

Feasibility and Impact of a Nurse-Led Home-Based Care Model for Refugees with Restricted Mobility: A Mixed-Methods Study in Beirut, Lebanon

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Abstract

Background

People with restricted mobility in humanitarian settings face extreme barriers to healthcare access, leading to functional decline, social isolation, and significant mental health distress (World Report on Disability, 2011). In Lebanese refugee camps, hazardous infrastructure, and the rising burden of non-communicable diseases (NCDs) further exacerbate the vulnerability of home-bound individuals and their informal caregivers (Saleh et al., 2021). This study evaluates a nurse-led home-based care (HBC) model designed to address these physical and psychosocial needs.

Methods

This mixed-methods descriptive study investigated a nurse-led HBC program in the Shatila and Bourj el Barajneh refugee camps in Beirut, Lebanon, between June 2021 and October 2023. We analysed routinely collected operational data for 105 patient-caregiver pairs (verbal retrospective consent) and conducted semi-structured in-depth interviews with a purposive subsample of 16 pairs (written prospective consent) to explore participant perceptions. Quantitative outcomes were analysed for the $n = 79$ dyads who completed the full intervention.

Results

The program achieved a high retention rate of 82%. Quantitative findings demonstrated significant improvements in mental health, with a reduction in depression and anxiety scores for both patients and caregivers (both $p < 0.001$). Patient dependency also decreased significantly (Basic Activities of Daily Living, $p = 0.003$). While medication adherence was high at enrolment, the program successfully maintained these levels throughout. Qualitative data revealed that the program's primary value was in alleviating profound social isolation and providing emotional support, which participants often prioritized over medical services.

Conclusion

HBC is a feasible and effective model for improving the well-being of highly vulnerable populations in complex humanitarian settings. The study underscores that in contexts of chronic distress, the psychosocial and relational components of care are as vital as clinical intervention for fostering resilience in both patients and caregivers.

1. INTRODUCTION

Disability is a dynamic interaction between health conditions, personal, and environmental factors (World Report on Disability, 2011). People living with disability (PWD) are extremely vulnerable, particularly during a humanitarian crisis when health, environment, and personal attitudes are deeply disarranged (Forced Migration Review, 2018). Although PWD are a heterogeneous group, they face shared challenges including isolation, invisibility, and heavy dependence on informal caregivers (Krahn et al., 2015). In humanitarian settings, physical barriers to reaching and entering health facilities such as lack of accessible transport and non-inclusive infrastructure significantly affect health outcomes (Lagu et al., 2022). In Lebanon, which hosts the largest concentration of refugees per capita in the world (El Arnaout et al., 2019), services for PWD are very limited (Handicap International, 2023). Syrian and Palestinian refugees in urban camps like Shatila and Bourj el Barajneh (BB) face amplified barriers; restricted mobility often reflects the progression of chronic non-communicable diseases (NCDs), creating a cycle of increasing vulnerability (Beydoun et al., 2021). Home-based care (HBC) represents a patient-centred model that provides clinical, psychosocial, and spiritual support within the home (WHO, 2002). While nurse-led HBC models have proven feasible for managing chronic conditions in low-resource settings (Young & Busgeeth, 2010), few studies have assessed their implementation in humanitarian refugee contexts. In 2021, Médecins Sans Frontières (MSF) launched a pilot nurse-led HBC program in South Beirut. This paper evaluates the program's feasibility and its short-term effects on health outcomes and participant perceptions.

2. METHODS

2.1 Study Design and Period

This mixed-methods descriptive study combined a retrospective quantitative analysis of routinely collected operational data and qualitative data from semi-structured in-depth interviews. Quantitative data included all patients enrolled between June 3, 2021, and August 31, 2022 (N = 105), with follow-up data collection continuing until October 1, 2023. Qualitative interviews were completed on November 3, 2023, upon reaching thematic saturation.

2.2 Inclusion Criteria and Consent

All adults (≥ 18 years) with restricted mobility due to chronic medical conditions enrolled in the HBC program, along with their primary caregivers, were eligible for inclusion. To ensure ethical compliance across both study components:

- Quantitative Component: Participants were included only if they retrospectively provided verbal informed consent for the use of their pseudo-anonymized operational data for research purposes.
- Qualitative Component: Participants were included in the purposive subsample only if they provided explicit written informed consent prior to the interviews.

