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Stigma, depression and quality of life among people affected by neglected tropical diseases in Nepal

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Background: Stigma and poor mental health are important factors influencing the quality of life (QOL) of people with neglected tropical diseases (NTDs). This study examines the relationship between stigma, depression and QOL among people affected by leprosy and lymphatic filariasis (LF) in Nepal.

Methods: A cross-sectional community-based survey was conducted among 102 NTD-affected persons (70 leprosy and 32 LF) using interview-administered questionnaires measuring the level of stigma (5-QSI-AP), symptoms of depression (PHQ-9) and QOL (WHOQOL-8). Three different regression models were developed, each using the ordinary least squares and Poisson regression to evaluate the association between stigma and QOL, depression and QOL, and stigma and depression.

Results: The mean scores were 21.8±4.4 for QOL, 6.6±5.6 for depression and 3.0±2.8 for stigma. Almost 17% reported the prevalence of depression symptoms. Both stigma ($\beta=-0.65$, $p<0.001$) and depression ($\beta=-0.32$, $p<0.001$) were associated with lower scores for QOL, while there was a significant positive relationship between stigma and depression ($\beta=0.92$, $p<0.001$). Similar results were obtained from the Poisson regression models.

Conclusions: The study showed a considerable burden of depression, stigma and poor QOL among study participants with leprosy and LF in Nepal. A holistic package of care that addresses the physical, mental and psychological well-being of people with NTD is required.

Contexte: La stigmatisation et la mauvaise santé mentale sont des facteurs importants qui influencent la qualité de vie des personnes atteintes de maladies tropicales négligées (MTN). Cette étude examine la relation entre la stigmatisation, la dépression et la qualité de vie chez les personnes atteintes de lèpre et de filariose lymphatique au Népal.

Méthodes utilisées: Une enquête communautaire transversale a été menée auprès de 102 personnes atteintes de MTN (70 de la lèpre et 32 de la filariose lymphatique) à l'aide de questionnaires administrés par entretien mesurant le niveau de stigmatisation (5-QSI-AP), les symptômes de dépression (PHQ-9) et la qualité de vie (WHOQOL-8). Trois modèles de régression différents ont été développés, chacun utilisant les moindres carrés ordinaires et la régression de Poisson pour évaluer l'association entre : (i) la stigmatisation et la QV; (ii) la dépression et la QV; et (iii) la stigmatisation et la dépression.

Résultats: Les scores moyens étaient de 21,8±4,4 pour la QV, 6,6±5,6 pour la dépression, et 3,0±2,8 pour la stigmatisation. Près de 17% des personnes interrogées ont signalé la prévalence de symptômes dépressifs. La stigmatisation ($\beta = -0{,}65$, $p<0\ 001$) et la dépression ($\beta = -0{,}32$, $p<0\ 001$) ont été associées à des scores plus faibles pour la qualité de vie, tandis qu'il existait une relation positive significative entre la stigmatisation et la dépression ($\beta = 0{,}92$, $p<0\ 001$). Des résultats similaires ont été obtenus à partir des modèles de régression de Poisson.

Conclusions: L'étude a montré une incidence importante de dépression, de stigmatisation et d'une mauvaise qualité de vie parmi les participants atteints de lèpre et de FL au Népal. Il convient donc de mettre en place un ensemble de soins holistiques pour ces patients qui prendrait en compte le bien-être physique, mental et psychologique des personnes atteintes de MTN.

Antecedentes: La estigmatización y la mala salud mental son factores importantes que influyen en la calidad de vida de las personas con enfermedades tropicales desatendidas. las personas con enfermedades tropicales desatendidas (ETD). Este estudio examina la relación entre el estigma, la depresión y la CdV entre las personas afectadas por lepra y lepra y la filariasis linfática en Nepal.

Métodos: Se realizó una encuesta comunitaria transversal entre 102 personas afectadas por ETD (70 de lepra y 32 de filariasis linfática) utilizando cuestionarios entrevistas para medir el nivel de estigma (5-QSI-AP), los síntomas de depresión (PHQ- 9) y la CdV (OMS- 9). 9) y la calidad de vida (WHOQOL-8). Se desarrollaron tres modelos de regresión diferentes regresión de Poisson para evaluar la asociación entre: (i) el estigma y (ii) la depresión. entre: (i) estigma y CdV; (ii) depresión y CdV; y (iii) estigma y depresión.

