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VALIDITY AND RELIABILITY OF THE ARABIC VERSION OF THE PATIENT HEALTH QUESTIONNAIRE-9 (PHQ-9) IN PATIENTS WITH HEART FAILURE (HF) IN LEBANON

by
AHMAD HILAL AL JAMMAL

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ABSTRACT
OF THE THESIS OF

Ahmad Al Jammal for Master of Science in Nursing
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Title: Validity And Reliability of the Arabic Version of the Patient Health Questionnaire-9 (PHQ-9) in Patients with Heart Failure (HF) in Lebanon

Background: Depression has been recognized as a common comorbidity in heart failure (HF). The significant presence of depression has been associated with increased mortality among patients with HF (Fan et al., 2014). Depression screening is now recommended by the European Society of Cardiology and the Italian Geriatric Cardiology Society's HF guidelines. The use of self-reported screening tools for patients is a major method of examining for depression. The Patient Health Questionnaire-9 (PHQ-9) is one of the most commonly used and approved self-reporting questionnaires for screening patients for depression. The PHQ-9 has been clinically validated in the HF population, making it an increasingly relevant clinical and research tool. The PHQ-9 was translated to Arabic and used to screen for depression in a Saudi community sample and in Lebanese cardiac patients. However, no research validating the properties of the Arabic PHQ-9 in cardiac patients has been reported in Lebanon.

Study aim: The overall aim of this study was to examine the psychometric properties and cultural validity of an Arabic version of the PHQ-9 as a depression screening tool in HF patients in Lebanon.

Design: This is a secondary data analysis. The study used interview data collected in two studies. The first study used an observational cross-sectional design to evaluate the psychometric properties of the Minnesota Living with Heart Failure questionnaire in Lebanese patients with HF. The second study used a correlational descriptive design to describe self-care behaviors and their determinants in a sample of Lebanese patients with HF.

Sample: The current study sample included a total of 208 patients who were included in the two studies described above.

Procedure: IRB approval was secured. The two data sets were then de-identified and merged. Statistical analysis included the calculation of the Cronbach's alpha coefficient. Two experts in cardiology and one patient were asked to evaluate the cultural appropriateness of the Arabic version of the PHQ-9 in the Lebanese population and its relevance to depression by rating each item on a 4-point scale, and an index was calculated for each item of the PHQ-9 and the overall scale. We also compared patients

with different New York Heart Association (NYHA) classes on their PHQ-9 scores using an ANOVA test to test the hypothesis that patients with a higher NYHA class will have higher depression scores. Furthermore, the Pearson correlation coefficient was used to evaluate the association between the PHQ-2 (a short version of the PHQ-9) and PHQ-9 scores. Since socioeconomic status and educational attainment have been linked to depression, ANOVA was used to compare PHQ-9 means across different groups of education and income, in addition to the t-test to compare PHQ-9 means by gender and comorbidity status.

Results: Out of the 208 patients, 37 (17.78%) were positively screened for depression by PHQ-9 at a cutoff ≥ 10. The psychometric assessment of the PHQ-9 showed acceptable internal consistency (Cronbach's alpha = 0.823). Two experts and a HF patient evaluated the Arabic version of the PHQ-9 in the Lebanese population to be culturally appropriate, overall. The Exploratory Factor Analysis yielded two factors: psychosomatic and cognitive. Furthermore, there were significant differences in PHQ-9 categories by NYHA class. The questionnaire was found to be reliable and valid, with potential for minor adjustments for cultural appropriateness.

Conclusion: These results can inform the implementation of depression screening in HF clinics in Lebanon, with advanced practice nurses using the Arabic PHQ-9 to assess patients, refer them to psychiatry when needed, and monitor their response to treatment over time.

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ABBREVIATIONS

ACE	Angiotensin-Converting Enzyme Inhibitors
ACS	Acute Coronary Syndrome
AHA	American Heart Association
APA	American Psychiatric Association
ARB	Angiotensin II Receptor Blocker
AUBMC	American University of Beirut Medical Center
BDI	Beck Depression Inventory
CABG	Coronary Artery Bypass Graft
CAD	Coronary Artery Disease
CCI	Charlson Comorbidity Index
CCU	Coronary Care Unit
COPD	Chronic Obstructive Pulmonary Disease
CRP	C-Reactive Protein
DHFK	Dutch HF Knowledge Scale
DSM	Diagnostic And Statistical Manual Of Mental Disorders
ED	Emergency Department
EF	Ejection Fraction
EMR	Electronic Medical Record
ESC	European Society Of Cardiology
ESSI	ENRICHED Social Support Inventory
GAD-7	Generalized Anxiety Disorder-7
GDS	Geriatric Depression Scale
HADS	Hospital Anxiety And Depression Scale
HF	Heart Failure
IL-6	Interleukin-6
ICD	Implantable Cardioverter-Defibrillator
IRB	Institutional Review Board
KCCQ	Kansas City Cardiomyopathy Questionnaire
mBDNF	Mature Brain-Derived Neurotrophic Factor
MDD	Major Depressive Disorder
MI	Myocardial Infarction
MLHFQ	Minnesota Living With Heart Failure
NYHA	New York Heart Association
PHQ-2	Patient Health Questionnaire-2
PHQ-9	Patient Health Questionnaire-9
PHQ-SADS	PHQ-Somatic, Anxiety, And Depressive Symptoms
QoL	Quality Of Life
SAS	Self-rating Anxiety Scale
ScHFI	Self-care of HF Index
SCI	Spinal Cord Injury
SDS	Self-rating Depression Scale
SICGe	Italian Geriatric Cardiology Society
TNF	Tumor Necrosis Factor
USPSTF	United States Preventative Services Task Force

DEDICATION

I dedicate this thesis to the three most important people in my life: my parents,

Hilal and **Thuraya**, and my wife, **Nourhan**.

To my parents, I express my deepest gratitude for their love, support, and encouragement throughout my life. Their sacrifices and dedication to my education have been an inspiration to me, and I am forever grateful for their guidance and wisdom. They have taught me the importance of hard work, perseverance, and the value of education. This thesis is a testament to their belief in me and my abilities, and I am honored to dedicate it to them. Thank you, Mom and Dad, for everything.

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CHAPTER 1

INTRODUCTION

Depression is one of the most prevalent mental health disorders the population faces, with a lifetime prevalence estimate of 10% (Tolentino & Schmidt, 2018). Its incidence rate may approach 20% in clinical settings (O'Connor et al., 2009). In order to be classified as having a Major Depression Episode (MDE), the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) specifies the presence of at least five of the following symptoms for a minimum of two weeks. A lack of interest or pleasure (anhedonia) or a depressive mood should be present (American Psychiatric Association, 2013). Secondary symptoms of MDE include changes in appetite or weight, insomnia or hypersomnia, psychomotor agitation or retardation, exhaustion or lack of energy, impaired thinking or concentration, feelings of worthlessness or excessive guilt, and suicidal ideation. These symptoms are scored on an all-or-none (0 or 1) scale based on their presence and a total summative score is calculated. According to the DSM-5 criteria, a major depressive episode is either present or absent based on the totality of the symptoms (American Psychiatric Association, 2013).

Depression has been recognized as a common comorbidity in heart failure (HF). It is three- to four-times more prevalent in HF patients compared to the general population (Bhatt et al., 2016). The significant presence of major depression as well as depressive symptoms has been associated with increased mortality among patients with HF (Fan et al., 2014). For patients with HF, a meta-analysis (Rutledge et al., 2006) documented that the prevalence of depression among those with HF was 21.5%. Moreover, those with depression or depressive symptoms were two times more likely to

suffer adverse outcomes than those without such symptoms. Furthermore, depression is associated with a 2- to 3-fold increase in mortality and rehospitalization within 3 to 12 months of being diagnosed with heart failure. Depression is also associated with increased health-care demands, an increased risk of social exclusion, financial distress, and caregiver exhaustion in patients with HF (Jha et al., 2019).