For participants unable to read or write, consent was obtained verbally in the presence of a witness and documented by the researcher.

2.3 Setting

Lebanon hosts the largest concentration of refugees per capita in the world, with a dramatic influx coinciding with the Syrian conflict (El Arnaout et al., 2019). Syrian and Palestinian refugees residing in urban camps like Shatila and Bourj el Barajneh display a high prevalence of chronic illness and disability (Strong et al., 2015). Camp dwellers are faced with overcrowded spaces, poor infrastructure, chronic economic distress, and limited formal public services. MSF has provided NCD care for this vulnerable population since 2013. Over the years, many NCD patients enrolled in the MSF program lost their mobility and became unable to visit MSF structures, including a Low Mobility Clinic equipped for easier accessibility. The extreme physical barriers of the camps, including steep, hazardous stairs and narrow roads inaccessible by car, required a home care approach as a possible response.

2.4 Nurse-led HBC Program

A pilot nurse-led HBC program was launched in 2021 to empower PWD and their caregivers through a multidisciplinary approach including health education, mental health support, and social services. Subjects were identified from the MSF NCD cohort, by notification from other organizations, or by direct community referrals. After enrolment, each participant received a 16-week personalized care plan inspired by the North American Nursing Diagnosis Association (NANDA-I) system (Nursing Diagnosis Handbook, 12th Edition). The program focused on five key areas of well-being: Communication and Mental Status, Moving and Positioning, Nutrition, Elimination, and Patient Comfort. Requirements for specific nursing interventions (e.g., wound dressing, fall risk advice, dysphagia-specific dietary advice) were defined as “specific care” needs. The program was led by a trained nurse and carried out by a multidisciplinary team including a health promoter, a mental health counsellor, and a social worker. While the program standard was 16 weeks, operational flexibility allowed clinical goals to dictate the timeline; thus, final evaluations occurred at the point of clinical discharge. Patients on complete bed rest were visited weekly, while homebound patients received visits every two weeks.

2.5 Data Collection and Variables

De-identified quantitative socio-demographic, program, and outcomes data were extracted from routinely collected operational data. Assessment of different clinical outcomes was done using validated tools upon admission and at discharge (Table 1). Mental health status was evaluated for both the patient and the caregiver, while functional status, self-reported pain, and wound healing were assessed for patients only. Medication literacy and adherence questionnaires were administered to the patient or the caregiver, depending on who oversaw the daily pharmacological treatment.

Table 1

Assessment domains and standardized tools used for evaluating patients and caregivers in the Home-Based Care program, June 2021 – October 2023, Beirut, Lebanon.

Domain / Assessment	Tool / Indicator	Target Population	Reference
Functional Independence	Basic Activities of Daily Living (BADL)	Patient	Katz et al. (11)
Depression Severity	Patient Health Questionnaire (PHQ-9)	Patient & Caregiver	Kroenke et al. (12); Sawaya et al. (14)
Anxiety Severity	Generalized Anxiety Disorder (GAD-7)	Patient & Caregiver	Spitzer et al. (13); Sawaya et al. (14)
Pain Intensity	Visual Analog Scale (VAS)	Patient	Standardized Clinical Tool
Medication Adherence	8-item Morisky Medication Adherence Scale (MMAS-8)	Patient or Caregiver	Morisky et al. (15); Ashur et al. (16)
Medication Literacy	Medication Literacy Questionnaire (MLQ)	Patient or Caregiver	Sunallah et al. (17)
Nursing Diagnosis	NANDA-I Functional Domains	Patient	Ackley et al. (18); Herdman & Kamitsuru (19)
Qualitative Perceptions	Semi-structured In-depth Interviews	Subsample (n = 16)	Dworkin (21)

2.6 Data Analysis

Descriptive statistics were used to describe the study population at enrolment. Outcome variables were analysed among patients who had the respective data reported at enrolment and at discharge (n = 79). Participants who did not complete the program (died or voluntarily withdrew) were excluded from quantitative outcome analysis. Changes in continuous/ordinal data (PHQ-9, GAD-7, BADL, VAS, MMAS-8) were analysed using the Wilcoxon signed-rank test; changes in NANDA-I functional domains and wound status were analysed using McNemar's test. Quantitative analysis was conducted using R Studio (version 4.1.2). Qualitative data was collected through semi-structured in-depth interviews conducted in Arabic with a purposive subsample (n = 16). Interviews were conducted by a trained female interviewer not affiliated with the project team to minimize social desirability bias. Manual thematic analysis was used to identify key themes (Dworkin, 2012). Findings were then triangulated with the quantitative data.