Resultados: Las puntuaciones medias fueron 21,8±4,4 para la CdV, 6,6±5,6 para la depresión y 3,0±2,8 para el estigma. Casi el 17% informó de la prevalencia de síntomas de depresión. Tanto el estigma ($\beta = -0{,}65$, $p<0\ 001$), como la depresión ($\beta = -0{,}32$, $p<0\ 001$) se asociaron con puntuaciones más bajas para la CdV, mientras que hubo una relación positiva significativa entre el estigma y la depresión ($\beta = 0{,}92$, $p<0\ 001$). Se obtuvieron resultados similares en los modelos de regresión de Poisson.

Conclusiones: El estudio mostró una carga considerable de depresión, estigma y mala CdV entre los participantes del estudio con lepra y FL en Nepal. Se requiere un paquete holístico de atención que aborde el bienestar físico, mental y psicológico de las personas con ETD.

Keywords: depression, leprosy, lymphatic filariasis, neglected tropical diseases, Nepal, quality of life, stigma.

Introduction

Neglected tropical diseases (NTDs) are prevalent in many developing tropical and subtropical countries, causing significant illness and hindering economic development in impoverished populations.[1] Studies have reported that patients suffering from NTDs tend to have a considerably diminished quality of life (QOL), mainly due to their symptoms, emotional state and treatment experiences.[2] Patients with visible deformities caused by leprosy tend to have a reduced QOL.[3] Leprosy and lymphatic filariasis (LF) have the potential to negatively impact the social, economic and mental well-being of individuals affected by these diseases and their families.[4] Individuals who are affected by NTDs may suffer from physical impairments that limit their activities as well as social participation restrictions and stigmatization. These factors can negatively impact their QOL and that of their families.[5]

Individuals affected by NTDs often face stigma and discrimination due to their impairments and disfigurements caused by these diseases.[6] Stigma related to NTDs can take various forms, including enacted stigma, anticipated stigma and internalized stigma,[7] and can result in serious social and psychological consequences such as social isolation, decreased QOL and negative impacts on mental health.[8] The most commonly reported reasons for stigmatization include concerns about physical appearance, fear of transmission and being perceived as a burden on one's family.[6] van Brakel et al.[5] found that almost 36% of individuals with leprosy-related disabilities reported experiencing social stigma. This study also showed a correlation between the level of community stigma and the level of participation among people with leprosy-related disabilities, as well as anticipated stigma.[5] Studies have found a close relationship between stigma and mental health in the context of NTDs[9] contributing significantly to comorbidity and the global burden of these diseases.[10] It is essential to address the issues related to stigma and its effect on mental health and QOL among individuals affected by NTDs to improve their well-being and reduce the burden of these diseases.

Mental health conditions and related psychosocial, cognitive and intellectual disabilities add significantly to the worldwide burden of disease. NTDs increase the risk of developing mental health conditions, and individuals with mental health conditions are at a higher risk of developing NTDs.[11] Stigma associated with NTDs can lead to psychological distress, including worry, fears, sadness and insecurity, which can result in decreased social functioning and self-isolation. This relationship between NTDs and psychological health conditions often leads to chronic comorbidity, which further affects QOL. Psychological consequences of NTDs can include low self-esteem, anxiety, depression and suicide.[12] Litt et al. highlighted the overlap between NTDs and mental health conditions, specifically depression.[8] A systematic review reported poor mental health and reduced QOL among patients affected by leishmaniasis[13] and outlined a conceptual framework where stigma, discrimination, social exclusion and low self-esteem contribute to lower QOL and mental illness. However, the review identified gaps in the literature on stigma, mental health and QOL.[13]

The population in low- and middle-income countries, such as Nepal, face significant challenges due to poverty, illiteracy and poor living conditions. The additional burden of NTDs further reduces their QOL by subjecting them to stigma and mental health problems.[14] Although Nepal is predominantly mountainous, it has become endemic to several NTDs, with almost everyone at risk of developing at least one. The Terai plains of southern Nepal have a particularly high prevalence of NTDs. However, there is limited information on the specific types of NTDs present in Nepal.[15] Despite the significant impact of NTDs on QOL, there are limited studies that explore the relationship between stigma, mental health and QOL among people affected by NTDs. This study aims to fill this gap by assessing the association between stigma, depression and QOL among people affected by leprosy and LF in Nepal.