Depression has also been linked to poor quality of life (QoL), less self-care, higher rehospitalization rates, and higher healthcare expenses in patients with HF. Depression was found to be an independent predictor of poor QoL in a study of 200 Jordanian patients with HF, based on the Hospital Anxiety and Depression Scale (HADS) (AbuRuz, 2018). Moreover, a study by Bhatt and colleagues (2016) showed that patients with mild depressive symptoms scoring between 5 and 9 on the PHQ-9 tool were 13 times more likely to have poor QoL compared to patients with minimal symptoms (PHQ-9 score <5) measured by the Kansas City Cardiomyopathy Questionnaire (KCCQ), and those with moderate to severe (PHQ-9 score ≥10) depressive symptoms were 60 times more likely to have poor QoL.

Depressive symptoms have also been linked to impaired thinking, decreased motivation, and poorer self-care in patients with HF (Chobufo et al., 2020). Patients with HF should practice self-care so that they can track their symptoms, identify physiological changes promptly, and adhere to their treatment plan. Higher PHQ-9 scores were shown to be independently linked with worse HF self-care by Freedland et al. (2020). Moreover, it has been shown that self-care programs improve HF self-care in patients experiencing depressive symptoms (Alosais et al., 2020).

Patients with HF and comorbid depression are more likely to seek healthcare services, according to a meta-analysis conducted by Rutledge and colleagues (2006).

Significant results included a 29% increase in overall healthcare expenses and a doubling of the likelihood of emergency department (ED) visits for patients with comorbid depression and HF compared to those with HF alone (Rutledge et al., 2006). In fact, Ishak et al. (2020) found that patients with both depression and HF were more likely to visit the ED than those with HF but no depression.

Furthermore, Unützer et al. (2009) analyzed the medical expenditures of 14,902 Medicare recipients and found that those with depression and HF or diabetes possessed higher healthcare expenditures ($15,750 annually) than the non-depressed patients with chronic diseases ($10,673 annually).

We present further elaboration on major outcomes in HF.

1.1 Depression and Outcomes in HF

1.1.1. QoL

Patients with chronic diseases were interviewed in a cross-sectional study (N = 301) that examined the levels of anxiety and depression. The condition was shown to be significantly associated with poor patients' QoL and limited ability to engage in physical activities (Dogu & Aydemir, 2018). Impaired QoL as a result of mental, social, physical, and psychological barriers was linked to depression in a study by Dogu and Aydemir (2018). High rates of depression in patients with chronic diseases are linked to problems in performing social and familial duties, cutting down on activities formerly enjoyed, and being more reliant on others for help. Depressive symptoms are associated with QoL, reduced productivity at work, and limitations in the patients' social and familial responsibilities (Dreskin, 2018).

Patients with HF are more likely to develop depression as their condition worsens, with an overall incidence of 21.5% (Rutledge et al., 2006; Faller et al., 2007).

Depressive symptoms are also more likely to be present in patients with a higher NYHA class, signifying more severe functional restriction (Rutledge et al., 2006), which may be traced back to the increased symptom load and QoL effect seen in patients with more severe HF (NYHA classes III and IV). Comorbidities such as chronic obstructive pulmonary disease (COPD), anemia, insulin-dependent diabetes mellitus, and hyperlipidemia were also found to increase the risk of depression in HF patients (Albert et al., 2009).

Furthermore, Rasmussen et al. (2021) observed that non-adherence to HF medications at one and three years of follow-up was linked with poor health-related QoL and depressive symptoms. Tang et al. (2014), who also examined the link between depression and medication adherence in patients with HF, discovered that patients who were depressed had lower rates of self-reported medication adherence compared to those who were objectively assessed. Moreover, a systematic review highlighted that among the many factors that might contribute to medication non-adherence in patients with HF is depression (Oostrom-Calo et al., 2013).

The importance of considering effective treatments for depression in order to enhance the physical and mental health aspects of QoL among cardiac patients was highlighted in a meta-analysis that evaluated the evidence obtained from various health, medical, social sciences, psychology, and psychiatric databases (O'Neil et al., 2011). The significant health implications of depression among cardiac patients who are at risk of deteriorating health are highlighted by O'Neil et al. (2011). Therefore, it is crucial to note that patients with chronic medical conditions are required to seek treatment for their depression (O'Neil et al., 2011).

1.1.2. Morbidity and Mortality

Beyond the impact on QoL, comorbid depression in patients with HF is also a predictor of reduced survival. Diez-Quevedo et al. (2013) tracked 1,017 HF outpatients for 5.4 years to examine the influence of depressive symptoms on mortality using a shortened version of the Geriatric Depression Scale (GDS). Depression was linked to higher all-cause but not cardiovascular mortality. Diez-Quevedo et al. (2013) found that the risk of death from heart disease and all causes was lower in people whose depressive symptoms got better during the first year of follow-up.

Furthermore, a hospital-based registry was used by O'Connor et al. (2008) to identify risk factors for 60- and 90-day mortality after HF hospitalization. A comprehensive risk prediction model based on 19 specified demographic and clinical variables was developed using step-by-step analysis. O'Connor et al. (2008) found that, among the greatest indicators of increased mortality risk, depressive history was third only to comorbid liver disease and pulmonary disease.

According to an early meta-analysis (Rutledge et al., 2006), patients with HF and comorbid depression or depressive symptoms have a significantly increased risk of mortality and associated cardiac events. Similar findings were found in a more recent meta-analysis of thirteen studies that focused only on mortality (Gathright et al., 2017). Patients with HF who also experienced depression had a higher risk of all-cause and cardiovascular mortality compared to those without depression (Gathright et al., 2017).

1.1.3. Healthcare Burden

In HF, comorbid depression is associated with higher healthcare demand and expenditures. Patients with HF and comorbid depression had a doubled incidence of ED

visits, greater hospital readmission rates, and longer hospital stays (Himelhoch et al., 2004). Additionally, Sullivan et al. (2002) conducted a 3-year retrospective study of 10,980 patients with HF and found that annual healthcare expenses for patients with HF and comorbid depression who are on antidepressants were 29% higher than for patients without symptoms of depression. This was primarily attributable to an increase in inpatient and outpatient medical follow-ups (Sullivan et al., 2002).

Eventually, to improve patient outcomes, there is an opportunity to systematically screen for and treat depression in patients with HF, particularly in the coronary care units and the cardiology specialty clinics, where patients are already scheduled for routine follow-up. There is a high prevalence of depression among patients with HF treated by physicians who are asked to follow up every one to three months; however, patients may not be regularly screened for or given treatment for depression. Therefore, screening for depression will benefit patients with HF, and the stigma linked with depression will be reduced if cardiology experts conduct regular depression screenings (Jha et al., 2019).

1.2. Purpose And Aims

Patients with HF who score highly on depression screening tools should be identified and treated according to an evidence-based treatment protocol. Screening patients with HF for depression and providing them with a suitable course of action as needed are critical for improving outcomes in this population. A formal diagnosis of depression, according to the criteria stated in the DSM-IV, is required before initiating therapy; importantly, systematic assessment using screening tools is helpful for the identification of depressive symptoms and referral to a specialist (Celano et al., 2018).

Even though the PHQ-9 was developed before the publication of the DSM-V in 2013, the criteria used in the PHQ-9 are consistent with the criteria for MDD as outlined in both the DSM-IV and the DSM-V. In fact, the American Heart Association (AHA) recommends regular screening and treatment for depression in the cardiac population due to the connection between depression and worsened cardiovascular outcomes (Deveney et al., 2016). The AHA also recommends a two-step process: first screening for depression using the PHQ-2, and then administering the PHQ-9 to patients who tested positive in the first screening. The PHQ-9 has been frequently used tool for depression screening (Deveney et al., 2016). Importantly, the Arabic version of the PHQ-9 has not been validated for use with HF patients in Lebanon.

