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The Effect of a Chronic Disease Self-Management Curriculum on the Mental Well-being of Persons Living with Lymphatic Filariasis in Léogâne, Haiti

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Abstract

The Effect of a Chronic Disease Self-Management Curriculum on the Mental Well-being of Persons Living with Lymphatic Filariasis in Léogâne, Haiti
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Introduction: Lymphatic filariasis (LF), a neglected tropical disease that can cause permanent disfigurement and disability, has a significant psychosocial burden that is often overlooked in LF treatment and morbidity management. A potential intervention that could address the psychosocial impact of LF infection is the Chronic Disease Self-Management (CDSM) program, a peer-led education program that teaches skills to better manage participants' chronic conditions and build their confidence.

Purpose: The purpose of this study is to assess the effectiveness of the six-week CDSM curriculum on the mental well-being of people living with lymphatic filariasis in Léogâne, Haiti.

Methods: The CDSM intervention was administered to 118 people with LF through Hope Clubs, which are support groups for people living with LF, in a stepped-wedge cluster randomized trial at the Hôpital Ste. Croix. After four months, their outcomes were compared with wait-listed control participants (n=93) using multiple linear and logistic regression modeling.

Results: Participants in the Intervention Arm had significant improvements in self-efficacy (β = 0.6, p-value = 0.004), but no significant improvements in depression or perceived social support. The effect of the intervention on all outcomes was not modified by participant age except for symptoms of depressive illness; older individuals had lower odds of reporting an improvement in their depressive symptoms after receiving the intervention than those who were among the youngest age bracket (age 18-34 years old). A per-protocol analysis suggested that high attendance for a majority of the training sessions may not be required to see significant improvement in self-efficacy ($\beta_{\text{low attendance}} = 0.8$, p-value = 0.002; $\beta_{\text{high attendance}} = 0.4$, p-value = 0.059).

Conclusion: The psychosocial burden of lymphatic filariasis can be partially addressed using the CDSM program. Future research is needed to evaluate the CDSM intervention among larger sample sizes of people living with LF, as well as people living with other neglected tropical diseases.

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Background

Neglected Tropical Diseases and Mental Health

Neglected Tropical Diseases (NTDs) are a collection of twenty diseases that have been identified by the World Health Organization (WHO) as being underfunded and largely a consequence of the environmental and socioeconomic conditions resulting from poverty (Bailey et al., 2019; World Health Organization, 2017). NTDs affect more than 1 billion people in 149 countries, especially the poorest populations from low- and middle-income countries (LMICs), and many have a chronic course that leads to disability, disfigurement, stigmatization, and discrimination (Bailey et al., 2019; Litt, Baker, & Molyneux, 2012; Ton, Mackenzie, & Molyneux, 2015; World Health Organization, 2020b). Since the turn of the 21st century, there has been significant interest in tackling NTDs, resulting in some of the most rapidly scaled-up global health programs (Litt et al., 2012). However, national and global health programs have largely focused on control, elimination, and eradication of NTDs and ignored addressing the significant psychosocial burden of NTDs on affected individuals (Litt et al., 2012).

Calls to address the mental health of persons living with NTDs have led to a focus on the psychosocial aspects of these illnesses. The evidence base demonstrates that people living with NTDs are at a higher risk for developing mental health conditions, and people living with mental health conditions are at a higher risk for contracting an NTD (Bailey et al., 2019; Litt et al., 2012; World Health Organization, 2020b). This association may be partially explained by the shared biological, behavioral, social, and environmental determinants of NTDs and poor mental health, including but not limited to age, sex, gender, ethnicity, nutrition, physical activity, substance use, sexual behaviors, socioeconomic status, migration, exposure to natural disasters and conflict, and marginalization (World Health Organization, 2020b). However, it is also influenced by the psychosocial impact of chronic NTDs, particularly skin NTDs, which cause distress, physical disability, permanent disfigurement, self and external stigma and discrimination, and loss of economic opportunity for both the patients themselves and their caregivers (Litt et al., 2012; World Health Organization, 2020b). Studies have found that there are higher rates of common mental health disorders and symptoms, such as anxiety, depression, substance abuse, and suicidal ideation, among those with NTDs compared to those with other common, chronic conditions (Bailey et al., 2019; World Health Organization, 2020b). Additionally, the burden of poor mental health and NTDs has global economic consequences; the WHO estimates that the global direct and indirect economic costs of mental disorders are $2.5 trillion USD, and the global cost of just one NTD, trachoma, is estimated to cost $2.9-8.0 billion USD in terms of lost productivity (World Health Organization, 2020b). Despite the knowledge that physical interventions are insufficient to address the psychosocial impact of chronic NTDs, there is a significant lack of psychological interventional studies among people living with NTDs and few examples of integrated approaches to NTD and mental health care.

Lymphatic Filariasis

Among NTDs, lymphatic filariasis (LF) has been consistently shown to be an important risk factor for mental disorders. Lymphatic filariasis is a parasitic disease caused by three types of microscopic, thread-like worms (nematodes) – *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori* – that attack and live for years in the human lymph system, which maintains the body’s fluid balance and fights infections (Centers for Disease Control and Prevention, 2020). While most people infected with LF are asymptomatic and never develop symptoms, others will progress to develop chronic lymphedema and elephantiasis in their limbs, breasts, and genitalia, and in men, swelling of the scrotum called hydrocele (Centers for Disease Control and

Prevention, 2020; World Health Organization, 2020a). People living with chronic LF often also suffer acute episodes of local inflammation involving the skin, lymph nodes, and lymphatic vessels that are mostly the result of secondary bacterial skin infections and are debilitating for weeks (World Health Organization, 2020a). Once a person living with LF develops symptoms, they usually have those symptoms for the rest of their life. However, they can benefit from lymphedema management that largely consists of skin hygiene and care, limb elevation, specific exercises to improve lymph flow, and wound management (Centers for Disease Control and Prevention, 2020).