Methods

Setting, participants and procedure

The data for this analysis were from the baseline survey of an NTD-focused project implemented by FAIRMED Foundation in Jhapa, Morang and Sunsari districts of Koshi province in Nepal. A community-based cross-sectional survey of people affected by NTDs was conducted in 25 project-implemented municipalities from the three districts. All the persons affected by NTDs (leprosy and LF) in the selected sample wards were approached through line listing and cases were explored through household visits. A total of 102 NTD-affected persons (70 leprosy and 32 LF) could be contacted and surveyed out of 137 persons on the list (86 leprosy and 51 LF).

Data were collected by face-to-face interviews using a structured questionnaire in the KoBo online data collection platform.[16] The questionnaire was prepared in English and then translated into Nepali. The Nepal Health Research Council provided ethical approval of this study (reference no. 557/2021). Informed written consent was obtained from the participants, assuring the confidentiality of the information collected. The data were collected by trained field researchers in face-to-face interviews (October–December 2021), with responses recorded in Android smartphones. All the safety measures, including physical distancing, hand hygiene and use of a mask, during the coronavirus disease 2019 pandemic as recommended by the government of Nepal and World Health Organization (WHO) were followed throughout the study period by all research teams.

Study variables

Quality of life

The QOL of the person affected by NTD was measured by the eight-item version the EUROHIS-QOL scale,[17,18] which is a shorter version of the WHOQOL-BREF scale.[19] The items constituted two questions each related to global QOL (overall QOL and general health), physical health (energy level and daily activities), psychosocial health (self-esteem and personal relationship) and environmental health (financial resources and living conditions). Items of the EUROHIS-QOL-8 are rated on a 5-point scale, ranging from 1 (worst) to 5 (best); the sum score has a possible range of 8–40, with a higher score indicating better QOL. The WHOQOL-BREF has been validated for assessing QOL in a range of settings and has been used to assess the QOL of NTD patients in a number of studies. The EUROHIS-QOL-8 has been previously used in Nepal, with the Nepalese version showing high reliability.[20]

Stigma

Stigma related to NTDs was measured using the 5-question Stigma Indicator–Affected People (5-QSI-AP) scale, which was developed to assess stigma areas including concealment, avoidance, pity and shame.[21] The scale was previously validated in Nepal.[22] The scale consists of five items, with each item scored as 0 (never or I do not know), 1 (sometimes) or 2 (often/usually). The possible score ranges from 0 to 10, with higher scores representing a higher level of experienced stigma.

Depression

Depression was assessed using the 9-item Patient Health Questionnaire (PHQ-9),[23] a standardized measured used to assess depression symptoms. The possible score ranges from 0 to 27, with higher scores indicating a greater number of symptoms of depression. The PHQ-9 has been previously used to measure the mental health of NTD-affected persons in Nepal[24] and other countries.[25–27]

Other variables

A range of sociodemographic and disease-related characteristics that might act as confounders were measured and included for adjustment. At the sociodemographic level, variables included age, education, family type, religion and marital status. Age was divided into three categories: 18–35 y, 36–55 y and >55 y. Education status included cannot read and write, informal education, primary school and secondary or above. Family types included single family and joint or extended family. Religion included Hindu and others. Marital status was categorized as unmarried (single, widowed, divorced and separated) or married. Occupation included household duties, agriculture, daily wages/labour, business and others. Annual household income (in Nepalese rupees [NPR]) was divided into ≤100 000, 100 000–300 000 and >300 000 (US$1=approximately 120 NPR in November 2021). NTD-related characteristics included how long ago the disease was first identified, training received on self-care in the past 12 months, respondent's perception of the adequacy of knowledge in caring for the NTD-affected person among family members, treatment sought in the past 12 months, perception of recovery from the disease, whether the disease hampered one's occupation and daily life and comorbidity conditions. Comorbidity conditions were measured by whether the patients had a chronic condition or not. Financial support received for the treatment of the disease included yes and no.