The overall goal of this study is to examine the psychometric properties and cultural validity of an Arabic version of the patient health questionnaire-9 (PHQ-9) as a depression screening tool in HF patients in Lebanon. The following are the specific aims of the study:

1. To examine the level of internal consistency of the PHQ-9 in Lebanese patients with heart failure.
2. To evaluate the cultural validity of the PHQ-9 in patients with HF in Lebanon.
3. To evaluate the construct validity of the PHQ-9 in patients with HF in Lebanon.
4. To examine the relationship between PHQ-9 scores and NYHA classes among patients with HF in Lebanon.
5. To examine the association between the PHQ-2 and PHQ-9 scores for depression screening in patients with HF in Lebanon.

1.3. Clinical Practice Hypothesis

Healthcare providers need to recognize depression in patients with HF since both exhibit similar symptoms. Dyspnea, fluid retention, and activity intolerance are all classic signs of HF (Kop et al., 2011). Distress, frustration, and changes in behavior (loss of interest in activities that were previously enjoyed, decreased social engagement, changes in appetite or sleep patterns), a sense of worthlessness or guilt, and frequent thoughts of death are all signs of depression (Kop et al., 2011). Fatigue, loss of energy, reduced physical activity, changes in weight, changes in sleep, and diminished attention may be symptoms of both conditions (Kop et al., 2011).

Depression and heart failure are intertwined entities, as evident in the pathophysiologic changes in both conditions, which include autonomic nervous system dysregulation, neurohormone release, vascular endothelial dysfunction, hypercoagulability, and increased inflammatory substances (Aloisi et al., 2019). Cortisol and aldosterone levels rise as a result of decreased feedback control in the hypothalamic-pituitary-adrenal axis due to autonomic nervous system dysregulation, which increases sympathetic nervous system activity. When norepinephrine, cortisol, and aldosterone levels are abnormally elevated, it is a reliable predictor of death in HF. Tumor necrosis factor (TNF), interleukin-6 (IL-6), and C-reactive protein (CRP) are all higher in depressed individuals, and this is linked to worse outcomes in HF (Aloisi et al., 2019). Hypercoagulable blood is caused by depression, aging, and HF all at the same time. Hypercoagulability increases depressive symptoms by suppressing the synthesis of mature brain-derived neurotrophic factor (mBDNF), which is critical for mood regulation as well as thrombogenesis and cardiovascular events (Liguori et al., 2018). Fatigue and other depressive symptoms may be triggered by the central nervous

system's reaction to inflammatory processes (Aloisi et al., 2019). Both depression and inflammation have a direct impact on the progress of HF (Kop et al., 2011). Anxiety and depression can have a significant impact on the health of individuals with hypertension and HF. Research suggests that anxiety and depression may lead to a worsening of hypertension, which reduces the oxygen supply to the brain's hippocampus (Aloisi et al., 2019). This reduction in oxygen supply can further complicate the illness trajectory of patients with HF, who already have a compromised circulatory system. Worsened illness can lead to a decline in overall health and an increased risk of complications, and consequently worsened mood. This means that a certain percentage of patients with HF will experience depression (Aloisi et al., 2019).

Comorbid depression is common in patients with HF, and the prognosis is based on a number of interrelated variables. Screening for depression is one of the healthcare provider’s duties towards assisting patients with HF. Thus, it is important to conduct psychometric testing and cultural validation of a depression screening tool for use in HF patients in Lebanon.

To the best of our knowledge, this study is the first to validate the psychometric properties of the Arabic version of the PHQ-9 in patients with HF in Lebanon. We hypothesize that the PHQ-9 has sound psychometric properties in our population and is a reliable depression screening tool for the HF population.

CHAPTER 2

LITERATURE REVIEW

2.1. Synthesis

The purpose of this literature review was to identify recent studies on the prevalence of depression in patients with HF, its adverse effects on health, QoL, depression and economic burden, and the effectiveness of various depression screening tools used in the cardiac population. According to Akincigil & Mathews (2017), depression screening falls short of what is needed despite its high prevalence.

In fact, there is lack of information and research on depression screening in Lebanese patients with HF, and healthcare providers would greatly benefit from further research on the topic. Moreover, researchers have highlighted that at the national level, there is a need to examine the efficacy of healthcare interventions that take cultural norms into account (Deek et al., 2022). For example, it may be important to consider how cultural beliefs around mental health and illness may affect patients' willingness to disclose symptoms of depression, which could impact the validity of the PHQ-9 scores. Additionally, cultural variations in the expression of symptoms of depression may also affect the reliability of the tool. Therefore, when evaluating the validity and reliability of the Arabic PHQ-9 in heart failure patients in Lebanon, researchers should take cultural factors into account and ensure that the tool is appropriate for use in this population. This provides for the context of this study in examining the psychometric properties and cultural validity of an Arabic version of the PHQ-9 as a depression screening tool in HF patients in Lebanon.

2.2. Depression and HF

A number of studies have reported on the prevalence of depression in patients with HF. An observational cohort study with 153 patients from the United States, Canada, and New Zealand reported a 36% prevalence of depression (Friedmann et al., 2006). Depressive symptoms were assessed using a threshold score of 13 on the Beck Depression Inventory II (BDI-II) as a screening tool (Friedmann et al., 2006). Participants in two other studies, however, had been screened for depression with a PHQ-9 threshold of 10 (Bhatt et al., 2016; Zahid et al., 2018). A study by Bhatt et al. (2016) revealed that depressive symptoms were reported by 26% of the 308 patients with HF in the United States, while the study by Zahid et al. (2018) indicated that 60% of 170 outpatients with HF reported having the same symptoms.

Studies have examined the link between depression and poor outcomes in patients with HF due to high rates of depression. Two meta-analyses showed that depression in HF patients increased the mortality rate compared to non-depressed patients with HF. Sokoreli et al. (2016) performed their analysis using hazard ratios adjusted for confounding variables (age, gender, NYHA class, ejection fraction (EF)). Chobufo et al. (2020) observed that depression in HF patients doubled the risk of HF-related morbidity and mortality. For patients with HF and intact EF, Chandra et al. (2020) observed that higher PHQ-9 levels were linked with increased cardiovascular mortality. Since most HF research has been done on patients with low EF, and considering the findings by Chandra et al. (2020), this shows that depression adversely impacts patients with HF regardless of their EF.

2.3. Depression Screening in HF

Depression screening is now recommended by the European Society of Cardiology (ESC) and the Italian Geriatric Cardiology Society (SICGe) HF guidelines (Aloisi et al., 2019). The BDI and GDS are screening instruments recommended by the above-mentioned organizations (Aloisi et al., 2019). Patients with CAD may be assessed for depression using a shortened version of the Patient Health Questionnaire-2 (PHQ-2) assessment, which has been recommended by both the American Psychiatric Association (APA) and the American Heart Association (AHA) (Lichtman et al., 2008). In addition, the AHA recommends utilizing the PHQ-2 and PHQ-9 for progressive screening and treatment of depression in cardiac patients, as proper depression therapy may improve outcomes (Lichtman et al., 2008).

Choosing a screening approach is a matter of personal preference, and the U.S. Preventive Services Task Force (USPSTF) suggests that physicians choose one that is most appropriate for their practice and the community they serve (USPSTF, 2009). In terms of the suggested screening interval, according to Jha and coworkers (2019), annual (or more frequent) rescreening for depression might be explored if there is considerable stress, a change in clinical status, or hospitalization. Depression screening for patients with HF should be done at all of their regular follow-up visits because it facilitates treatment implementation (Maurer et al., 2018).