Over 947 million people in 54 countries are at risk for lymphatic filariasis, mostly in the tropics and sub-tropics of the Global South, and require yearly preventative chemotherapy to prevent the acquisition of the disease (Pan American Health Organization, 2020). Over 120 million people are estimated to be infected globally, and roughly 40 million people are disfigured and disabled by LF, making it the world's leading cause of permanent disability (Centers for Disease Control and Prevention, 2020; World Health Organization, 2020a). Lymphatic filariasis infections are usually acquired during childhood and are spread person to person by a wide variety of mosquitos (World Health Organization, 2020a). The disease is typically diagnosed by examination of blood under a microscope to identify the microscopic worms, however there are two considerations that make diagnosing and estimating the prevalence of LF difficult: 1) the microscopic worms are nocturnal, which means that blood samples must be collected at night as it is the only time the worms circulate in the blood, and 2) because symptoms develop years after infection, lab tests are frequently negative because the patients no longer have an active infection (Centers for Disease Control and Prevention, 2020). Lymphatic filariasis elimination is possible through mass drug administration (MDA), in which an entire at-risk population receives preventative chemotherapies to prevent future community transmission (Centers for Disease Control and Prevention, 2020; World Health Organization, 2020a). MDA is the cornerstone of national LF elimination strategies and has had some success in the 21st century. The WHO estimates that since 2000, the population requiring MDA has declined by 597 million and that MDA from 2000 to 2015 has "averted at least $100.5 billion USD of economic loss expected to have occurred over the lifetime of cohorts who have benefited from treatment" globally (World Health Organization, 2020a). With coordinated efforts and scaled-up MDA programming around the world, lymphatic filariasis has the potential to be eradicated in our lifetime (Kastner, Stone, Steinmann, Tanner, & Tediosi, 2015).

Lymphatic Filariasis and Mental Health

While there has been broad investment into LF control and elimination around the world, the significant psychosocial impact of the disease has largely been neglected. LF morbidity management usually consists of four components: treatment of acute inflammation attacks, management of lymphedema, management of hydrocele, and the provision of appropriate antifilarial medicines; and ignores the mental health aspects of the disease (Pan American Health Organization, 2020). However, there are a few studies that have investigated the mental health implications of LF. Qualitative studies of persons living with LF report feelings of despair, shame, frustration, hopelessness, embarrassment, increased stress, anxiety, depression, and suicidal ideation due to their disease, even among those of high socioeconomic status (Abdulmalik et al., 2018; Krishna Kumari, Harichandrakumar, Das, & Krishnamoorthy, 2005; Litt et al., 2012; Zeldenryk, Gray, Speare, Gordon, & Melrose, 2011). Depression is of particular concern among this population; recent studies of LF patients show a wide range of the prevalence of depression, from 8% in Sri Lanka, to 37% in Haiti, to 70% in Togo, and as high as

97% in India (Ton et al., 2015). Studies have also found that unemployment, which is common among LF patients, and severity of disease symptoms are associated with more serious psychosocial problems (Krishna Kumari et al., 2005; Litt et al., 2012; Obindo et al., 2017; World Health Organization, 2017). When the burden of depressive illness in filariasis patients is included in the calculation of disability-adjusted life years (DALYs) attributed to disease, the figure nearly doubles from 2.78 million DALYs (as estimated by the Global Burden of Disease study of 2010) to 5.09 million DALYs (Ton et al., 2015). Thus, mental health disorders represent a significant but overlooked comorbidity of lymphatic filariasis.

Beyond mental disorders, lymphatic filariasis can have a profound impact on an individual's social well-being. The emotional distress and discrimination arising from lymphatic filariasis frequently lead to difficulties in occupational functioning, marital life, interpersonal relationships, and community participation (Abdulmalik et al., 2018). People living with LF are often unable to work, cannot participate in community events such as attending church, weddings, funerals, graduations, and community meetings due to social stigma and limited mobility, and can have difficulties completing daily activities such as dressing, bathing and using the bathroom due to their disability (Zeldenryk et al., 2011). There are also gender-specific social consequences of LF; among men, investigators believe that there is pervasive under-reporting of the burden of hydrocele (swelling in the scrotum) due to patient unwillingness to report sexual dysfunction and the disease's effect on sexual relationships (Wynd, Melrose, Durrheim, Carron, & Gyapong, 2007). LF can also affect the "marriageability" of those infected, especially young women. In many contexts around the world, if a woman is unmarried when she begins to develop LF symptoms, she may have limited marriage prospects due to community beliefs that her children will also have LF and/or she will be a financial burden because of long-term healthcare costs and lack access to employment (Ton et al., 2015; Wynd et al., 2007; Zeldenryk et al., 2011). Additionally, many persons living with LF do not have access to formal health systems and instead rely on the practical, emotional, and financial support of their families. It is often female family members who spend substantial time caring for their loved ones with LF and perform "tasks that may be physically, emotionally, socially, and financially demanding" (Litt et al., 2012), and the burden of filariasis on caregivers is estimated to be 229,537 DALYs (Ton et al., 2015). Social exclusion and reduced quality of life are common among people living with lymphatic filariasis and their families but are rarely addressed by LF programs that typically focus only on the physical aspects of the disease.

The psychosocial burden of lymphatic filariasis not only increases the suffering of the patients and their caregivers but also perpetuates the cycle of poverty and frequently leads to worse outcomes and morbidity of LF. Chronic disability, poverty, and pervasive unemployment create a vicious cycle that reinforces "suffering and the economic impact on affected people, their families, communities, and health systems" (World Health Organization, 2020b). LF-related stigma and discrimination also keep affected individuals from seeking care, leading to delayed treatment and quicker progression to the outwardly visible complications of the disease (Wynd et al., 2007). Frequently, people report that they only sought LF-specific healthcare services when their disease began to interfere with their livelihood for fear of being identified as an LF patient (Zeldenryk et al., 2011). In fact, regardless of socioeconomic status, people with LF will often choose to pay for private LF care rather than free, government-provided services due to social stigma; however, this health-seeking behavior usually results in patients receiving less effective, or even ineffective, care. (Perera, Whitehead, Molyneux, Weerasooriya, & Gunatilleke, 2007). Those with mental health comorbidities are more likely to have worse outcomes as mental health conditions can lead to worse health-seeking behaviors, delayed treatment, and poor medication adherence (World Health Organization, 2020b). Thus, psychosocial aspects of lymphatic filariasis predispose afflicted persons to suffer from mental distress and disorders; moreover, the unaddressed mental health comorbidities in LF patients threaten the effectiveness of national and global elimination campaigns as they can lead to poor health behaviors that undermine elimination efforts. There is a major opportunity to improve the well-being of people living with LF by using an integrated approach to lymphatic filariasis care.