Data analysis

Study variables were summarized using descriptive statistics (mean, standard deviation [SD] and percentages). Collinearity between the independent variables assessed by Pearson's correlation coefficient ($r>0.50$) found significant correlation between stigma and depression ($r=0.54$). Three different models were developed to evaluate the association between stigma and QOL, depression and QOL, and stigma and depression. Associations were analysed using multivariate linear regression methods. Due to the nature of the data, we also fitted the Poisson regression models estimating the incidence rate ratio. The models were initially developed including all variables, and final reduced models were achieved using a manual backward selection method including only variables significant at $p<0.05$. Analyses were performed using Stata version 16 (StataCorp, College Station, TX, USA).[28]

Table 1. Sociodemographic characteristics of the study sample

Characteristics	Leprosy, n (%)	LF, n (%)	Total, n (%)
Age (years)			
18–35	22 (31.4)	3 (9.4)	25 (24.5)
36–55	22 (31.4)	19 (59.4)	41 (40.2)
≥56	26 (37.1)	10 (31.3)	36 (35.3)
Sex			
Male	49 (70.0)	14 (43.8)	63 (61.8)
Female	21 (30.0)	18 (56.3)	39 (38.2)
Ethnicity			
Dalit	11 (15.7)	4 (12.5)	15 (14.7)
Janajati	27 (38.6)	10 (31.3)	37 (36.3)
Madheshi	18 (25.7)	11 (34.4)	29 (28.4)
Brahmin/Chhetri	12 (17.1)	2 (6.3)	14 (13.7)
Muslim and other	2 (2.9)	5 (15.6)	7 (6.9)
Religion			
Hindu	65 (92.9)	26 (81.3)	91 (89.2)
Other	5 (7.1)	6 (18.8)	11 (10.8)
Annual income (NPR)			
≤100 000	42 (60.0)	18 (56.3)	60 (58.8)
>100 000–300 000	26 (37.1)	11 (34.4)	37 (36.3)
>300 000	2 (2.9)	3 (9.4)	5 (4.9)
Education			
Cannot read and write	27 (38.6)	16 (42.2)	43 (42.2)
Informal education	12 (17.1)	9 (20.6)	21 (20.6)
Primary school	9 (12.9)	5 (13.7)	14 (13.7)
Secondary or above	22 (31.4)	2 (23.5)	24 (23.5)
Occupation			
Household duties/housewife	13 (18.6)	9 (21.6)	22 (21.6)
Agriculture	14 (20.0)	5 (18.6)	19 (18.6)
Daily wages/labours	20 (28.6)	10 (29.4)	30 (29.4)
Business	10 (14.3)	7 (16.7)	17 (16.7)
Other (student, self-employed)	13 (18.6)	1 (13.7)	14 (13.7)
Marital status			
Unmarried	16 (22.9)	4 (12.5)	20 (19.6)
Married	54 (77.1)	28 (87.5)	82 (80.4)
Type of family			
Single	47 (67.1)	18 (56.3)	65 (63.7)
Joint or extended	23 (32.9)	14 (43.8)	37 (36.3)

Results

Sample characteristics

Table 1 presents sociodemographic characteristics of the NTD-affected persons (by type of disease) who participated in the study. The mean age of the study participants was 47.4 y (SD 15.0). A greater proportion of respondents were male (61.8%), followed the Hindu religion (89.2%) and were married (80.4%). More than one-third (36.3%) were of Indigenous (Janajati) ethnicity followed by Madheshi (28%). Around 59% reported their annual household income as <100 000 NPR. A greater proportion of the sample could not read and write (42.2%) and reported labour as their primary occupation (29.4%).

Disease-related characteristics

A total of 44.1% of participants reported the disease was identified in 6 months–5 y. Two-thirds (65.7%) of participants sought treatment in the last 12 months, while 92.2% of participants did not get any training on self-care in last 12 months and 65.7% believed that their family members did not have adequate knowledge to care for their condition. Around two-thirds of the participants (68.6%) had the perception that they would recover from the disease. More than half (52.9%) reported that the disease status had affected the patient's education and 30.4% reported that NTDs hampered them in their daily life. Around half reported that they had a comorbid condition. A higher proportion of patients affected by LF (53.1%) sought treatment in the past 12 months compared with patients affected by leprosy (25.7%). Patients affected by LF also more often reported that their disease status hampered their occupation and daily life, as well as having comorbid conditions (Table 2).

