Bureaus have committed to incorporating these into governmental health services. It may be possible to incorporate a psychosocial component into the podoconiosis programme, in order to identify those at risk and provide targeted treatment and prevention. The K10 scale would be an appropriate screening tool for this.[47] There have been a number of trials in similar settings that show that low-skilled community mental health workers can provide effective care and improve mental health at low cost.[69,70]

While the results in this community indicated the association of podoconiosis and mental distress, it is important that this study is repeated in different populations (e.g. other communities where podoconiosis is highly prevalent). Further quantitative research would help clarify the relationship between podoconiosis, disability and depression and further qualitative studies could aim to understand the results better. An exploration of the psychological aspects of podoconiosis, and an examination of the experiences of those with both podoconiosis and mental distress would add depth and may give clues to the mechanisms behind such an association. Finally, future studies should use repeated measurements to see the persistence of symptoms, measure the impact of the co-morbidities on functioning and additional burden on careers.

Conclusion

Podoconiosis is a NTD that causes substantial disability and deformity among those affected and can lead to psychological, social and physical consequences. It is often highly stigmatising for individuals. This study was the first to examine mental distress in podoconiosis affected individuals. It found an increased prevalence of mental distress in podoconiosis affected individuals, with a significant association of podoconiosis and mental distress after adjusting for important covariates. Based on these findings, and in view of the high stigma and reduced quality of life of people with

podoconiosis, we recommend integration of psychosocial care into current morbidity management of podoconiosis.

References

1 Price E. The association of endemic elephantiasis of the lower legs in East Africa with soil derived from volcanic rocks. Trans R Soc Trop Med Hyg 1976;70:288–95.

2 Birrie H, Balcha F, Jemaneh L. Elephantiasis in Pawe settlement area: podoconiosis or bancroftian filariasis? Ethiop Med J 1997;35:245–50.

3 Desta K, Ashine M, Davey G. Prevalence of podoconiosis (endemic non-filarial elephantiasis) in Wolaitta, Southern Ethiopia. Trop Doct 2003;33:217–20.

4 Onapa AW, Simonsen PE, Pedersen EM. Non-filarial elephantiasis in the Mt. Elgon area (Kapchorwa District) of Uganda. Acta Trop 2001;78: 171–6.

5 Ruiz L, Campo E, Corachan M. Elephantiasis in Sao Tome and Principe. Acta Trop 1994;57:29–34.

6 Tada MS, Marsden PD. Probable podoconiosis in Brasilia. Rev Soc Bras Med Trop 1993;26:255.

7 Wanji S, Tendongfor N, Esum M et al. Elephantiasis of non-filarial origin (podoconiosis) in the highlands of north-western Cameroon. Ann Trop Med Parasitol 2008;102:529–40.

8 Davey G, Newport M. Podoconiosis: the most neglected tropical disease? Lancet 2007;369:888–9.

9 Davey G. Podoconiosis, non-filarial elephantiasis, and lymphology. Lymphology 2010;43:168–77.

10 Alemu G, Tekola Ayele F, Daniel T et al. Burden of podoconiosis in poor rural communities in Gulliso woreda, West Ethiopia. PLoS Negl Trop Dis 2011;5:e1184.

11 Geshere Oli G, Tekola Ayele F, Petros B. Parasitological, serological, and clinical evidence for high prevalence of podoconiosis (non-filarial elephantiasis) in Midakegn district, central Ethiopia. Trop Med Int Health 2012;17:722–6.

12 Kloos H, Kello AB, Addus A. Podoconiosis (endemic non-filarial elephantiasis) in two resettlement schemes in western Ethiopia. Trop Doct 1992;22:109–12.

13 Molla YB, Tomczyk S, Amberbir T et al. Podoconiosis in East and West Gojam zones, northern Ethiopia. PLoS Negl Trop Dis 2012;6:e1744.

14 Tekola Ayele F, Alemu G, Davey G, Ahrens C. Community-based survey of podoconiosis in Bedele Zuria woreda, southwest Ethiopia. Int Health 2013;5:119–25.

15 Tekola Ayele F, Adeyemo A, Finan C et al. HLA class II locus and susceptibility to podoconiosis. N Engl J Med 2012;366:1200–8.

16 Davey G, GebreHanna E, Adeyemo A et al. Podoconiosis: a tropical model for gene-environment interactions? Trans R Soc Trop Med Hyg 2007;101:91–6.

17 Price EW. Pre-elephantiasic stage of endemic nonfilarial elephantiasis of lower legs: 'podoconiosis'. Trop Doct 1984;14:115–9.

18 Sikorski C, Ashine M, Zeleke Z, Davey G. Effectiveness of a simple lymphoedema treatment regimen in podoconiosis management in southern Ethiopia: one year follow-up. PLoS Negl Trop Dis 2010;4:e902.

19 Tekola F, Mariam DH, Davey G. Economic costs of endemic non-filarial elephantiasis in Wolaita Zone, Ethiopia. Trop Med Int Health 2006;11:1136–44.