Lymphatic Filariasis in Haiti

Lymphatic filariasis in the Americas has its roots in the slave trade; numerous parasitic diseases were transported along with millions of people from sub-Saharan Africa and the presence of mosquitos allowed for the dispersion of lymphatic filariasis across the region (Lammie et al., 2007). Economic development in the last century led to the spontaneous disappearance of the parasite in most of the Americas, with ongoing transmission limited to Brazil, Dominican Republic, Haiti, and Guyana (Lammie et al., 2007). One of the countries most affected by lymphatic filariasis is Haiti. LF has been fairly common in Haiti for centuries with approximately 2-5% of adults having lymphedema or elephantiasis during the late 1990s (J. Coreil, Mayard, Louis-Charles, & Addiss, 1998). In fact, Hispaniola, the island that consists of the Dominican Republic and Haiti, currently accounts for 90% of the LF burden in the entire hemisphere (Keys, Gonzales, Beau de Rochars, Blount, & Noland, 2018). Locally, lymphedema is referred to as *gwo pye* or “big foot” and traditionally was understood to be “a mystical illness caused by the placement of magical powder along the footpath” (J. Coreil et al., 1998). People living with *gwo pye* frequently seek treatment from voodoo healers in Haiti, although people also seek care in clinical settings, especially at the Hôpital Ste. Croix (J. Coreil et al., 1998). The

Hôpital Ste. Croix has had long-term involvement in filariasis projects in Léogâne and is the only facility in Haiti to provide comprehensive LF care, which focuses on preventing disability, managing the physical effects of LF, and providing access to surgical interventions (Pan American Health Organization, 2010). Qualitative research of women living with LF in Haiti found that many suffered from losses of social and economic opportunity, strain on family relationships, especially with their children, difficulty performing daily self-care, trouble finding appropriate footwear, feelings of embarrassment and sadness, and experiences of ridicule from their community (J. Coreil et al., 1998). However, they also reported finding great comfort by being around other women with lymphatic filariasis who have similar lived experiences (J. Coreil et al., 1998).

In 2000, Haiti established the National Program to Eliminate Lymphatic Filariasis (NPELF) and began its efforts with determining the prevalence of LF in the entire country. The study sampled school-age children from all 133 communes (roughly equivalent to counties) and found that the parasite was endemic to 88% of all communes in Haiti, which was much more widespread than previously thought, and virtually the entire population was considered at risk for LF (Beau de Rochars et al., 2004). The study also found that overall national antigen prevalence in children ages 6-11 years old was 7.3% and that unlike in other populations, higher socioeconomic status was not protective against LF in parts of the country (Beau de Rochars et al., 2004; Boyd et al., 2004). Since the establishment of NPELF, the program has faced numerous obstacles, including “political crises, hurricanes, a devastating earthquake, a deadly cholera outbreak in the earthquake's aftermath” and now the COVID-19 pandemic (Oscar et al., 2014). Despite these obstacles, they have had great success in scaling up MDA; by 2015 MDA had achieved 100% coverage of all 133 communes and NPELF was working to conduct a transmission assessment survey that would identify regions where MDA could be stopped (Lammie et al., 2017; Oscar et al., 2014). The program's success reflects the strong commitment and investment from the government and its partners and offers a highly valuable infrastructure that can be used to address the psychosocial component of lymphatic filariasis.

One component of the NPELF strategy was the establishment of "Hope Clubs" in Léogâne, which are small, peer-led support groups for people living with lymphatic filariasis (Oscar et al., 2014). Created in the late 1990s, Hope Clubs were developed as part of a study to assess the feasibility and acceptability of support groups for women with LF in Léogâne (Jeannine Coreil, Mayard, & Addiss, 2003). Women's clubs were already operating in several Haitian communities at the time and the Hope Clubs became "indigenized" during the study process, resulting in the development of program activities and formats that had a "a distinctly Haitian style," and incorporated spiritual components and trainings in practical skills (Jeannine Coreil et al., 2003). The initial study suggested that Hope Club participation was associated with significant benefits in the areas of LF knowledge, home care practices, and quality of life, and the Hope Clubs were integrated into the LF clinic at the Hôpital Ste. Croix in Léogâne at the end of the study (Jeannine Coreil et al., 2003). Twenty years later, more than 200 Hope Club participants meet monthly in small groups of 20-30 people and are led by *animatrices* who are LF patients trained in risk reduction, hygiene, and basic lymphedema care. Hope Clubs are one of the few examples of peer-led, LF morbidity management support groups in the world and have the potential to be an effective mechanism to treat the mental health and psychosocial burden of the illness.

The Chronic Disease Self-Management Program

While there is a dearth of integrated care approaches to treating LF, there are several models that have been developed to reduce the psychosocial burden of chronic diseases more generally; one such strategy with a very strong evidence base is the Chronic Disease Self-Management Program (CDSMP). Originally developed by researchers at Stanford University in the late 1990s, more than 20 randomized control trials and longitudinal studies have demonstrated that CDSMP is effective in improving health behaviors, health status, self-efficacy, and in some cases reducing health care utilization (Brady et al., 2013; K. Lorig, Ritter, Pifer, & Werner, 2014; K. R. Lorig et al., 1999). CDSMP has been disseminated internationally, translated into twelve languages, and has reached more than 100,000 people living with chronic conditions in the United States alone (Brady et al., 2013; K. Lorig et al., 2014; Self-Management Resource Center, 2020). While most of the studies assessing CDSMP have been conducted in Western populations, CDSMP has also been implemented in China, Japan, South Korea, Anguilla, and St. Kitts and Nevis, and among people of Latino, Vietnamese, Bangladeshi, Aboriginal or Torres Strait Islander, Indian, Arab, Turkish, and Kurdish descent (Fattahi, 2018; Fu et al., 2003; Griffiths et al., 2005; Kim & Youn, 2015; Muscat et al., 2019; Pan American Health Organization, 2015, 2016; Siu, Chan, Poon, Chui, & Chan, 2007; Swerissen et al., 2006; Yukawa et al., 2010). In addition, the CDSMP has been used with people living with a variety of chronic diseases, including diabetes, arthritis, stroke, lung disease, heart disease, cancer, hypertension, and serious mental illnesses but never with people living with NTDs, such as LF (Brady et al., 2013; K. Lorig et al., 2014; Risendal et al., 2014).