2.7 Ethics

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Médecins Sans Frontières Ethics Review Board (Reference: 2230, May 24, 2022) and locally from the University of Balamand Institutional Review Board (Reference: IRB-REC/O/018–23/0423, April 25, 2023). For the quantitative component, verbal informed consent was obtained from participants at the time of program enrolment for the retrospective use of their pseudo-anonymized data for research

purposes. For the qualitative component, written informed consent was obtained from all participants prior to the in-depth interviews. For participants unable to read or write, consent was obtained verbally in the presence of a witness and documented by the researcher.

3. RESULTS

3.1 Participant Characteristics and Baseline Requirements

We enrolled 105 patient-caregiver dyads. The mean age of patients at admission was 69.0 years (SD = 16.8), and 63% (n = 66) were female. The cohort was predominantly Palestinian refugees (78%, n = 82), primarily residing in the Bourj el Barajneh camp (54%, n = 57). At baseline, 34% (n = 36) of patients were bed-ridden, reflecting severe restricted mobility. The primary reasons for disability included stroke (13%, n = 14), aging-associated mobility issues (9%, n = 9), lower extremity amputation/deformity (9%, n = 9), and hip fracture (8%, n = 8). Regarding chronic conditions, 38% (n = 40) of patients had two or more risk factors for cardiovascular disease or existing cardiovascular complications. Among caregivers, 97% were family members and 99% were female.

Table 2

Baseline demographic and clinical characteristics of patients with disabilities enrolled in the Home Care Program (N = 105), June 2021 – October 2023, South Beirut, Lebanon.

Characteristic	Category	Total (N = 105), n (%)
Demographics		
	Age (years), Mean (Standard Deviation)	69.0 (16.8)
	Gender	
	Female	66 (63%)
	Male	39 (37%)
	Marital Status	
	Widowed	47 (45%)
	Married	37 (35%)
	Single	21 (20%)
	Nationality	
	Palestinian	82 (78%)
	Lebanese	13 (12%)
	Syrian	10 (10%)
Socio-Economic		
	Registration Status [^]	
	Registered with UNRWA (among Palestinians)	77 (94%)
	Registered with UNHCR (among Syrians)	9 (90%)
	Not registered / Lebanese	19 (18%)
	Main Source of Access to Care	
	UNRWA	54 (51%)
	Public Health Care Center support	24 (23%)
	No access to care	19 (18%)
	Médecins Sans Frontières	8 (8%)
Clinical Profile		
	Primary Non-Communicable Disease Diagnosis*	
<p>Note: [^]Registration percentages are calculated based on the respective nationality denominators. [*]Primary NCD diagnosis is based on medical history available at enrolment.</p>		

Characteristic	Category	Total (N = 105), n (%)
	Diabetes type-2 and Hypertension	27 (26%)
	No identified Non-Communicable Disease	22 (22%)
	Hypertension only	20 (19%)
	Other Non-Communicable Diseases	16 (15%)
	Diabetes type-2, Hypertension, and Other	13 (12%)
	Hypertension and Other	7 (6%)
	Level of Disability	
	Home Bound	69 (66%)
	Bed-ridden	36 (34%)

Note: ^Registration percentages are calculated based on the respective nationality denominators.
*Primary NCD diagnosis is based on medical history available at enrolment.

3.2 Baseline Clinical and Functional Assessment

Baseline clinical assessment (Table 3) indicated high dependency (median BADL score 2 (IQR 1–4)), moderate self-reported pain (median VAS score 4 (IQR 1.5–8)), and moderate-to-severe symptoms of depression (median Patient PHQ-9: 13 (IQR 8–16); median Caregiver PHQ-9: 12 (IQR 8.25–15)) and anxiety (median Patient GAD-7: 9 (IQR 5–13); median Caregiver GAD-7: 12.5 (IQR 7–14.75)). Medication literacy was high (90% (IQR 71.4–100)), as was baseline medication adherence (MMAS-8 score 8 (IQR 6–8)). Issues related to elimination (66%), hygiene (61%), and risk of falls (60%) were the most common identified nursing needs. Initially, 12 (11%) patients were admitted with wounds. By the time of discharge, 7/12 (58%) had their wounds completely healed. Two patients showed improvement, with a decrease in total wound's area, though healing was not complete. For 2 other patients, wound status remained unchanged, despite intervention.