Stigma, depression and QOL

A Cronbach's α coefficient of 0.88 for the EUROHIS-QOL-8 and 0.93 for the PHQ-9 indicated a high internal consistency of the scales in this study. The internal consistency of the 5-QSI-AP scale was 0.79, suggesting adequate reliability of the scale. The mean score for QOL was 21.8±4.4, indicating a poor QOL among person affected by NTDs. The mean scores for the PHQ-9 and 5-QSI-AP were 6.6±5.6 and 3.0±2.8, respectively. While the scores for QOL were comparable between leprosy and LF patients, both depression and stigma scores were higher among leprosy patients compared with LF patients (Table 3).

Supplementary File 1 presents the QOL domain scores for people affected by NTD. The QOL score was highest for the environment domain, followed by physical domain. The prevalence of depressive symptoms (as measured by PHQ-9 ≥10) among the study patients was 16.7%, with 9.8% severe and 6.9% moderate depression. An additional 43.1% had symptoms of mild depression (Supplementary File 2). Supplementary File 3 shows the percentage of responses in different categories of response options for each of the five items of the stigma scale. A higher proportion of respondents perceived that they experienced difficulties in finding or keeping a job as a result of their NTD disability. Around 57% felt ashamed because of the condition and more than half also reported experiencing people trying to avoid them.

Table 4 shows the correlation among the study variables. QOL total score was positively associated with all the QOL subdomains, except for the environment domain. Similarly, there was a strong positive correlation between the global, physical and psychosocial subdomains, while the environment subdomain had a weak negative correlation with the QOL global subdomain ($r=-0.25$, $p<0.01$). There was a significant moderately strong positive correlation between stigma and depression ($r=0.59$, $p<0.001$) and a moderately strong negative correlation of stigma ($r=-0.50$, $p<0.001$) and depression ($r=-0.51$, $p<0.001$) with QOL.

Association between stigma, mental health and QOL

As presented in Table 5, three different models were employed to investigate the relationship between stigma, mental health

Table 2. Disease-related characteristics of the study sample

Characteristics	Leprosy, n (%)	LF, n (%)	Total, n (%)
Identified the disease			
<6 months	13 (18.6)	7 (21.9)	20 (19.6)
6 months–5 y	39 (55.7)	6 (18.7)	45 (44.1)
>5 y	18 (25.7)	19 (59.4)	37 (36.3)
Stage of the disease			
Under treatment	65 (92.9)	29 (90.6)	94 (92.2)
Recently diagnosed (past 3 months)	5 (7.1)	3 (9.4)	8 (7.8)
Training on self-care in last 12 months			
Yes	7 (10.0)	3 (9.4)	10 (9.8)
No	63 (90.0)	29 (90.6)	92 (90.2)
Adequate knowledge of care among family members			
Yes	23 (32.9)	12 (37.5)	35 9(34.3)
No	47 (67.1)	20 (62.5)	67 (65.7)
Sought treatment in the last 12 months			
Yes	52 (74.3)	15 (46.9)	67 (65.7)
No	18 (25.7)	17 (53.1)	35 (34.3)
Monetary support received			
Yes	10 (14.3)	3 (9.4)	13 (12.8)
No	60 (85.7)	29 (90.6)	89 (87.3)
Perception on recovery from disease			
Yes	35 (50.0)	4 (12.5)	39 (38.2)
Maybe	22 (31.4)	9 (28.1)	31 (30.4)
No	7 (10.0)	12 (37.5)	19 (18.6)
Don't know	6 (8.6)	7 (21.9)	13 (12.8)
Hampered in occupation			
Yes	31 (44.3)	23 (71.9)	54 (52.9)
Sometimes	17 (24.3)	6 (18.8)	23 (22.6)
No	22 (31.4)	3 (9.4)	25 (24.5)
Hampered in daily life			
Yes	18 (25.7)	13 (40.6)	31 (30.4)
Sometimes	26 (37.1)	10 (31.3)	36 (35.3)
No	26 (37.1)	9 (28.1)	35 (34.3)
Comorbidity			
Yes	31 (55.7)	21 (65.6)	52 (49.0)
No	39 (44.3)	11 (34.4)	50 (51.0)