In studies that investigate signs of depression in patients, researchers rely on three different methodologies (Ng et al., 2016; Unützer & Park, 2012). The first and least specific technique involves reviewing the medical record for any history of prescribed antidepressant usage. The clinical interview is a second, more focused strategy. The patient is interviewed by a clinician who is certified to diagnose

depression by determining whether the DSM-V criteria for diagnosing depression are met. At least five of the following symptoms must be present for at least two weeks, and at least one of the symptoms must be: diminished interest or pleasure, or depressed mood, anhedonia, change in weight or appetite, psychomotor agitation, fatigue or loss of energy, feelings of worthlessness, and a diminished ability to think (American Psychological Association, 2013). The use of self-reported screening tools for patients is the third major method of examining for depression. A systematic review by Ishak et al. (2020) showed that there are a wide variety of methods for screening for depression in people with HF. The GDS, BDI, HADS, PHQ-2, and PHQ-9 are the most regularly used and approved self-reporting questionnaires for screening patients for depression (Ishak et al., 2020; Liguori et al., 2018; Siu et al., 2016).

2.4. Screening Tools Cardiac Population

Depression screening in the cardiac population was addressed in earlier studies that validated the use of several screening tools, including the Hospital Anxiety and Depression Scale HADS, BDI-II, Hamilton Rating Scale for Depression (HAM-D), GDS, PHQ-2, and PHQ-9.

2.4.1. Hospital Anxiety and Depression Scale (HADS)

One of the most commonly used and straightforward depression screening tools is the Hospital Anxiety and Depression Scale (HADS) (Ceccarini et al., 2014). This screening tool has been shown to accurately identify depressive symptoms using a 14-item Likert-scale scoring method. The goal of the questionnaire was to offer a valid instrument for use in clinical settings. It consists of 14 items, seven of which reflect

anxiety and seven of which screen for depression. The total score for anxiety or depression on HADS may range from 0 to 21 based on how individuals respond to each of the scale's 21 items, which are each evaluated on a 0–3 Likert scale. When categorized as mild (8–10), moderate (11–15), or severe (16–21), an individual's overall score serves as an indicator of global mood disorder (Ceccarini et al., 2014).

Martin et al. (2003) investigated the utilization of HADS in patients receiving coronary treatment after an acute myocardial infarction (MI). Using confirmatory factor analysis and reliability analysis, it was found that the questionnaire has strong psychometric properties across three time points (1 week, 6 weeks, and 6 months) with Cronbach's alphas of 0.87, 0.88, and 0.90 in patients with MI.

However, most of the published work overstates the HADS's efficacy since cut points were permitted to be freely altered, allowing researchers to take advantage of differences in their own samples or methods of sampling (Thombs et al., 2008). Another issue with measuring the HADS's effectiveness is due to ambiguity in the language of the items, especially the use of British expressions, and to differences in the performance of the HADS across languages and cultures, which could discourage the integration of cross-cultural studies into systematic reviews and meta-analyses (Igwesi-Chidobe et al., 2021). Another aspect worth noting is that the depression scale of the HADS does not capture suicidal ideation.

2.4.2. The Beck Depression Inventory-II (BDI-II)

The BDI is a depression screening tool that is also widely used and investigated (Ceccarini et al., 2014). The test-retest reliability of the screening instrument was developed and validated by Beck, Steer, and Brown (1996) (cited in Ceccarini et al.,

2014). The Beck Depression Inventory is a 21-item scale that measures depressive symptoms on a 4-point scale (0–3). Only eight of the 23 questions in the tool evaluate physical symptoms like sleeplessness and exhaustion; the other 13 items target cognitive or emotional disorders. Depression is classified as mild when the overall BDI score is between 10 and 18, moderate when it's between 19 and 29, and severe when it's 30 or above (Ceccarini et al., 2014). Many studies supported the utilization of this tool, as it has been shown to match up with clinical diagnoses in more than 90% of patients with depression (Ceccarini et al., 2014). It is also important to note that this tool is not used as a diagnostic tool but rather to measure the degree to which a person is experiencing depression (Ceccarini et al., 2014). As a result, it can only be used to assess the severity of depressive symptoms, and the expert will need to rely on other indicators for a diagnosis.

2.4.3. Hamilton Rating Scale for Depression (HAM-D or HRSD)

The HAM-D is one of the most well-known and widely-used tools for assessing the severity of depression (Ceccarini et al., 2014). Over the years, the 17-item version of the test was shown to be the most popular scale for randomized controlled studies, including depression. However, some researchers believe that this abbreviated version has limitations, including but not limited to not including all symptom domains of major depressive disorder (MDD); not including reverse neurovegetative symptoms; not including some items measuring constructs of irritability and anxiety; not including loss of interest and hopelessness; and assigning different ratings to different symptom domains (insomnia coded up to 6 points, while fatigue is only up to 2 points) (Ceccarini et al., 2014).

2.4.4. The Geriatric Depression Scale

The Geriatric Depression Scale is a 30-item tool designed primarily for use with the geriatric population (Delville & McDougall, 2008). For quick clinical usage, the GDS is often condensed into a 15-item scale. The tool has been validated for usage with both medically and mentally impaired patients (Delville & McDougall, 2008). Two studies used the GDS; one used the 30-item version (Subramanian et al., 2005), while the other used the 15-item version (Fulop et al., 2003) and compared its findings to those of the Structured Clinical Interview (SCI). An SCI is an example of a one- to two-hour semi-structured interview used to diagnose mental health disorders. When used in clinical studies, SCI must be administered by a mental health practitioner or a trained assistant (Delville & McDougall, 2008).

Using the 30-item GDS, Fulop and colleagues (2003) assessed the development of depression in a group of outpatients six months following their HF hospitalization. The 30-item GDS was completed by the participants twice after they were discharged from the hospital (4 weeks and 24 weeks later). The authors found that patients with a higher NYHA class upon hospital discharge had a greater risk of being depressed at all three follow-up visits (Delville & McDougall, 2008). In a longitudinal study conducted by Subramanian and colleagues (2005), the 15-item GDS scale was used to compare the accuracy of patients' self-reported NYHA class assignments with those of their healthcare providers. They reported the 15-item GDS's incorporation of somatic symptoms seen in both HF and depression lowered the GDS's reliability by making the diseases seem more closely related than they really were (Delville & McDougall, 2008).

2.4.5. The Patient Health Questionnaire 9 (PHQ-9)

The PHQ-9 serves a dual purpose in the screening and monitoring of the response to treatment for depressive disorders; a global score of 5 or above on the PHQ-9 constitutes a clinically significant response to depression intervention (Ceccarini et al., 2014). The PHQ-9 score can range from 0 to 27, with scores of 5, 10, 15, and 20 indicating the lower limits of mild, moderate, moderately severe, and severe depression, respectively. A shift of 5 points or more on the PHQ-9 is considered to have a substantial impact on health-related QoL and functional status. A score under 10 is considered a partial response to treatment, while a score under 5 is considered remission (Ceccarini et al., 2014). The PHQ-9 is an appealing, dual-purpose tool for screening and measuring the severity of depressive disorders due to its short length and construct and criterion validity, especially in the busy context of clinical practice (Ceccarini et al., 2014).

2.4.6. The Patient Health Questionnaire 2 (PHQ-2)

The PHQ-9 is a straightforward, two-item, simple screening tool that asks the patient yes-or-no questions about whether or not they have felt sad, depressed, or hopeless during the last two weeks. These items are the first two items of the PHQ-9. If the answer to each question is "yes," on the PHQ-2, a physician trained in the diagnosis and treatment of depression should use the longer, nine-item Patient Health Questionnaire 9 (PHQ-9) (Ceccarini et al., 2014). The PHQ-2 is a shortened version of the 9-item PHQ-9. Not at all (a score of 0), a few days (a score of 1), more than half the days (a score of 2), and almost every day (a score of 3) are possible responses (Ceccarini et al., 2014).