CDSMP has consistently demonstrated a positive impact on self-efficacy, health distress, and depression symptoms. The program is based on self-efficacy theory and uses six weekly, peer-led, small-group training sessions to facilitate group education, skills building, and enhance personal efficacy (K. Lorig et al., 2014; Self-Management Resource Center, 2020). Topics taught during the CDSMP include: techniques to deal with negative and distressing emotions, effective communication with a variety of audiences, action planning, healthy decision-making, appropriate exercises for maintaining and increasing physical activity, appropriate use of medications, and self-evaluation of treatments (K. Lorig et al., 2014; Self-Management Resource Center, 2020). Meta-analyses and longitudinal studies have shown that CDSMP improves both general and disease management self-efficacy, as well as reduces health distress and depression symptoms in people living with chronic diseases at 6 months, 12 months, and 2 years after completion of the program, including participants who were depressed at baseline (Brady et al., 2013; K. Lorig et al., 2014; Kate R. Lorig et al., 2001; Ory et al., 2013; Ritter, Ory, Laurent, & Lorig, 2014). While subject follow-up is usually strong in CDSMP studies, several studies have used both intention-to-treat and per-protocol analysis of the intervention when there was suboptimal participant attendance; comparison of the two methods illustrate that self-management skills and depression scores can improve when there is higher session attendance (Buszewicz et al., 2006; Griffiths et al., 2005). Although CDSMP has been studied in many contexts, it has not been assessed in a low-income country setting nor among people living with chronic NTDs like lymphatic filariasis.

The Mental Health – Lymphatic Filariasis Study in Haiti

There is a great need to improve the psychosocial burden of people living with lymphatic filariasis in Haiti. The Chronic Disease Self-Management Program has the potential to be an effective psychological intervention for people living with NTDs that could be incorporated into the existing support group structures as a model for integrated lymphatic filariasis and mental health care. The overall goal of this study is to improve the mental health and well-being of Hope

Club participants in Léogâne, Haiti through the implementation of the six-week CDSM curriculum translated into Haitian Creole. The objectives of this study are to: 1) examine the impact of the Creole version of the CDSM intervention on Hope Club participants' depression, self-efficacy, and social support outcomes, 2) determine if the relationship between the Creole version of the CDSM intervention and Hope Club participants' depression, self-efficacy, and social support outcomes varies by age, and 3) investigate the impact of participant attendance on Hope Club participants' depression, self-efficacy, and social support outcomes through a per-protocol analysis. As there is little research to identify models of care that can effectively address the comorbidity of NTDs and depression, the results from this study have the potential to demonstrate an innovative and holistic approach to NTD treatment. Moreover, the evaluation of the CDSM intervention in a low-income setting and with people living with NTDs will inform the acceptability of the program in new populations. Finally, evaluation of the program will significantly inform the development of morbidity management and disability prevention policy and practical implementation for national NTDs programs.

Methods

Study design

Data for this study are from a stepped-wedge cluster randomized trial evaluating the effectiveness of the Chronic Disease Self-Management curriculum among Hope Club participants in Léogâne, Haiti. A stepped-wedge trial allows for study participants to receive the exposure in waves, usually with control participants receiving the intervention after the intervention participants have completed the trial. For this study, ten Hope Clubs were randomized into two groups; half received the CDSM intervention first (Intervention Arm), while the remaining Hope Clubs served as wait-listed controls (Wait-listed Control Arm). After six months and completion of the CDSM curriculum in the Intervention Arm, the CDSM intervention was then provided to participants in the Wait-listed Control Arm.

The CDSM curriculum is an evidence-based self-management program offered by the Self-Management Resource Center (SMRC). The CDSM training sessions were conducted by *animatrices* who are lymphatic filariasis (LF) patients trained in risk reduction, hygiene, and basic lymphedema care, and currently facilitate the Hope Clubs. Experienced trainers certified by the SMRC conducted a training of two master trainers who were local LF nurses from Léogâne. The training took place in California in June 2019 rather than in Haiti as originally planned due to political instability and civil unrest that resulted in a Level 3 U.S. Travel Advisory. The *animatrices* were subsequently trained in July 2019 by the master trainers in Léogâne, with a virtual refresher training occurring in November 2019 through SMRC approximately one week prior to implementation of the curriculum in the Intervention Arm. The study was approved by the Emory University Institutional Review Board and Haiti’s Ministry of Health.

Study Population

The study population for this analysis is Haitian adults, ages 18 years old or older, who have LF and are members of Hope Clubs at the Hôpital Ste. Croix in Léogâne, Haiti. Consent forms were read to participants in English, French, or Haitian Creole, according to participant preference, and informed consent was obtained before any study procedures were conducted. The total number of Hope Club participants that provided informed consent to participate in the study was 211, with 118 randomized into the Intervention Arm and 93 randomized into the Wait-listed Control Arm.

Data Collection Process and Instrument

Quantitative data collection for Intervention and Wait-listed Control participants was conducted using in-person household surveys and occurred at two time points: Baseline, before the CDSM intervention was implemented in October 2019, and Mid-point, after the Intervention Arm completed the CDSM curriculum but before the Wait-listed Control Arm received it in April 2020. The same household survey was used for both time points.

The data was collected using Next Generation Evaluation and Monitoring (NEMO), an open-source data collection system built and maintained by the Carter Center (TCC). Equipped with NEMO, trained enumerators in Léogâne were able to submit quantitative survey responses remotely via Android devices, SMS, or from a web browser to the TCC field and mission headquarters in real-time. NEMO organizes enumerator findings and allows for the creation of general reports within NEMO and export of data for deeper analysis in a CSV file format.

The household survey instrument used in this study was developed by the Mental Health Program and Hispaniola Initiative of the Carter Center and consisted of measures of mental well-being, self-rated health, and quality of life. This study focused on three measures included in the survey: Multidimensional Scale of Perceived Social Support (MSPSS), Self-Efficacy for

Managing Chronic Disease 6-item scale (SMCDS), and Zanmi Lasante Depression Symptom Inventory (ZLDSI). MSPSS uses a Likert scale to measure perceived social support from a person's family, friends, and significant other (referred to as a "special person") (Gregory D. Zimet, Dahlem, Zimet, & Farley, 1988; G. D. Zimet, Powell, Farley, Werkman, & Berkoff, 1990). SMCDS is a validated scale developed by the Self-Management Resource Center to measure self-efficacy among persons with chronic diseases and is often utilized in CDSM studies (Ritter & Lorig, 2014). Finally, ZLDSI is a depression screening instrument in Haitian Creole developed by Partners in Health and Zanmi Lasante in the wake of the 2010 earthquake in Haiti and is the first depression screening measure that is specific to Haitians living in Haiti (Rasmussen et al., 2015). The MSPSS and SMCDS scales were translated into Haitian Creole by a certified translator for this study so that the entire survey instrument could be administered in Haitian Creole. Demographic information of gender and age for each participant was self-reported in the baseline survey.