20 Yakob B, Deribe K, Davey G. Health professionals' attitudes and misconceptions regarding podoconiosis: potential impact on integration of care in southern Ethiopia. Trans R Soc Trop Med Hyg 2010;104:42–7.

21 Hotez PJ. Stigma: The Stealth Weapon of the NTD. PLoS Negl Trop Dis 2008;2:e230.

22 Perera M, Whitehead M, Molyneux D et al. Neglected patients with a neglected disease? A qualitative study of lymphatic filariasis. PLoS Negl Trop Dis 2007 November 2007;1:e128.

23 Tora A, Davey G, Tadele G. A qualitative study on stigma and coping strategies of patients with podoconiosis in Wolaita zone, Southern Ethiopia. Int Health 2011;3:176–81.

24 Yakob B, Deribe K, Davey G. High levels of misconceptions and stigma in a community highly endemic for podoconiosis in southern Ethiopia. Trans R Soc Trop Med Hyg 2008;102:439–44.

25 Gebrehanna E. The social burden of podoconiosis in Wolaita zone [MPH thesis]. Addis Ababa: Addis Ababa University; 2005.

26 Weiss MG. Stigma and the social burden of neglected tropical diseases. PLoS Negl Trop Dis 2008;2:e237.

27 Prince M, Patel V, Saxena S et al. No health without mental health. Lancet 2007;370:859–77.

28 Verhaak PF, Heijmans MJ, Peters L, Rijken M. Chronic disease and mental disorder. Soc Sci Med 2005;60:789–97.

29 Litt E, Baker MD, Molyneux D. Neglected tropical diseases and mental health: a perspective on comorbidity. Trends Parasitol 2012;28: 195–201.

30 Bhatia MS, Chandra R, Bhattacharya SN, Imran M. Psychiatric morbidity and pattern of dysfunctions in patients with leprosy. Indian J Dermatol 2006;51:23–5.

31 Lasry-Levy E, Hietaharju A, Pai V et al. Neuropathic pain and psychological morbidity in patients with treated leprosy: a cross-sectional prevalence study in Mumbai. PLoS Negl Trop Dis 2011;5:e981.

32 Leekassa R, Bizuneh E, Alem A. Prevalence of mental distress in the outpatient clinic of a specialized leprosy hospital. Addis Ababa, Ethiopia, 2002. Lepr Rev 2004;75:367–75.

33 Nishida M, Nakamura Y, Aosaki N. Prevalence and characteristics of depression in a Japanese leprosarium from the viewpoints of social stigmas and ageing. A preliminary report. Lepr Rev 2006;77:203–9.

34 Richard SA, Mathieu E, Addiss DG, Sodahlon YK. A survey of treatment practices and burden of lymphoedema in Togo. Trans R Soc Trop Med Hyg 2007;101:391–7.

35 Su TW, Wu LL, Lin CP. The prevalence of dementia and depression in Taiwanese institutionalized leprosy patients, and the effectiveness evaluation of reminiscence therapy—a longitudinal, single-blind, randomized control study. Int J Geriatr Psychiatry 2012;27:187–96.

36 Tsutsumi A, Izutsu T, Islam AM et al. The quality of life, mental health, and perceived stigma of leprosy patients in Bangladesh. Soc Sci Med 2007;64:2443–53.

37 Person B, Addiss D, Bartholomew LK et al. "Can it be that god does not remember me": a qualitative study on the psychological distress, suffering, and coping of Dominican women with chronic filarial lymphedema and elephantiasis of the leg. Health Care Women Int 2008;29:349–65.

38 Person B, Addiss D, Bartholomew LK et al. A qualitative study of the psychosocial and health consequences associated with lymphedema among women in the Dominican Republic. Acta Trop 2007;103:90–7.

39 Scott J. The psychosocial needs of leprosy patients. Lepr Rev 2000;71:486–91.

40 Wijesinghe RS, Wickremasinghe AR. Quality of life in filarial lymphoedema patients in Colombo, Sri Lanka. Trans R Soc Trop Med Hyg 2010;104:219–24.

41 Deribe K, Tomczyk S, Mousley E et al. Stigma towards a neglected tropical disease: felt and enacted stigma scores among podoconiosis patients in Northern Ethiopia. BMC Public Health 2013;13:1178.

42 Molla YB, Tomczyk S, Amberbir T et al. Patients' perceptions of podoconiosis causes, prevention and consequences in East and West Gojam, Northern Ethiopia. BMC Public Health 2012;12:828.

43 Tekola F, Bull S, Farsides B et al. Impact of social stigma on the process of obtaining informed consent for genetic research on podoconiosis: a qualitative study. BMC Med Ethics 2009;10:13.

44 Tora A, Davey G, Tadele G. A qualitative study on stigma and coping strategies of patients with podoconiosis in Wolaita zone, Southern Ethiopia. Int Health 2011;3:176–81.

45 Mousley E, Deribe K, Tamiru A, Davey G. The impact of podoconiosis on quality of life in Northern Ethiopia. Health Qual Life Outcomes 2013;11:122.