The Patient Health Questionnaires may be completed in less than five minutes by most patients on their own, providing a preliminary screen of depression and a severity score for treatment planning and follow-up (Ceccarini et al., 2014). The PHQ-9 has been shown to be an effective instrument for spotting both severe depression and subthreshold depressive illness in the general population. The DSM-IV criteria for diagnosing mood disorders are reflected in the Patient Health Questionnaire-9 (PHQ-9), which is just half as long as many other depression tests (Ceccarini et al., 2014).

2.5. Validation and Translation of the PHQ-9

The PHQ-9 is a multidimensional depression screening tool that uses a 4-likert scale ranging from 0 (not at all) to 3 (nearly every day) to evaluate the frequency of a range of depressive symptoms such as hopelessness, loss of interest or pleasure, fatigue, sleep disturbance, and difficulty concentrating. This allows for a comprehensive evaluation of the patient's depression symptoms, which can help with screening and treatment planning. Additionally, a multidimensional assessment tool like the PHQ-9 can be used to track the progress of treatment over time. The overall score on the PHQ-9, ranging between 0 and 27, is calculated by adding the points from each of the nine items (Hammash et al., 2013). The PHQ-9's total score may be used to assess the severity of depression and can therefore be used to identify high-risk patients who may require prompt medical attention (Deveney et al., 2016). This comprehensive assessment allows for a more accurate diagnosis and treatment planning and can also be used to track progress over time.

Several studies have shown that the PHQ-9 is an effective tool for depression screening (Akincigil & Mathews, 2017; Ng et al., 2016). Ng et al. (2016) found that

using the PHQ-9 in primary care had an 81% sensitivity and 92% specificity. Additionally, the PHQ-9 was found to be a useful tool for assessing a patient's mood during the follow-up visit and while being treated for depression (Malpass et al. 2016). Many barriers restrict the usage of screening tools, including the time required to teach the staff to utilize these tools and the time required for the patients to complete them (Doi et al., 2018). A study by Jetelina et al. (2018) showed that there was an increase in total patient screening when the PHQ-9 was embedded into the electronic medical record (EMR).

A retrospective analysis found that a nurse-led early screening approach was effective in validating the PHQ-9. The findings revealed that 48% of the 79 patients who were screened for depression using the PHQ-9 during the first seven days of their hospitalization tested positive for depression (McIntosh, 2017). A systematic evaluation of 27 existing tools for post-stroke depression screening found that effective screening tools are categorized into three groups: verbal self-report, use of graphic aids, and observational tools. The PHQ-9, the most commonly used and well-validated questionnaire with solid clinical significance, was able to identify depression better than any other questionnaire (Burton & Tyson, 2015).

Moreover, a study by Dajpratham et al. (2020) that used a Thai-translated version of the PHQ-9 to screen for depression in poststroke patients supported the validity in the Thai population. The PHQ-9 was chosen because of its high sensitivity to depression and ease of translation into Thai. Thus, the PHQ-9 was found to be a valid tool for identifying symptoms of depression and adjustment disorders in post-stroke patients with a threshold score of 6 (Dajpratham et al., 2020). In addition, Prisnie et al. (2016) evaluated four depression screening tools, including the PHQ-2, PHQ-9, HADS,

and GDS. An optimal combination of a sensitivity of 81.8% and a specificity of 97.1% was shown in the PHQ-9 among stroke and transient ischemic attack patients. On the other hand, the sensitivity and specificity for the other screening tools were as follows: PHQ-2 (sensitivity: 75.0%, specificity: 96.3%), HADS-D (sensitivity: 63.6%, specificity: 98.1%), and GDS-15 (sensitivity: 45.5%, specificity: 84.8%).

After extensive use in cardiac research, the PHQ-9 has been shown to be a valid and reliable screening tool for MDD based on DSM-IV diagnostic criteria (Stafford et al., 2007). In recently hospitalized patients with CAD, Stafford et al. (2007) examined the validity of the PHQ-9. Cronbach's alpha was measured to determine the reliability of the scale in this investigation. The Cronbach's coefficient of 0.90 for the PHQ-9 showed outstanding internal consistency. The questionnaire was found to be 81.5% sensitive and 80.6% specific (Stafford et al., 2007). Also, the PHQ-9 is an effective tool for depression screening that can be used in follow-up examinations following the primary diagnosis (Lichtman et al., 2008).

Despite the wide range of accessible depression screening tools, several studies have focused on investigating the structure and reliability of the Arabic-translated PHQ-9 in Arabic-speaking populations. A study by Sawaya et al. (2016) translated the PHQ-9 and GAD-7 screening tools into Arabic and evaluated their psychometric properties in an Arabic-speaking Lebanese psychiatric population. Findings revealed that the PHQ-9 is a valid indicator of depressive symptoms in a sample of Lebanon's psychiatric patients. Even in the absence of adequate mental health treatment, it may be a helpful screening tool for depression to assess whether the patient needs a psychiatric referral (Sawaya et al., 2016).

Furthermore, Summaka et al. (2019) investigated the psychometric properties of the Arabic version of the PHQ-9, including validity and reliability, among Lebanese individuals with spinal cord injury (SCI). Moreover, an observational cross-sectional study by AlHadi et al. (2017) demonstrated that the Arabic version of the PHQ-9 is a valid and reliable tool to screen for depression, anxiety, somatic, and panic disorders in a Saudi community sample.

According to Pressler et al. (2011), the PHQ-8's psychometrics were examined in patients with HF and found to be reliable, with a Cronbach's alpha coefficient equal to 0.82. The Arabic translation and validation in Saudi Arabia were also completed by AlHadi et al. (2017). However, no research that tested the psychometric properties of PHQ-9 in cardiac patients has been reported in Lebanon, although in the study by Zahwe et al. (2020), the finding of a significant association between the MLHFQ, which measures QoL, and the PHQ-9 provided evidence of predictive validity since depressed patients often report poor quality of life.

In addition to the Arabic translation, a study by Gholizadeh et al. (2017) examined the psychometric properties and validity of an Urdu-translated PHQ-9 to screen for depression in patients with CAD in Pakistan. With a suggested threshold score of 6, the Urdu version of the PHQ-9 showed valid psychometric qualities for screening depression in patients with CAD, with a Cronbach's alpha of 0.83. Using a PHQ-9 score of 6 as a cutoff yielded the highest area under the receiver operating characteristic curve (ROC) of 0.86), a sensitivity of 76%, and a specificity of 76% (Gholizadeh et al., 2017).

Another study by Gholizadeh et al. (2019) examined the psychometric properties of the Persian PHQ-9 in a sample that included 150 hospitalized patients with

CAD in Tehran. The Persian PHQ-9 revealed sound psychometric properties to screen for depressive symptoms in patients with CAD. With a suggested cut-off score of 7 or more, it demonstrated acceptable internal consistency, with a Cronbach's alpha coefficient of 0.80, a sensitivity of 76, a specificity of 78, and an area under the curve of 0.82. (Gholizadeh et al., 2019).

In Germany, Kendel et al. (2010) examined the unidimensionality of a previously translated German version of the PHQ-9 in hospitalized patients undergoing coronary artery bypass graft (CABG). Findings of the Rasch reliability was 0.79, indicating the reliability of the German-translated PHQ-9 (Kendel et al., 2010).

The Spanish version of the PHQ-9 was used by Aslan et al. (2020) in a cross-sectional study that aimed to evaluate the reliability, factor structure, and criterion validity of the Spanish PHQ-9 in self-dependent elderly patients aged between 65 and 80, in a primary healthcare center in Chile. The PHQ-9 revealed an acceptable internal consistency of 0.79; confirmatory factor analysis demonstrated a good fit for both 1- and 2-factor solutions. The cut-off score of ≥ 6 yielded a sensitivity of 0.95 and a specificity of 0.76 for detecting MDD (Aslan et al., 2020).