Impact of COVID-19 on Study Activities

The first case of COVID-19 in Haiti was recorded on March 19, 2019, and mid-point data collection began on April 17, 2019. At the time of mid-point data collection, the only restrictions on movement within the country was a policy implemented by the government restricting meeting size to 10 people or fewer. Therefore, enumerators were still able to collect mid-point data from participants in their homes. Enumerators were trained in procedures to keep themselves and study participants safe, including wearing masks and maintaining six feet of distance between themselves and participants. They were also able to distribute hand sanitizer and educate the participants' families on the SARS-CoV-2 virus, how it is spread, and how they can protect themselves as part of the data collection process.

Study Measures

Exposure: CDSM Intervention

The CDSM intervention consists of six training sessions, each 2.5 hours long, and covers topics including: making action plans, the mind-body connection, problem-solving, dealing with difficult emotions, managing pain and fatigue, relaxation techniques, exercise, eating healthy, communication skills, dealing with depression, medication usage, making informed treatment decisions, and working with your health care provider. Participants in the Intervention Arm attended CDSM training sessions during their Hope Club meetings on an approximately bi-weekly basis for three months. Participant attendance was self-reported during mid-point data collection upon completion of the CDSM intervention, with response options ranging from 0 to 6 CDSM meetings attended. Participants in the Wait-listed Control Arm attended their regularly schedule Hope Club meetings, for which attendance was not recorded.

Outcome: Three outcomes were examined in this study – self-efficacy skills, social support, and depressive symptoms – and are described in more detail below.

Self-efficacy Skills

SMCDS is a 6-item instrument that assesses how confident respondents are in managing the physical and emotional effects of their disease on their daily life. Participants rank their confidence for each item on a scale of 1 to 10, with 1 representing “Not at all confident” and 10 representing “Totally confident.” An average total score is calculated by taking the mean of the responses. Higher scores reflect a higher level of perceived self-efficacy. Scoring of this scale was conducted in accordance with survey instructions (Self-Management Resource Center, 2001).

Social Support

MSPSS is a 12-item scale with a different set of 4 questions specific to each social group – family, friends, and special person. The response scale is divided into seven categories: “very strongly disagree,” “strongly disagree,” “mildly disagree,” “neutral,” “mildly agree,” “strongly agree,” and “very strongly agree,” with a corresponding numeric score of 1 to 7. A total average score is calculated by taking the mean of all responses, and average scores for each social group are calculated by taking the mean of the relevant responses. MSPSS can be scored either as a sum total or mean, however means were used for this study per the scoring instructions from one of the instrument’s developers (G. Zimet, 2016). One question, "My family really tries to help me” had a binary response scale of “Yes” or “No,” reflecting an error in the survey creation and verification stages and is scored as either 1 or 0. Thus, this item was excluded from the total average score and family average score calculations. Higher scores reflect a higher level of perceived social support.

Depressive Symptoms

The ZLDSI is a 13-item scale that measures a respondent’s mood and vegetative symptoms for the past 15 days. Each item has four response options: “Not at all,” “For a few days, 1-5 days,” “More than a week, 6-9 days,” and “Almost every day, 10-15 days,” with a corresponding numeric score of 0 to 3 for each response. A total score is calculated by summing the responses, with possible scores ranging from 0 to 39 and a cutoff score of 13 to indicate symptoms of depressive illness. Higher scores reflect more severe symptoms of depressive illness. The scoring of this scale was conducted in accordance with survey instructions (Rasmussen et al., 2015).

Covariates: Participant gender and age were examined as covariates. Gender was categorized as male or female. Age was recorded as an integer as well as categorized into four groups for assessment of effect modification: 18-34 years old, 35-49 years old, 50-64 years old, and 65+ years old. Age category ranges were determined in accordance with a previous study that assessed age differences in depression from a national survey of the US household population (Kessler et al., 2010).

Statistical analysis

The primary analysis included 189 Hope Club participants with complete data and was analyzed on an intention-to-treat basis. Twenty-two individuals were excluded from the analytic sample because they did not have mid-point data collected. Descriptive statistics for all variables at baseline were calculated for the entire study sample and separately for the Intervention and Wait-listed Control Arms. Change scores between mid-point and baseline were calculated for continuous outcomes. The Intraclass Correlation Coefficient (ICC) was assessed for each outcome, with an ICC ≥ 0.01 indicating significant cluster correlation for Hope Clubs; two outcomes, SMCDS and ZLDSI scores met the criteria for correlated data. Collinearity of predictors was assessed using variance inflation factors (VIF) for continuous outcomes, and condition indices (CI) and variation decomposition proportions (VDP) for categorical outcomes. VIF values greater than 10 or CI values greater than 30 in combination with two or more VDPs greater than 0.5 indicated collinearity. For each continuous outcome, separate multi-level linear regression models were used with results reported as parameter estimates. ZLDSI scores were assessed both continuously and categorically. Change scores were the continuous outcome of interest, and the change score was classified as either “improvement of depressive symptoms” or “no change or worsening of depressive symptoms” for the categorical outcome. For categorical outcomes, logistic regression models were used with results reported as odds ratios (OR). All models with either SMCDS or ZLDSI scores as the outcome of interest were fit using generalized estimating equations. For all primary analyses, the models adjusted for participant gender and age. Effect modification by participant age was also assessed using the four age categories, with 18 to 34 years old as the reference category. All primary regression models assessed statistical significance for each predictor at the alpha 0.05 level. Statistical analyses were conducted using SAS v9.4.

Due to suboptimal attendance of the CDSM sessions, a secondary per-protocol analysis was also completed using the 189 Hope Club participants with complete data. A hypothesis-generating analysis assessing differences in baseline characteristics between Intervention Arm participants with suboptimal and optimal attendance to identify any predictive factors on participation was conducted using two-sample t-tests and chi-square tests; however, this analysis lacked statistical power. Suboptimal attendance was defined as attending at most three of the six CDSM sessions, and optimal attendance was defined as attending at least four of the six sessions. The per-protocol analysis compared Intervention Arm participants with suboptimal attendance to Wait-listed Control Arm participants as well as Intervention Arm participants with optimal attendance to Wait-listed Control Arm participants.