46 Central Statistical Agency of Ethiopia:Office of Population and Housing Census Commission. 1994 Population and Housing Census of Ethiopia: Results for Amhara Region. Vol 1, Part 1: Population size and characteristics Addis Ababa, Ethiopia. 1995. http://www.csa.gov.et/new csaweb/images/documents/surveys/Population%20and%20Housing% 20Census%201994/survey0/data/docs/report/Statistical_Report/K03/ K03_partI.pdf [accessed 10 June 2014].

47 Kessler RC, Andrews G, Colpe LJ et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol Med 2002;32:959–76.

48 Kessler RC, Barker PR, Colpe LJ et al. Screening for serious mental illness in the general population. Arch Gen Psychiatry 2003;60:184–9.

49 Tesfaye M, Hanlon C, Wondimagegn D, Alem A. Detecting postnatal common mental disorders in Addis Ababa, Ethiopia: validation of the Edinburgh postnatal depression scale and Kessler scales. J Affect Disorders 2010;122:102–8.

50 Hanlon C, Medhin G, Alem A et al. Measuring common mental disorders in women in Ethiopia: reliability and construct validity of the comprehensive psychopathological rating scale. Soc Psychiatry Psychiatr Epidemiol 2008;43:653–9.

51 Sartorius N. Stigma and mental health. Lancet 2007;370:810–1.

52 WHO. Prevention of mental disorders: effective interventions and policy options: a summary report. Geneva: World Health Organization; 2004.

53 Alem A, Kebede D, Woldesemiat G et al. The prevalence and socio-demographic correlates of mental distress in Butajira, Ethiopia. Acta Psychiatr Scand Suppl 1999;397:48–55.

54 Deyessa N, Berhane Y, Alem A et al. Depression among women in rural Ethiopia as related to socioeconomic factors: a community-based study on women in reproductive age groups. Scand J Public Health 2008;36:589–97.

55 Deribew A, Tesfaye M, Hailmichael Y et al. Common mental disorders in TB/HIV co-infected patients in Ethiopia. BMC Infect Dis 2010;10:201.

56 Deribew A, Tesfaye M, Hailmichael Y et al. Tuberculosis and HIV co-infection: its impact on quality of life. Health Qual Life Outcomes 2009;7:105.

57 Franklin H, Tora A, Deribe K et al. Development of a scale to measure stigma related to podoconiosis in Southern Ethiopia. BMC Public Health 2013;13:298.

58 Ermias M, Samuel E. Correlates of mental Distress in Jimma town, Ethiopia. J Health Sci 2003;14:39–49.

59 Piccinelli M, Homen FG. Gender differences in the epidemiology of affective disorders and schizophrenia. Geneva: World Health Organization, Division of Mental Health and Prevention of Substance Abuse;1997.

60 Kebede D, Alem A, Shibre T et al. Health related quality of life (SF-36) survey in Butajira, rural Ethiopia: normative data and evaluation of reliability and validity. Ethiop Med J 2004;42:289–97.

61 Skevington SM, Lotfy M, O'Connell KA, WHOQOL Group. The World Health Organization's WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial. A Report from the WHOQOL Group. Qual Life Res 2004;13:299–310.

62 WHO DoMHaSA. Prevention of mental disorders: effective interventions and policy options: a summary report. Geneva: World Health Organization, 2004.

63 Kebede D, Alem A, Rashid E. The prevalence and socio-demographic correlates of mental distress in Addis Ababa, Ethiopia. Acta Psychiatr Scand Suppl 1994;397:5–10.

64 Rai D, Zitko P, Jones K et al. Country- and individual-level socioeconomic determinants of depression: multilevel cross-national comparison. Br J Psychiatry 2013;202:195–203.

65 Patel V, Kleinman A. Poverty and common mental disorders in developing countries. Bull World Health Organ 2003;81:609–15.

66 Deyessa N, Berhane Y, Alem A et al. Intimate partner violence and depression among women in rural Ethiopia: a cross-sectional study. Clin Pract Epidemiol Ment Health 2009;5:8.

67 Kessler RC, Nelson CB, McGonagle KA et al. The epidemiology of co-occurring addictive and mental disorders: implications for prevention and service utilization. Am J Orthopsychiatry 1996;66: 17–31.

68 Regier DA, Farmer ME, Rae DS et al. Comorbidity of mental disorders with alcohol and other drug abuse. Results from the Epidemiologic Catchment Area (ECA) study. JAMA 1990;264:2511–8.

69 Patel V, Weiss HA, Chowdhary N et al. Effectiveness of an intervention led by lay health counsellors for depressive and anxiety disorders in primary care in Goa, India (MANAS): a cluster randomised controlled trial. Lancet 2010;376:2086–95.

70 Rahman A, Malik A, Sikander S et al. Cognitive behaviour therapy-based intervention by community health workers for mothers with depression and their infants in rural Pakistan: a cluster-randomised controlled trial. Lancet 2008;372:902–9.