Table 3

Baseline clinical needs, functional scores, and mental health assessment of patients with disabilities enrolled in the Home-Based Care Program (N = 105), June 2021 – October 2023, South Beirut, Lebanon.

Category	Variable / Assessment Tool	Baseline Value (N = 105)
Clinical Needs		n (%)
	Elimination problems	69 (66%)
	Comfort & Hygiene support	64 (61%)
	Specific Care needs (e.g., wound care)	26 (25%)
	Dysphagia	24 (23%)
Functional Scores		Median (IQR)
	Basic Activities of Daily Living (BADL)	2 (1–4)
	Pain Visual Analog Scale (VAS)	4 (1.5–8)
Medication Management		Median (IQR)
	Medication Adherence (MMAS-8)	8 (6–8)
	Medication Literacy (MLQ, %)*	89.6 (71.4–100)
Mental Health (PHQ-9)		Median (IQR)
	Patient (PHQ-9P)	13 (8–16)
	Caregiver (PHQ-9C)	12 (8.25–15)
Anxiety (GAD-7)		Median (IQR)
	Patient (GAD-7P)	9 (5–13)
	Caregiver (GAD-7C)	12.5 (7–14.75)
Note: IQR: Interquartile Range. *Program specific percentage of correct answers. #Patients could have more than one need identified.		

3.3 Retention in the Program

The program achieved a retention rate of 82%, with 86 pairs completing the full personalized 16-week program. Nine patients (9%) dropped out prior to completion, and 10 (9%) died while enrolled. Among patients who completed the program (n = 86), the median length of stay for patients with a reported discharge date was 26 weeks (IQR: 15–36), significantly longer than the theoretical 16-week standard due to clinical flexibility for complex cases. Participants received a median of 2.7 follow-up visits per month.

3.4 Health Outcomes

Seventy-nine participants, out of the 86 who concluded the full program, had a complete data set. The intervention resulted in 97.5% (n = 77) of participants experiencing at least one positive outcome across the 5 functional domains analysed, with only 2.5% (n = 2) showing no positive outcome in any of the domains. Significant improvement was observed in Communication & Mental Health, where the proportion of those 'in need' dropped from 91% (n = 72) at baseline to 48% (n = 38) at discharge (p < 0.001). Similarly, significant reductions in the need for support were seen in Elimination (62% vs 25%, p < 0.001), Moving & Positioning (90% vs 56%, p = 0.001), and Comfort & Hygiene (90% vs 58%, p = 0.007). 14% of subjects showed improvement in 2 domains and 13% in 3 domains. The Nutrition & Diet domain showed a reduction in the proportion of participants 'in need' from 43% (n = 34) at baseline to 16% (n = 13) at discharge. While this represents an improvement in 26% of the total cohort, the change was not statistically significant (p = 0.123). Participants who did not experience improvement, were stable at discharge. No clinical deterioration ("not in need" at baseline to "in need of support" at discharge) was observed in the Communication & Mental Health domain. Overall deterioration rates across all other domains remained exceptionally low, ranging from 2.5% to 8.8% (Table 4).

Table 4

Changes in functional domains (Nurse Assessment) from enrolment to discharge among patients in the Home-Based Care program, June 2021 – October 2023, South Beirut, Lebanon (n = 79)

Functional domain	"In need of support" at baseline, n/79 (%)	"In need of support" at discharge, n/79 (%)	Proportion improved*, n (%)	p-value [^]
Communication & MH Status	72 (91)	38 (48)	34 (43)	< 0.001
Elimination	49 (62)	20 (25)	29 (37)	< 0.001
Moving & Positioning	71 (90)	44 (56)	27 (34)	0.001
Comfort & Hygiene	71 (90)	46 (58)	25 (32)	0.007
Nutrition & Diet	34 (43)	13 (16)	21 (26)	0.123

*Proportion improved is calculated as the percentage of the total analysis cohort (N = 79) who transitioned from "In need" to "Not in need" of support. ^p-values calculated using McNemar's test for paired categorical data.