Table 3. Scores for QOL, depression and stigma

Characteristic	Possible score	Leprosy (n=70), mean±SD	LF (n=32), mean±SD	Total (n=102), mean±SD
Quality of life	8–40	21.6±4.5	22.2±4.2	21.8±4.4
Depression (PHQ-9)	0–27	6.9±5.6	5.9±5.7	6.6±5.6
Stigma	0–10	3.2±2.7	2.4±3.1	3.0±2.8

and QOL. Models 1 and 2 assessed the relationship of stigma and mental health, respectively, with QOL, while model 3 included mental health as an outcome variable and stigma as an independent variable. Each model was adjusted for sociodemographic and disease-related characteristics significant at $p<0.05$ (full models are included in Supplementary File 4). The results showed that both stigma ($\beta=-0.65$, $p<0.001$; model 1) and depression ($\beta=-0.32$, $p<0.001$; model 2) were associated with lower scores for QOL. Each 1 unit increase in stigma score was associated with a 0.65 unit decrease in QOL score, while each 1 unit increase in depression was associated with a 0.32 unit decrease in QOL score. There was a significant positive relationship between stigma and depression ($\beta=0.92$, $p<0.001$; model 3), which suggested that each 1 unit increase in stigma was associated with a 0.92 unit increase in depression among the NTD-affected persons. Similar results were obtained from the Poisson regression models, with each additional score of stigma associated with a 3% decrease in the QOL score and each additional score of depression associated with a 2% decrease in the QOL score. Conversely, each additional score of stigma was associated with an 11% increase in the depression score (Table 5).

Discussion

The study demonstrated low levels of QOL and high levels of depression and stigma among study participants with leprosy and LF, with mean scores of 21.8±4.4 for QOL, 6.6±5.6 for depression and 3.0±2.8 for stigma. Previous studies using the EUROHIS-QOL-8 in Nepal reported QOL scores of 25.7±4.2 among older adults[20] and 27.6±3.5 among the general population.[29] Almost 17% of participants showed symptoms of depression. van Dorst et al.[24] reported the prevalence of depression (total PHQ-9 score ≥10) among leprosy patients of 24.6% in Nepal, which was 17.2% in our study. This prevalence is much higher than the prevalence of 4.1% in the general population in Nepal using the same scale.[30] These findings showed that there is a considerable burden of mental health conditions and diminished QOL among persons affected by leprosy and LF in Nepal.

A similar level of depression and QOL was reported previously in a study in low-income countries among individuals affected by LF, podoconiosis or leprosy.[31] Persons with leprosy perceived a higher level of stigma and poor psychological health compared with persons with LF. This is similar to the findings reported in India, where participants affected by leprosy reported a higher intensity of depression and anxiety.[32] The results also showed that stigma exists among persons affected by NTDs, especially in getting a job, feeling pity and ashamed, and avoidance by other people. The results of the current study are consistent with studies in Bangladesh[9] and Brazil[33] using the WHOQOL-BREF, which found that people with leprosy had significantly poorer QOL than controls. Previous studies in Nepal also reported lower levels of psychological well-being among people affected by leprosy.[24,34]

The study provided valuable insights into the relationships between stigma, mental health and QOL in individuals affected by NTDs, particularly leprosy and LF. The findings suggest that stigma and mental health are both significant predictors of QOL, highlighting the importance of addressing these factors in the care and management of NTDs, thereby improving patients' QOL.

Table 4. Correlation among the study variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) QOL total	1						
(2) QOL-global	0.81***	1					
(3) QOL-physical	0.90***	0.78***	1				
(4) QOL-psychosocial	0.85***	0.62***	0.71***	1			
(5) QOL-environment	0.18^{+}	−0.25**	−0.08	−0.05	1		
(6) Stigma	−0.50***	−0.44***	−0.45***	−0.43***	−0.05	1	
(7) PHQ-9	−0.51***	−0.46***	−9.50***	−0.46***	0.03	0.59***	1

***$p<0.001$, **$p<0.01$, *$p<0.05$, $^{+}p<0.1$.

Table 5. Association between stigma, mental health and QOL

	Linear regression			Poisson regression		
Model	β	p-Value	95% CI	IRR	p-Value	95% CI
Model 1: stigma and QOL[a]	−0.65	<0.001	−0.90 to −0.41	0.97	<0.001	0.95 to 0.98
Model 2: depression (PHQ-9) and QOL[b]	−0.32	<0.001	−0.47 to −0.18	0.98	0.002	0.97 to 0.99
Model 3: stigma and depression (PHQ-9)[c]	0.92	<0.001	0.62 to 1.21	1.11	<0.001	1.08 to 1.14

β: unstandardized regression coefficient; IRR: incidence rate ratio.