Another cross-sectional study by Shin et al. (2020) aimed to assess the normative data and psychometric features of the Korean-translated PHQ-9 in a nationally representative community sample. Their results supported the reliability of the Korean PHQ-9 for screening depression in the Korean population, with a Cronbach's alpha of 0.79. More specifically, a study by Kim and Lee (2019) was able to evaluate the psychometric properties of the PHQ-9 among Korean university students. The internal consistency of the PHQ-9 in this sample indicated a Cronbach's alpha of

0.83. Thus, the Korean PHQ-9's psychometric properties have been shown to be satisfactory (Kim & Lee, 2019).

In China, a study by Sun et al. (2020) showed sufficient reliability of the Chinese-translated PHQ-9 with a Cronbach's alpha of 0.892. Also, compared to the GAD-7, the Self-rating Anxiety Scale (SAS), and the Self-rating Depression Scale (SDS), the Chinese version of the PHQ-9 detected more emotional disorders in Chinese outpatients with atypical chest pain (Lin et al., 2021).

Nowadays, there are several methods for evaluating depression in patients with HF that are beneficial for research but impractical in clinical settings. Many of these instruments are thorough symptom checklists. As an alternative, the PHQ-9 is a brief, self-administered tool for depression that takes less than five minutes to complete. It has been clinically validated in the HF population, making it an increasingly relevant clinical and research tool (Pressler et al., 2011; Hammash et al., 2013). The PHQ-9, a nine-item questionnaire based on criteria from the DSM-IV, can be used to screen for major depression. Eight primary care clinics and seven obstetrical clinics participated in research to determine the diagnostic validity of the PHQ-9. For MDD, a PHQ-9 score of 10 or more exhibited a sensitivity of 88% and a specificity of 88% (Kroenke et al., 2001).

2.6. PHQ-9 in the HF Population

Patients in primary and secondary care settings, as well as community samples, have all been the subject of substantial research into the PHQ-9 since its release. However, research on its application and interpretation in patients with HF is limited.

Georgiopoulou et al. (2012) investigated the PHQ-9 and its association with healthcare demand rates and QoL among 308 outpatients with HF. The study reported that 26% of the patients presented with moderate-to-severe symptoms, which was associated with increased all-cause and HF ED visits. The authors also reported that less than 50% of these patients adhered to antidepressants (Georgiopoulou et al., 2012). This study's findings supported the association of an increased PHQ-9 score with worsened QoL (Georgiopoulou et al., 2012).

Moreover, Hammash et al. (2013) tested the psychometric PHQ-9 in a sample of 322 patients with HF. The study reported good internal consistency reliability (a Cronbach's alpha of 0.83) for the PHQ-9. The results of the study also supported the use of the PHQ-9 with a cut-off score of 10. With a sensitivity of 70% and a specificity of 92%, the PHQ-9 can identify depressive symptoms (Hammash et al., 2013).

Piepenburg et al. (2015) investigated the predictive potential of PHQ-9 and PHQ-2 in 852 hospitalized patients with cardiac decompensation and left ventricular EF ≤40%.The follow-up 18 months later showed the deaths of 152 patients and the rehospitalization of 482 patients (Piepenburg et al., 2015). This study documented the potential of the PHQ-2 (hazard ratio=1.18; 95% CI; 1.09–1.29; P<0.001) and the PHQ-9 (hazard ratio=1.07; 95% CI; 1.04–1.09; P<0.001) of predicting death, as well as predicting rehospitalization (hazard ratio=1.07; CI; 1.01–1.21; P=0.02 and hazard ratio, 1.03; confidence interval, 1.01–1.04; P=0.001, respectively) (Piepenburg et al., 2015).

In 2018, Zahid et al. used the PHQ-9 to evaluate the frequency of depressive symptoms and their predictors in a sample of 170 patients with congestive HF. The study reported that 60% of the patients were depressed, of whom 42% had mild depressive symptoms and the rest had moderate-to-severe depressive symptoms (Zahid

et al., 2018). The authors concluded that depression is common in the HF population and that it needs to be addressed immediately (Zahid et al., 2018).

Furthermore, Zormpas et al. (2022) evaluated the association of depression and QoL in 446 patients with HF and an implantable cardioverter-defibrillator (ICD) using the PHQ-9. According to the study's findings, 43.2% of the sample had depression, with 16.8% experiencing moderate-to-severe depression (Zormpas et al., 2022). Findings also reported the association between a high PHQ-9 score and low QoL. Eventually, this study demonstrated the importance of depression screening among patients with HF and an ICD (Zormpas et al., 2022).

2.7. Summary of Literature Review

This literature review highlights the lack of information and research on depression screening in Lebanese patients with HF and emphasizes the need for further study in this area, particularly with regards to cultural factors that may affect the validity and reliability of depression screening tools. The study aims to investigate the psychometric properties and cultural validity of an Arabic version of the PHQ-9 as a depression screening tool in HF patients in Lebanon.

Several studies have reported on the high prevalence of depression in patients with HF, with rates ranging from 36% to 60%. Research has also linked depression with poor outcomes in patients with HF, including increased mortality and an increased risk of morbidity and mortality related to HF. Studies have also found that depression adversely impacts patients with HF, regardless of their EF. To address this, depression screening is recommended by various organizations, and physicians may choose a screening approach that is most appropriate for their practice. Self-reported screening

tools such as the GDS, BDI, HADS, PHQ-2, and PHQ-9 are the most commonly used and approved for screening patients for depression.

Among these screening tools, the PHQ-9 is a widely used, validated, and reliable depression screening tool that uses a 4-likert scale to evaluate the frequency of a range of depressive symptoms. It is commonly used to evaluate the patient's depression symptoms, track the progress of treatment over time, and identify high-risk patients who may require prompt medical attention. Studies have shown that the PHQ-9 has excellent sensitivity and specificity, and it is considered a valid and reliable tool for depression screening. It has been used in various studies and has been found to be effective in different populations, including primary care, post-stroke patients, and hospitalized patients with CAD.

Additionally, the PHQ-9 has been translated into Arabic and has been found to be a valid indicator of depressive symptoms in Arabic-speaking populations. The PHQ-9 has been extensively studied in primary and secondary care settings, as well as in community samples, for its association with healthcare demand rates, QoL, and depression in patients with HF. The PHQ-9 has also been found to have good internal consistency and reliability, with a cut-off score of 10 for identifying depressive symptoms.

2.8. Conceptual Framework

Based on Engel's (1977) biopsychosocial model of disease, a Domain Management Approach to assessing patients with HF is advocated to address the multidimensional needs of older adults with HF and improve outcomes (Gorodeski et

al., 2018). The four domains to be considered are: medical, mental and emotional, physical function, and social environment (see Appendix B).

The medical domain focuses on describing the origin and severity of disease (such as ischemic and non-ischemic causes and the degree of dysfunction in HF) and on pharmacological therapy (Gorodeski et al., 2018). Clinicians caring for patients with HF must address multimorbidity, polypharmacy, and nutritional status in addition to assessing the etiology and severity of the disease, as these factors may impact therapy and prognosis (Gorodeski et al., 2018). The physical function domain tackles activities of daily living, including the ability to exercise (NYHA functional classification), and the risk of injury (falls) (Gorodeski et al., 2018). The social environment domain refers to the patient's physical and social surroundings outside of the clinic or hospital setting. In the case of HF, the patients' family that provide care and the available social support systems, home environment, financial resources, and other resources will help promote treatment adherence and health outcomes (Gorodeski et al., 2018). The mind and emotion domain focuses on examining the patient's cognitive activity and emotional capacity to manage HF (Gorodeski et al., 2018). Besides, adherence to treatment, self-management skills, and underlying mental health disorders are all crucial elements of HF care that fall within the scope of this domain. It is therefore important to address the mind and emotion domain in the context of HF treatment (Gorodeski et al., 2018). In summary, it is recommended that healthcare professionals adopt this 4-domain, comprehensive approach in caring for a vulnerable population of elderly with HF.