Regarding medication management, the median medication adherence score remained high at 8 (IQR 6–8) at enrolment and 8 (IQR 7–8) at discharge; however, 23% of participants showed a statistically significant improvement in their individual adherence levels (p = 0.003). No significant improvement was reported for medication literacy, which moved from a baseline of 89.6% (IQR 71.4–100) to 100% (IQR 84.8–100) at discharge (p = 0.329). PHQ-9 and GAD-7 scores significantly improved after the program in 66% of patients and 45% of caregivers, and in 41% of patients and 50% of caregivers, respectively (p < 0.001). Although the program was not specifically aimed at increasing mobility, BADL scores showed a

reduction in the level of dependency in 30% of patients ($p = 0.003$). Self-reported level of pain, as detected by VAS, was also significantly lower in 30% of patients at discharge, with the median score shifting from 4 (IQR 1.5–8) to 4 (0–6) ($p = 0.001$) (Table 5).

Table 5

Changes in clinical and functional scores from enrolment to discharge among patients in the Home-Based Care program, June 2021 – October 2023, South Beirut, Lebanon (n = 79)

Score / Scale	Proportion Improved (N = 79)*	Baseline Median (IQR)	Discharge Median (IQR)	p-value#
Medication Literacy (MLQ, %)	n (12)	89.6 (71.4–100)	100 (84.8–100)	0.329
Medication Adherence (MAQ)	n (23)	8 (6–8)	8 (7–8)	0.003
Basic Activities of Daily Living (BADL)	30%	2 (1–4)	2 (1–5.75)	0.003
Pain Visual Analog Scale (VAS)	30%	4 (1.5–8)	4 (0–6)	0.001
PHQ-9 (Patient)	66%	13 (8–16)	6 (4–9)	< 0.001
PHQ-9 (Caregiver)	45%	12 (8.25–15)	6 (4.5–9)	< 0.001
GAD-7 (Patient)	41%	9 (5–13)	4.5 (2–6.25)	< 0.001
GAD-7 (Caregiver)	50%	12.5 (7–14.75)	6 (4–8)	< 0.001

*Participants who completed the 16-week program and had complete data at both enrolment and discharge. #p-values were calculated using the Wilcoxon signed-rank test.

3.5 Thematic Insights

A total of 16 patient/caregiver pairs were interviewed. All caregivers participating in the qualitative part of the study were family members living in the same household with the dependent. Four main themes were identified: burden of disability, financial crisis and available support system, coping mechanisms developed, and the effect of MSF's HBC program.

3.5.1 Burden of Disability

One of the most common burdens expressed by caregivers was the lack of time to conduct daily tasks, while almost all PWD felt as "useless" members of the family, needing support in basic daily activities, including personal hygiene. All patients interviewed found it difficult to work due to their disability. Men were particularly vocal about the impact of disability on their self-image and mental well-being, as they considered themselves unproductive members of society and unable to function as the head of their household. This qualitative distress was reflected in the quantitative data; while male patients entered the program with high levels of psychological distress, they showed significant recovery. Specifically,

male patients (n = 29) demonstrated a significant median reduction in PHQ-9 scores from 14 to 5 ($p < 0.001$) and GAD-7 scores from 10 to 4 ($p < 0.001$). High recovery was likewise observed among female patients (n = 50), whose PHQ-9 scores moved from 12 to 6.

"I don't like anyone to help me. I'd rather fall on the ground a hundred times than ask my son to help me up. She [wife] wanted to call someone from outside, but I told her not to. I don't want anyone to gloat over me. I'd rather fall on the ground and stay there for three hours than ask for help." (Male patient).

Caregivers expressed the need to be "always alert" to protect their dependents from falling or hurting themselves. In several households, caregivers were responsible for multiple family members with disabilities, a load that frequently exacerbated their own physical or mental health issues. Many caregivers described feeling as if they were in the same 'prison' as the patient, living the same restricted life within the home. This entrapment often led caregivers to neglect their own medical needs in favour of the patient. This psychological strain is evidenced by the high baseline distress scores, with caregivers entering the program with a median PHQ-9 of 12 (8.25–15) and a GAD-7 of 12.5 (7–14.75).

"As soon as he wakes up, I turn him on the other side, and I put a pillow under him, so he doesn't fall. I help him in the toilet, I feed him, and change his diaper." (Female caregiver).