Results

Table 1. Baseline Characteristics of Hope Club Participants, n=211[†]

	All Participants		Intervention (n=118)		Wait-listed Control (n=93)	
	N or Mean (Std)	**%**	**N or Mean (Std)**	**%**	**N or Mean (Std)**	**%**
Gender						
Female	199	94.3	113	95.8	86	92.5
Age (years)	54.6 (14.1)		53.3 (13.9)		56.1 (14.3)	
Age Category						
18-34 years	17	8.1	12	10.2	5	5.4
35-49 years	59	28.0	32	27.1	27	29.0
50-64 years	79	37.4	49	41.5	30	32.3
65+ years	56	26.5	25	21.2	31	33.3
Self-efficacy Score	6.8 (2.1)		6.6 (2.0)		7.0 (2.1)	
Social Support Score	4.4 (1.4)		4.5 (1.3)		4.4 (1.5)	
Family Support	4.7 (1.8)		4.7 (1.8)		4.6 (1.8)	
Friends Support	3.5 (1.9)		3.6 (1.8)		3.5 (1.9)	
Special Person Support	5.2 (1.5)		5.2 (1.4)		5.1 (1.7)	
Depression Score	12.9 (9.1)		12.9 (9.5)		12.9 (8.6)	
Symptoms of Depressive Illness*	106	50.2	57	48.3	49	52.7
CDSM Attendance						
0-3 Sessions	N/A		52	47.7	N/A	
4-6 Sessions	N/A		57	52.3	N/A	

* A depression score of at least 13 indicates significant symptoms of depressive illness.

[†] T-tests or chi-square tests indicated no significant differences between Intervention and Wait-listed Control Arms (all p-values >.05).

Demographics and Baseline Characteristics

The study sample was predominantly female (94.3%), and the majority of participants (63.9%) fell into either the middle age (50-64 years old) or elderly (65+ years old) age categories (Table 1). At the beginning of the study, participants on average reported moderate self-efficacy skills, with a mean score of 6.8 on a scale of 10, and neutral (mean = 4.4) perceived total social support. There was a high prevalence of depression at baseline, with half (50.2%) of all participants having symptoms of depressive illness. There was no statistically significant difference in baseline characteristics between Intervention and Wait-listed Control subjects.

Attendance of the CDSM intervention was varied, and only 52.3% reported attending at least four of the six CDSM meetings during the study period.

Although the intervention was implemented in Hope Clubs, the only outcomes that showed evidence of correlation by Hope Club were self-efficacy (ICC = 0.01) and depression (ICC = 0.06) (Table 2).

Table 2. Intraclass Correlation Coefficient (ICC) for each Outcome

Outcome	ICC	Indication of Correlated Outcomes
Self-efficacy Score	0.01	Yes
Social Support Score	-0.01	No
Family Support	-0.02	No
Friends Support	-0.01	No
Special Person Support	-0.04	No
Depression Score	0.06	Yes

Effect of CDSM Intervention

The CDSM intervention had a statistically significant effect only on self-efficacy scores (Table 3); participants in the Intervention Arm on average had 0.6 higher self-efficacy scores after receiving the intervention compared to Wait-listed Control subjects (p-value = 0.004). The intervention had a null effect on all domains of perceived social support. Although intervention participates had a greater reduction in depression by the end of the study period, there was not a statistically significant difference between the two arms.

Table 3. Effect of CDSM Intervention on Self-efficacy Scores, Social Support Scores, Depression Scores, and Symptoms of Depressive Illness, n=189*

	Intervention (n=109)	**Wait-listed Control (n=80)**	**β or OR (CI)**	**p-value**
	Mean Difference or N (%)	Mean Difference or N (%)		
Self-efficacy Score	0.2	-0.4	0.6	0.004
Social Support Score	0.0	0.0	-0.1	0.729
Family Support	0.0	0.0	0.0	0.900
Friends Support	0.0	0.0	0.0	0.858
Special Person Support	-0.1	0.1	-0.2	0.393
Depression Score	-3.3	-2.7	-0.8	0.673

Improvement of Depressive Illness	66 (60.6%)	46 (57.5%)	1.2 (0.6, 2.3)	0.665
No Change or Worsening of Depressive Illness	43 (39.4%)	34 (42.5%)	Ref	

*All outcomes are adjusted for participant age and gender. OR=Odds Ratio; CI=95% Confidence Interval.

The only significant interaction between study arm and age category was for improvement in depressive illness (Table 4). Participants among the older age categories were at much lower odds of reporting an improvement in depressive symptoms after completion of the CDSM intervention ($OR_{\text{Age 35-49 vs. Age 18-34}} = 0.05$, $OR_{\text{Age 50-64 vs. Age 18-34}} = 0.04$, $OR_{\text{Age 65+ vs. Age 18-34}} = 0.04$, p-value = 0.049).

Table 4. Effect of CDSM Intervention on Self-efficacy Scores, Social Support Scores, Depression Scores, and Symptoms of Depressive Illness by Age Category, n=189*

	Intervention (n=109)	**Wait-listed Control (n=80)**	**Interaction**	**p-value**
	Mean Difference or N (%)†	Mean Difference or N (%)†	***β* or OR (CI)**	
Self-Efficacy Score				0.579
35-49 years	-0.2	-0.4	-1.0	
50-64 years	0.4	-0.2	-0.6	
65+ years	0.6	-0.1	-0.6	
Social Support Score				0.754
35-49 years	0.2	0.1	0.5	
50-64 years	-0.2	-0.1	0.3	
65+ years	0.2	0.0	0.6	
Family Support Score				0.533
35-49 years	0.2	-0.1	-0.3	
50-64 years	-0.1	0.1	-0.8	
65+ years	-0.3	0.1	-1.0	
Friends Support Score				0.329
35-49 years	0.1	0.1	1.4	
50-64 years	-0.2	-0.6	1.8	
65+ years	0.4	0.0	1.9	
Special Person Support Score				0.416
35-49 years	0.2	0.1	0.3	
50-64 years	-0.3	0.3	-0.4	
65+ years	0.2	0.0	0.5	
Depression Score				0.632
35-49 years	-1.4	-1.8	4.5	
50-64 years	-4.3	-3.1	2.9	
65+ years	-3.2	-3.7	4.8	
Improvement of Depressive Illness				0.049
35-49 years	15 (13.8%)	13 (16.3%)	0.05 (0.0, 0.5)	
50-64 years	29 (26.6%)	15 (18.8%)	0.04 (0.0, 0.3)	

65+ years	12 (11.0%)	17 (21.3%)	0.04 (0.0, 0.2)	
No Change or Worsening of Depressive Illness				Ref
35-49 years	14 (12.9%)	12 (15.0%)	Ref	
50-64 years	19 (17.4%)	9 (11.3%)	Ref	
65+ years	8 (7.3%)	9 (11.3%)	Ref	

*All outcomes are adjusted for participant gender. The reference category for participant age is 18-34 years old. OR=Odds Ratio; CI=95% Confidence Interval.