2.9. Conceptual Model

Figure 1. The adapted version of Gorodeski et al.'s (2018) biopsychosocial 4-domain model with addressing the complex and multidimensional needs of the HF population.

In reference to the adapted version of Gorodeski et al.'s model in Figure 1, this study primarily focuses on the *mind and emotion* domain of HF as it involves the psychometric testing of the PHQ-9 depression screening tool in Lebanese patients with HF. The availability of a valid and reliable screening tool may facilitate the use of the

tool in our region, enable the implementation of an evidence-based therapy approach when necessary, and, in turn, improve clinical outcomes in the Lebanese HF population.

The hippocampus has been called the "emotional brain" and "the seat of the autonomic nervous system" (Dalgleish, 2004). Hippocampal abnormalities are related to depression and memory loss in the elderly with dementia who do not have HF. Due to its susceptibility to cerebral hypoxia, the hippocampus may be negatively impacted by the reduced cerebral blood flow that occurs in HF (Gorodeski et al., 2018). Studies have shown that patients with HF who have decreased blood flow to the hippocampus experience memory loss and depression. Consequently, it is possible that the cognitive impairment and depression experienced by older adult patients with HF are both indications of the same underlying mechanisms (Gorodeski et al., 2018).

CHAPTER 3

METHODOLOGY

This study consisted of a secondary analysis of interview data from two studies conducted by Dr. Noureddine (Zahwe et al., 2020) and Dr. Massouh (Massouh et al., 2020). The first study (Zahwe et al., 2020) used an observational cross-sectional design to evaluate the psychometric properties of the Minnesota Living with Heart Failure (MLHFQ) questionnaire in Lebanese patients with HF. The MLHFQ is an instrument used to measure quality of life in patients with HF. In this study, the Arabic-translated PHQ-9 (see Appendix A) was used to measure depression, and the study was conducted using face-to-face interviews.

The second study (Massouh et al., 2020) used a correlational descriptive design. The primary purpose of this study was to describe self-care behaviors and their determinants in a sample of Lebanese patients with HF and subsequently make recommendations for interventions to promote self-care among this vulnerable patient population. In this study, the PHQ-9 was used to measure depression as one of the predictors of self-care.

3.1. Sample

3.1.1 Samples in the Two Original Studies

The sample of the first study (Zahwe et al., 2020) included 210 Lebanese patients recruited from the American University of Beirut Medical Center (AUBMC), a tertiary referral medical center, during their visit to the outpatient cardiology department. The second study (Massouh et al., 2020) was conducted at the coronary

care unit and the cardiology specialty clinics at AUBMC. The sample included 100 patients with confirmed HF recruited from the coronary care unit (CCU) and the cardiology specialty clinics at AUBMC. After excluding the CCU patients from Dr. Massouh's data set to get a homogenous sample, there were a total of 208 outpatient cardiology patients in the current merged dataset for secondary analysis.

3.1.2. Inclusion/Exclusion Criteria

Inclusion criteria of the first study (Zahwe et al., 2020) were (1) adults (>18 years) (2) diagnosed with chronic HF with an (3) EF<50%. Patients were excluded if they had a history of an acute coronary event in the preceding three months or if they had severe cognitive impairments that interfered with their ability to participate in the interview.

Inclusion criteria of the second study (Massouh et al., 2020) were: (1) Lebanese nationality or currently living in Lebanon, (2) speaking Arabic, (3) 40 years of age or older, (4) with confirmed HF and a left ventricular systolic dysfunction based on objective left ventricular EF less than 45%, (5) diagnosed at least 3 months prior to inclusion in the study, (6) and clinically stable for at least 2 weeks (no active HF exacerbation and/or additional clinic or ED visits for HF in the last 2 weeks). Potential participants were excluded if they were clinically unstable, in an acute exacerbation, and/or had a concomitant terminal illness such as cardiogenic shock, documented dementia, and documented severe psychological illness (excluding depression) or any impairment (for example visual impairment) that would prevent them from performing self-care.

3.2. Data Collection

The current study utilized 2 datasets from the studies described. In the first study (Zahwe et al., 2020), between November 2017 and December 2018, all patients who attended the outpatient cardiology department and met the inclusion and exclusion criteria were recommended to participate by their treating physician. The researcher approached patients who expressed an interest in participating. After receiving written informed consent from the patient, the researcher conducted the face-to-face interview in a private room. The interviewees' responses to the interview questions were recorded on a paper copy of the questionnaire. As part of the questionnaire, participants were asked about their age, marital status, education, income, the amount of smoking and alcohol they consumed, how active they were, and what medications they were taking. Medical records were also obtained to collect information on the patient's medical history, left ventricular EF, and NYHA class.

In the second study (Massouh et al., 2020), information on demographics such as age, gender, education, location of residence, marital status, living status, number of people in a household, and income was obtained through medical record reviews and semi-structured interviews. In addition to obtaining information on the disease indices, the researchers also attempted to obtain information on the etiologies of the disease, the minimum left ventricular EF value, the most recent ProBNP, the duration of HF in years, the number of hospitalizations in the last year, the number of drugs prescribed, vital signs, cardiovascular comorbidities and interventions, the stage of renal dysfunction, and the number of comorbid medical conditions.

3.3. Measures

The first study (Zahwe et al., 2020) included a sociodemographic questionnaire, the Minnesota Living with Heart Failure Questionnaire (MLHFQ), and the PHQ-9.

The second study (Massouh et al., 2020) included a sociodemographic and clinical characteristic questionnaire, the Self-Care in HF Index (ScHFI) version 6.2, the Dutch HF Knowledge Scale (DHFK), the ENRICHD Social Support Inventory (ESSI), the PHQ, and the Charlson Comorbidity Index (CCI). In the current study, we used data on demographics, clinical characteristics, and the PHQ-9.

3.4. Ethical Considerations

Prior to the start of the original studies, approvals were obtained from the American University of Beirut's Institutional Review Board (IRB) and the American University of Beirut Medical Center (AUBMC) administration for the retrieval and ethical usage of the database. The current study was based on de-identified datasets for secondary data analysis.

3.5. Data Management

Once IRB approval was secured, only de-identified datasets were obtained from Dr. Noureddine and Dr. Massouh. The data was merged from the two datasets. Data cleaning and variable recoding including gender (male=0, female=1), BMI (1=healthy, 2=overweight, 3=obese), governorate (1=**B**eirut, 2=Bekaa, 3=**N**orth **L**ebanon, 4=**S**outh **L**ebanon, 5=mount **L**ebanon), marital status (0=not currently married, 1=married), income (1=between 6000$ and 11,999$, 2=between 12,000$ and 24,000$, 3=more than 24,000$ smoking history (1=never smoked, 2=ex-smoker, 3=current smoker), comorbidities (0=no, 1=yes) were done. CCU patients (from Dr. Massouh's data set)

were excluded to obtain a more homogenous sample. Moreover, the dataset was reviewed for missing data. The BMI (1.0%) and alcohol consumption (0.5%) variables had minimal missing data.