[a] Independent variable stigma and dependent variable QOL. Adjusted for occupation, knowledge of care for family member and NTD hampered daily life.

[b] Independent variable depression and dependent variable QOL. Adjusted for ethnicity, sex, occupation, knowledge of care for family member and NTD hampered daily life.

[c] Independent variable stigma and dependent variable depression. Adjusted for ethnicity, occupation and stage of disease.

Individuals who perceive higher levels of stigma experience lower QOL. This finding is consistent with previous research indicating that stigma can have a significant negative impact on the well-being of individuals affected by NTDs.[24,35] The negative association between mental health and QOL suggests that individuals with poorer mental health experience lower QOL. This finding is in line with prior research that has consistently found mental health to be a key predictor of QOL.[4] The positive association between stigma and mental health indicates that individuals who perceive higher levels of stigma may be more likely to experience mental health issues. Social discrimination, exclusion and isolation, difficulties with relationships and decreased work capacity could be the possible factors contributing to the association between stigma, depression and diminished QOL among people affected by NTDs.[33] Pierneef et al.[36] found discrimination, lack of social support, restrictions in social participation and community attitudes and cultural beliefs about the disease affected mental health. The relationship of stigma and mental health with QOL underscores the pervasive and harmful effects of stigma on the lives of NTD-affected patients.

Limitations

This study has some limitations. Although this study showed the association of depression and stigma with QOL, the cross-sectional nature of the study limited determination of the direction of the observed associations. We did not measure all factors that might be associated with QOL and depression among NTD-affected persons. For instance, a higher disability grade can result in poorer mental well-being, perceived stigma and QOL.[32,34,37] Our study did not measure disability grade among the patients. The previous study largely used the Dermatology Life Quality Index to measure the QOL of patients affected by leprosy and LF, which limited the comparison of QOL observed in this study. Furthermore, the study did not have controls to compare the observed scores for QOL, mental health and stigma of NTD patients with the general population. The strengths of this study include standard tools for measuring QOL, mental health and stigma that have been previously validated in Nepal. The analyses were carried out using ordinary least squares regression as well as Poisson regression models, with both analyses producing similar results. Further, we have presented outcome scores for both leprosy and LF patients, a novel contribution that was absent in prior studies.

Implications

The study confirms that there is a considerable burden of mental health conditions and stigma associated with leprosy and LF. Efforts to address stigma and mental health needs of people affected by NTDs should be reorganized into the existing healthcare services. Healthcare providers and policymakers should work to reduce stigma and address mental health concerns to improve QOL among people affected by NTDs, with a special focus on persons affected by leprosy. Interventions aimed at reducing stigma may include increasing public awareness of NTDs, improving access to treatment and care and providing education and support to individuals with NTDs and their families. Addressing mental health concerns may involve screening for mental health issues, providing access to mental health services and promoting self-care and coping strategies. By addressing these key factors, healthcare providers and policymakers can help to improve the well-being and QOL of individuals with NTDs. Early identification and effective management of cases should be emphasized. It is also important to broaden the scope of programs by incorporating rehabilitation services, facilitating access to mental health support and actively challenging the stigmatization of NTDs through informative campaigns that dispel misconceptions.[38]

Conclusions

The findings of this study showed a considerable burden of depression, stigma and diminished QOL among persons affected by leprosy and LF in Nepal. The study also established a strong correlation between higher levels of depression and stigma with poorer QOL, while stigma showed a positive association with depression. These results highlight the compelling need for a comprehensive care approach that addresses the physical, mental, social and psychological needs of individuals with NTDs. In order to effectively manage morbidity and prevent disability associated with these diseases, interventions should incorporate evidence-based strategies that address the mental, social and psychological dimensions of these conditions. By adopting such a holistic package of care, we can strive towards improving the overall well-being and QOL of those affected by NTDs.

Supplementary data

Supplementary data are available at *International Health* online (http://inthealth.oxfordjournals.org).

Authors' contributions: DKT, NS, CN and BB conceived the study. DKT and CN designed the study protocol. AK, JT and CN contributed to the field implementation. HRD and DKT undertook data analysis and modelling. DKT, AK and PP carried out the analysis and interpretation of data and drafted the manuscript. All authors critically revised the manuscript and approved the final version.

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Data availability: Data used in this study are available upon reasonable request from the corresponding author.

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