†Percents represent column percentages. Percents do not add up to 100 because reference category percents are not shown.

Per-Protocol Analysis

Baseline characteristics between Intervention Arm participants with suboptimal (0-3 CDSM sessions) and optimal (4-6 CDSM sessions) attendance were similar except for self-efficacy and depression scores (Table 5). Those who attended three or fewer CDSM sessions reported lower baseline self-efficacy scores and higher baseline depression scores than intervention participants who attended at least four sessions (mean self-efficacy score 6.1 vs. 7.1 and mean depression score 15.4 vs. 10.8, respectively).

Table 5. Baseline Characteristics of Intervention Participants by CDSM Session Attendance

	0-3 CDSM Sessions Attended (n=52)		**4-6 CDSM Sessions Attended (n=57)**		**p-value**
	N or Mean (Std)	**%**	**N or Mean (Std)**	**%**	
Gender					
Female	49	94.2	55	96.5	0.668
Age (years)	55.4 (14.0)		50.7 (13.2)		0.077
Age Category					0.376
18-34 years	5	9.6	7	12.3	
35-49 years	12	23.1	17	29.8	
50-64 years	22	42.3	26	45.6	
65+ years	13	25.0	7	12.3	
Self-efficacy Score	6.1 (2.2)		7.1 (1.6)		0.010
Social Support Score	4.5 (1.2)		4.5 (1.4)		0.839
Family Support	4.8 (1.9)		4.7 (1.7)		0.652
Friends Support	3.4 (1.9)		3.8 (1.8)		0.289
Special Person Support	5.3 (1.5)		5.2 (1.4)		0.653
Depression Score	15.4 (10.7)		10.8 (7.9)		0.014
Improvement of Depressive Illness	33	63.5	33	57.9	0.553
No Change or Worsening of Depressive Illness	19	36.5	24	42.1	

When the effect of the CDSM intervention was assessed by attendance level, it had a greater impact on those with suboptimal attendance. Intervention Arm participants with suboptimal attendance had significantly improved self-efficacy scores compared to Wait-listed Control participants (β = 0.8, p-value = 0.002) and lower but non-significant depression scores (β = -2.0, p-value = 0.272) (Table 6).

Table 6. Per-protocol analysis – Intervention participants attending at most three of six CDSM sessions and all control participants. Effect of CDSM Intervention on Self-efficacy Scores, Social Support Scores, Depression Scores, and Symptoms of Depressive Illness.*

	Intervention (0-3 CDSM Sessions), n=52	**Wait-listed Control, n=80**	**β or OR**	**p-value**
	Mean Difference or N (%)	Mean Difference or N (%)		
Self-efficacy Score	0.5	-0.4	0.8	0.002
Social Support Score	-0.1	0.0	-0.1	0.484
Family Support	-0.4	0.0	-0.4	0.165
Friends Support	0.2	0.0	0.3	0.484
Special Person Support	-0.3	0.1	-0.4	0.162
Depression Score	-4.7	-2.7	-2.0	0.272
Improvement of Depressive Illness	33 (63.5%)	46 (57.5%)	1.3	0.561
No Change or Worsening of Depressive Illness	19 (36.5%)	34 (42.5%)	Ref	

*All outcomes are adjusted for participant age and gender.

In contrast, improvement in self-efficacy scores among Intervention Arm participants with optimal attendance was borderline significant (β = 0.4, p-value = 0.059) and Wait-listed Control subjects had greater but non-significant reductions in depression scores than the optimal attendance group (β = 0.5, p-value = 0.753) (Table 7). In terms of perceived social support, the Intervention Arm participants with suboptimal attendance generally reported slightly lower scores after the intervention (overall social support β = -0.1, family support β = -0.4, friends support β = 0.3, and special person social support β = -0.4), while change scores were mixed or null among the intervention participants with optimal attendance (overall social support β = 0.0, family support β = 0.3, friends support β = -0.2, and special person social support β = 0.0)

(Table 6 and 7); however, none of the change scores of social support were statistically significant for either attendance group.

Table 7. Per-protocol analysis – Intervention participants attending at least four of six CDSM sessions and all control participants. Effect of CDSM Intervention on Self-efficacy Scores, Social Support Scores, Depression Scores, and Symptoms of Depressive Illness.*

	Intervention (4-6 CDSM Sessions), n=57	**Wait-listed Control, n=80**	***β* or OR**	**p-value**
	Mean Difference or N (%)	Mean Difference or N (%)		
Self-efficacy Score	0.0	-0.4	0.4	0.059
Social Support Score	0.1	0.0	0.0	0.951
Family Support	0.3	0.0	0.3	0.228
Friends Support	-0.1	0.0	-0.2	0.548
Special Person Support	0.1	0.1	0.0	0.931
Depression Score	-2.0	-2.7	0.5	0.753
Improvement of Depressive Illness	33 (57.9%)	46 (57.5%)	1.1	0.868
No Change or Worsening of Depressive Illness	24 (42.2%)	34 (42.5%)	Ref	

*All outcomes are adjusted for participant age and gender.

Discussion

This study assessed the effect of a CDSM intervention on a range of mental well-being outcomes among Hope Club participants living with lymphatic filariasis in Léogâne, Haiti. The intervention was shown to significantly improve self-efficacy among those randomized into the Intervention Arm, however there was no demonstrated effect on depression or perceived social support at mid-point. The effect of the intervention on all outcomes was not modified by participant age, except for symptoms of depressive illness. Older individuals had lower odds of reporting an improvement in their depressive symptoms after receiving the intervention than those who were among the youngest age bracket (age 18-34 years old); however, it should be noted that the reference category for this analysis was small for both arms (Intervention Arm n=12, Wait-listed Control Arm n=5), which may have affected the statistical testing. The per-protocol analysis suggested that high attendance for a majority of the sessions may not be required to see significant improvement in self-efficacy, and level of attendance did not seem to affect other mental well-being outcomes.