Disability impacts the family livelihood, especially through high medical expenses. Some caregivers reported the need to reduce working hours or stop working to care for their dependent, impacting their ability to earn money and sometimes requiring external support from family members abroad or local/international organizations. There is also a high level of decision-making expected from caregivers regarding when to seek care or making medical decisions, as well as responsibility for overall health management, including administering medication, wound care, and medical record keeping.

"My daughter was born with a spinal cord defect, which means she has paralysis... I had two options: close the opening with surgery, which would mean she would live with paralysis, or not have the surgery... I decided to have the surgery, and thank God I made the right decision, because the most beautiful thing in my life is [my daughter]." (Female caregiver)

3.5.2 Burden of Disability

Since 2019, Lebanon has experienced an economic and political crisis, which has impacted every aspect of livelihood, particularly for PWD. Everything became more expensive, including transportation, medications, and fees for private healthcare. The consequences on the health seeking behaviour include lack of treatment adherence, seeking medical care only in emergency situations, self-medicating, rationing medications, and relying on international aid for medications and disability aid equipment. These are some of the drivers for patients and caregivers preferring to receive care at home, rather than in health facilities. Some of the caregivers mentioned rationing their own medications, which has caused some health complications. They used to receive free medications from the designated United Nations Agencies, but due to the economic and financial crisis, the support for Syrians and Palestinians in Lebanon has trimmed down, especially for chronic medications. In some cases, the participants

reported paying for drugs out of pocket. Some stated they would rather secure their medications than food, as it is the main source of stress for them.

*"I used to take medications, but not anymore, because financially my mother can't afford it anymore."
(Female patient)*

As for support, many participants mentioned having family members abroad providing financial support. Also, other family members help with transportation, entertainment, and facilitating medical appointments. Support is also given by neighbours who help when the caregiver has health problems and is unable to lift the dependent in case of falls, moving down the stairs or pushing a wheelchair. Caregivers rely on neighbours or other family members but only for medical appointments or in case of emergencies.

"My son abroad is honestly the one who helps me and sends money to his mother, and she gives me my allowance. What can I do?" (Male patient)

Some of the participants mentioned how challenging it is for PWD to live in Lebanon. There are few organizations that support disability, especially for the aging population, and due to financial crisis, they reduced their services. Some patients mentioned the high level of care provided for PWD abroad, mainly in Europe, as compared to Lebanon or other Arab countries. This includes accessible infrastructure around the cities and easy access to quality and available healthcare. One male participant recounted how his medical aid was stolen and how he regrets coming back to Lebanon from abroad, due to the difference in treatment.

"This walker I used it a few times and bought it with me [to Lebanon] and it got stolen. This is a brand, and I drove it more than once here and it got stolen from me. We cannot drive it here. The streets are not like there [Sweden]". (Male patient)

"If they had given me residency, I would not have come. But I am better off staying abroad than in Arab countries. The treatment is better there, but the treatment in Arab countries is miserable." (Male patient)

3.5.3 Coping Mechanisms

participants shared different coping mechanisms. Many of the patients spend their days watching television or social media, playing games, or waiting for visitors. They also shared how the person they spend the most time with is their caregiver as they are their sole confidant and emotional outlet and support. Most participants mentioned their reliance on God and prayer to relieve them of their suffering. Some had optimistic conviction and accepted their disability and living conditions while placing their trust in God's plan. Other participants, noticeably the men, are waiting for their end of life as a means through which God relieves their suffering, as they feel helpless and a burden to their families:

"Thank God, patience and strong faith in God are enough for me to overcome this...For example, a blind person doesn't see anything, but I see everything in front of me, I see the world, I see everything and

overcoming this means that others have it harder than me.. And thank God, life must go on and must continue.” (Female patient)

“What am I supposed to do? I'm just waiting for God to relieve me. Thank God, I thank God, and I don't want anything from people. May God help us.” (Male patient)

Caregivers expressed their attempt to encourage a supportive environment for their disabled family members so that they feel more independent. However, they also expressed challenges to care for the dependent due to their own health issues or to the lack of financial means. Caregivers cope differently: many spend their days caring for their disabled family member but also taking care of the house chores and cooking meals.

3.5.4 Effect of MSF's HBC Program

Participants shared benefiting from the HBC program in different ways, including medical checkups, medications, laboratory testing, medical supplies, and non-food items, such as hygiene kits and water beds. Moreover, the consensus for patients and caregivers was the positive impact of having visitors regularly, and the provision of care in the comfort of their own home. The caregivers find it difficult to leave their disabled family member alone or unattended to go pick up medications or support services from MSF or other organizations, which is why they appreciated the home visits including both medical and nonmedical services.