The impact of the intervention on self-efficacy is consistent with findings from other CDSM studies. A meta-analysis of five CDSM studies delivered in small English-speaking groups found a modest positive effect on overall self-efficacy at 4 to 6 months (effect size = 0.35, 95% CI: 0.19, 0.49) (Brady et al., 2013). Notably, this meta-analysis includes both RCTs and longitudinal studies; when only RCTs of small group CDSM studies included in the review are investigated, five (Barlow, Turner, Edwards, & Gilchrist, 2009; Kendall et al., 2007; Kennedy et al., 2007; K. R. Lorig, Ritter, & Gonzalez, 2003; Swerissen et al., 2006) of six (Haas et al., 2005) studies showed significant improvements in self-efficacy. In contrast, this study’s finding of no significant reduction in depression among intervention participants is inconsistent with the meta-analysis that found a modest effect on reducing depression at 4 to 6 months (effect size = -0.22, 95% CI: -0.30, -0.13) (Brady et al., 2013). However, when examining the RCT trials of the CDSM intervention in the review, depression results are less convincing; only one study showed significant improvement in depression (Kennedy et al., 2007) and two showed no significant difference in depression among intervention and control subjects (Barlow et al., 2009; Swerissen et al., 2006). Therefore, the non-significant reduction in depression demonstrated in our study is consistent with other experimental studies of CDSM interventions. Perceived social support has not been rigorously assessed in any CDSM study therefore our null results cannot be compared to previous research.

This study also found largely no effect of participant age on the CDSM intervention effect except for improvement in depressive symptoms, which may support results from a large, longitudinal study of the CDSM intervention (Ory et al., 2014). It should be noted that our results are not directly comparable to this longitudinal study because their study's reference group is much older than our young adult cohort, the study design is different, and the mental well-being outcomes assessed do not overlap. With that caveat, the Ory et al. study found that their middle-aged cohort (age 50 to 64 years old) was significantly more likely to have better overall quality of life and fewer unhealthy mental health days 12 months post-intervention compared to the older cohort (age 65 years old or older) but did not find significant interaction by age for any illness symptomatology outcomes. Thus, both our analysis and the Ory et al. analysis suggest that younger adults who receive the CDSM intervention may have a greater benefit on their mental health than older adults.

The per-protocol analysis of this study showed that significant improvement in self-efficacy was achieved among suboptimal attendance Intervention Arm participants but not optimal attendance participants. However, it is important to highlight that there were significant differences in baseline self-efficacy and depression scores among the suboptimal and optimal attendance subjects, and the higher levels of baseline self-efficacy among the optimal attendance group could explain why they had borderline but not significant improvement in self-efficacy skills compared to Wait-listed Control subjects. Two CDSM studies have looked at the impact of attendance on the CDSM interventional effect, but both only focused on the high attendance cohort and their findings were contradictory. One study conducted among Bangladeshi patients in London demonstrated that higher attendance led to a stronger effect on outcomes (Griffiths et al., 2005), while another study of arthritis patients in the United Kingdom did not find any differences between the per-protocol and intention-to-treat (ITT) analyses (Buszewicz et al., 2006). Similar to Buszewicz et al. paper, this study did not find major differences between the per-protocol and ITT analyses, as both analyses showed no effect on depression or perceived social support and significant or borderline significant increases in self-efficacy scores. Neither of the aforementioned studies investigated the effect of the CDSM intervention on outcomes among the suboptimal attendance group, nor assessed baseline differences in the outcome measures among low and high attendance participants, so it is difficult to explain their differing results.

This study has at least four strengths. First, this is the first time that the CDSM intervention has been used among people with NTDs, let alone people with lymphatic filariasis, and it is the first CDSM study to be conducted in a low-income country. Thus, the results from this study add to the existing literature on the effectiveness of the CDSMP and demonstrate an innovative adaption of an integrated chronic disease and mental health care model to NTDs. Second, this study was a randomized control trial, which greatly improves the likelihood that our results have high internal validity compared to a longitudinal study. Third, this study utilized the Zanmi Lasante Depression Symptom Inventory scale to measure depression, which is a validated tool specific to Haitians and allowed the study to measure depression in a culturally relevant and reliable way. Finally, this is the first CDSM trial to measure the intervention's effect on perceived social support and marks another contribution to the CDSM intervention literature.

Amid these strengths, there are at least four limitations. First, due to the restricted number of Hope Clubs at the Hôpital Ste. Croix to randomize and the overall small sample size, our analyses might have low power resulting in type II errors. Second, data on CDSM session attendance was self-reported and subject to recall bias, although even if the CDSM attendance data is not completely accurate, it may serve as a proxy variable for participant engagement and thus still gives value to the per-protocol analyses. Third, the study team was unable to monitor intervention implementation during the study, so the role of implementation fidelity on the CDSM intervention's effectiveness is unknown. Finally, there were important, external events occurring in Léogâne during the study, such as social unrest, political clashes between government forces and protesters, and the COVID-19 pandemic, which may have introduced unmeasured confounding; these external events may have created obstacles for subjects to attend CDSM sessions, and caused psychological distress that may affect their mental well-being outcomes (Cénat, McIntee, & Blais-Rochette, 2020; Galvin & Michel, 2020).

Public Health Significance

The results from this study illustrate that psychosocial interventions designed for chronic disease management can be successfully implemented in populations living with lymphatic filariasis. Additionally, this study demonstrates the acceptability and feasibility of using an integrated chronic disease and mental health care model to address NTD morbidity management in a low-resource setting – particularly in contexts where there are existing social support groups that can be used as a dissemination mechanism. Given the great mental, social, and economic consequences of LF and similar infections, morbidity management and disability prevention programs should assess how evidence-based, chronic disease management strategies can be adapted to address the psychosocial burden of NTDs. Future studies may improve our understanding of the effect of the CDSM program on mental well-being among this population by including larger samples of people living with LF and other NTDs. Additionally, conducting CDSM trials in other low-income countries can assess if the intervention can be disseminated in diverse populations and communities. Finally, further research into reliable mental health interventions in the context of NTD care and morbidity management is needed in order to support national, regional, and global NTD elimination and eradication goals.

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