“During MSF's visit, my mood changes. A person changes their scenery. Because all my time is spent watching TV shows, I've come to know all the actors' stories.” (Female patient)

“I would like to thank you very much for your services. These are capabilities that humans cannot surpass. First, I benefited from them by having a urinary catheter implanted for my daughter twice. When I did it privately, it was expensive, so I benefited from them. Then, they gave me some medicine for my daughter to raise her iron levels. I thank you very much because the cheapest medicine is now missing and expensive, and I don't have the ability to go buy it now. Also, as for the gauze and disinfectants, they also helped me with them.” (Female caregiver)

When asked about their expectations from the program, some did not have many expectations but were welcoming of any home-based program and visitors. The participants that did have expectations mentioned being cured from their disability or being provided with the needed surgery or physiotherapy. Many did not remember the health messages given to them by the health promotion team during the program except when it came to their medication adherence or wound care. However, many expressed the positive impact that the visits had on their overall mental and social wellbeing. They shared how having a “mental health professional” who was “kind” and “patient” impacted them the most, sometimes even more than the provision of wound care or medications, as they were able to open about their disturbing thoughts and emotions and learned how to cope with their disability and living conditions. Some participants became more accepting of their situation or felt more capable of expressing themselves and the mental and emotional pain they feel. Some participants feel hopeless or apathetic

as they are aware that their health and living conditions will not improve soon. Overall, participants prioritized the mental health support and medical care provided in this program.

"I am so grateful to MSF for their unwavering support during my difficult time. They visited me six times, providing both practical and emotional assistance that made a world of difference." (Female caregiver)

4. DISCUSSION

4.1 Summary of Findings

This mixed-methods study demonstrates that a nurse-led home-based care (HBC) model is a feasible and highly effective intervention for improving the well-being of refugees with restricted mobility and their caregivers in complex humanitarian settings. Our findings show that the program not only met clinical needs, such as wound care and medication adherence, but also significantly reduced depression and anxiety for both patients and caregivers. The 82% retention rate and the robust recovery in mental health scores suggest that HBC addresses a critical gap in traditional facility-based healthcare delivery in urban refugee camps.

4.2 Addressing the Burden of Disability and Isolation

The qualitative data revealed that the "burden of disability" extends far beyond physical limitations; it is characterized by profound social isolation and a sense of "uselessness" among patients. The high baseline PHQ-9 and GAD-7 scores reflect this psychological distress. Interestingly, our quantitative analysis showed that while men felt a greater blow to their self-image as "unproductive" heads of household, they responded remarkably well to the intervention, with a significant median reduction in PHQ-9 scores from 14 to 5 ($p < 0.001$). This aligns with existing literature suggesting that home-based interventions can mitigate the stigma associated with seeking care in traditional settings (Young & Busgeeth, 2010).

4.3 Impact on Caregivers

A unique strength of this study is the inclusion of the "patient-caregiver dyad" as the unit of care. Caregivers in our cohort nearly all of whom were female family members entered the program with higher anxiety scores than the patients themselves. The "prison-like" environment described in the interviews highlights the entrapment of informal caregivers in refugee camps. By providing education and emotional support, the HBC program successfully reduced caregiver distress, confirming that supporting the caregiver is essential for the long-term sustainability of home-based NCD management (Saleh et al., 2021).

4.4 Feasibility and Clinical Outcomes. The program's success in maintaining high medication adherence and improving functional status (BADL) in 30% of patients despite the severe economic collapse in Lebanon is noteworthy. The flexibility of the program, allowing a median stay of 26 weeks for complex cases, allowed for clinical goals to be met rather than strictly adhering to an arbitrary 16-week timeline. This operational flexibility is a key recommendation for future HBC models in humanitarian contexts.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Médecins Sans Frontières Ethics Review Board (Ref: 2230) and the University of Balamand Institutional Review Board (Ref: IRB-REC/O/018-23/0423). Retrospective verbal informed consent was obtained for the quantitative component, and written informed consent was obtained for the qualitative interviews.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due to MSF data protection policies but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

DS and JE conceptualized the study. DS performed the statistical analysis and drafted the manuscript. KM, NE, MH, CS, and FT provided oversight and critical revisions. All authors read and approved the final manuscript.

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