3.6. Data Analysis

The two data sets were de-identified and merged. Data analysis was conducted using IBM SPSS version 26. Descriptive statistics were conducted on demographic and clinical variables to examine the distribution of individual variables and their minimum and maximum values (to identify outliers). Means and standard deviations were calculated for continuous variables; frequencies and percentages were reported for categorical variables. Statistical analysis included the calculation of the Cronbach's alpha coefficient (specific aim 1) as well as Exploratory Factor Analysis, with Varimax rotation and Principal Component Analysis (PCA) as a factoring technique (specific aim 3). In addressing specific aim 2, two experts and one patient were asked to evaluate the cultural appropriateness of the Arabic version of the PHQ-9 in the Lebanese population and its relevance to depression by rating each item on a 4-point scale (1 = inappropriate to 4 = appropriate). We additionally asked the raters to evaluate the relevance of the Arabic questionnaire to depression; this would provide further info on content validity. The experts include a doctoral student in neuropsychology, a DNP-prepared psychiatry/mental health practitioner, and an asymptomatic HF patient with a Cardiac Resynchronization Therapy-Defibrillator (CRT-D) maintained on antidepressants. Finally, we compared the ratings given by the panel on each item of the PHQ-9.

We also compared patients with different NYHA classes on their PHQ-9 scores using an ANOVA test to investigate the hypothesis that patients with a higher NYHA

class will have higher depression scores (specific aim 4). Furthermore, further analyses were conducted whereby the Pearson r correlation coefficient was used to measure the association between PHQ-2 and PHQ-9 scores (specific aim 5). We also used ANOVA to compare PHQ-9 means across different groups of BMI, education, and income, in addition to independent samples t-test to compare PHQ-9 means by gender and comorbidity status.

CHAPTER 4

RESULTS

4.1. Sample Characteristics

4.1.1. Demographics and Lifestyle Factors

The sample included 208 patients with HF. Patients' ages ranged from 18 years to 93 years , with a mean of 64.64 ± 14.19 years (Table 1). More than half the sample were between 61 and 80 years old (n = 119). The majority of the patients were male (n = 164, 78.8%).

In terms of geographic distribution, almost half of the participants (n=102; 49%) were from Beirut, followed by Mount Lebanon (n=63; 30.3%) and other regions. Moreover, most participants were married (n=164; 78.8%) and unemployed/retired (n=117; 56.3%). As for income group categorization, 45.2% (n=49) had an annual income between $12,000 and $24,000, closely followed by the 40.9% of participants who made an annual income between $6000 and $11,999. In addition, almost half of the participants (n=93; 44.7%) had the educational attainment of a university degree.

The vast majority of participants (n=169; 81.3%) reported that they do not consume alcohol. Moreover, 21.6% (n=45) of participants indicated that they still smoke (current smoking). In contrast, 39.9% (n=83) had never smoked, and 38.5% (n=80) were ex-smokers.

4.1.2. General Health Indices

The participants' BMI categorizations showed that most patients did not fall within the healthy range, but were overweight (BMI 25 to 29.99 kg / m^2) (n=86; 41.3%)

and obese (BMI 30 kg / m^2 and above) (n=75; 36.1%). In terms of comorbidities, 64.9% (n=135) had HTN, in addition, 56.7% (n=118) had CAD. Furthermore, EF was moderately reduced (25% ≤EF< 35%) and severely reduced (EF<25%) in 81 participants (38.9%), respectively.

4.1.3. Medication Classes

Most patients (n = 181, 87%) in the total sample experienced polypharmacy (≥ 5 medications). The majority of patients (n=179; 86.1%) take β-Blockers, followed by Angiotensin-Converting Enzyme Inhibitors/ Angiotensin II Receptor Blocker (ACEI/ARB) medications (n=145; 69.7%). Only a few (n=18; 8.7%) indicated that they use Entresto (neprilysin inhibitor/ ARB). Other medications included aldosterone antagonists (Spironolactone**)** (n=68; 32.7%) and other diuretics (Loop/Thiazides) (n=140; 67.3%)

4.2. PHQ-9 Score

The questionnaire was administered to a total of 208 respondents. Based on final scores, most respondents (n = 84; 40%) were shown to have minimal depression, closely followed by 27.4% (n = 57) who have mild depression. Moreover, 14.4% (n = 30) of participants did not have depression, and 12.9% (n = 27) had moderate depression. The highest depression categories reported the lowest participant numbers, with only 3.8% (n = 8) of participants having moderately severe depression and 0.9% (n = 2) having severe depression.

4.2.1. PHQ-9 Score by Gender, BMI, Education, Income, Comorbidity Status

PHQ-9 scores were significantly higher (indicating more depressive symptoms) in the female group than the male group ($p = 0.018$). However, PHQ-9 scores did not differ significantly by the patient's BMI.

PHQ-9 scores did not differ significantly by the patient's educational attainment: $F(4,203) = 0.865$, $p = 0.486$. Similarly, PHQ-9 scores did not differ significantly by the patient's income: $F(86.57,4417.53) = 2.00$, $p = 0.137$. There were also no difference in mean PHQ-9 scores by CAD ($p = 0.542$) or hypertension status ($p = 0.516$).

Table 1. Sample Characteristics

Variables	**Mean ± SD/ n (%)** **(N= 208)**
Age (years)	64.64 ± 14.19 years
18 to 30 years	3 (1.5%)
31 to 60 years	65 (31%)
61 to 80 years	119 (57.2%)
80+ years	21 (10.3%)
Gender	
Male	164 (78.8%)
Female	44 (21.2%)
Governorate	
Beirut	102 (49%)
Mount Lebanon	63 (30.3%)
South Lebanon	16 (7.7%)

North Lebanon	15 (7.2%)
Beqaa	12 (5.8%)
Marital Status	
Married	164 (78.8%)
Not currently married	44 (21.2%)
Annual Income ($)	
Between $6000 and $11,999	85 (40.9%)
Between $12,000 and $24,000	94 (45.2%)
More than $24,000	29 (13.9%)
Employment Status	
Currently employed	91 (43.8%)
Retired/Unemployed	117 (56.3%)
Educational Attainment	
University diploma	93 (44.7%)
High school diploma	39 (18.8%)
Lower school diploma	29 (13.9%)
Elementary school diploma	40 (19.2%)
Illiterate	7 (3.4%)
Smoking Status	
Never smoked	83 (39.9%)
Ex-smoker	80 (38.5%)
Current smoker	45 (21.6%)

Alcohol Consumption[1]	
No	169 (81.3%)
Yes	38 (18.3%)
Body mass index (kg/m^2)[2]	
Healthy (BMI 18.5 to 24.9)	44 (21.2%)
Overweight (BMI 25 to 29.99)	86 (41.3%)
Obese (BMI 30 to higher)	75 (36.1%)
Ejection Fraction (%)	
Mild reduction (35%≤EF≤45%)	46 (22.1%)
Moderate reduction (25%≤EF<35%)	81 (38.9%)
Severe reduction (EF<25%)	81 (38.9%)
Hypertension	
No	73 (35.1%)
Yes	135 (64.9%)
CAD	
No	90 (43.3%)
Yes	118 (56.7%)
Comorbidities	
No	15 (7.2%)
Yes	193 (92.8%)
HF NYHA Classes	

[1] There was missingness of 0.4%

[2] There was missingness of 1.4%

NYHA Class I	77 (37%)
NYHA Class II	81 (38.9%)
NYHA Class III	50 (24%)
Selected HF Medication Use	
ACEI/ ARBs	
No	63 (30.3%)
Yes	145 (69.7%)
β-Blockers	
No	29 (13.9%)
Yes	179 (86.1%)
Spironolactone/ Eplerenone	
No	140 (67.3%)
Yes	68 (32.7%)
Other Diuretics (Loop/Thiazides)	
No	68 (32.7%)
Yes	140 (67.3%)
Entresto	
No	190 (91.3%)
Yes	18 (8.7%)
PHQ-9 Score	**5.21±4.65**
PHQ-9 Score Categories	
<1: No depression	30 (14.4%)
1-4: Minimal depression	84 (40.6%)
5-9: Mild depression	57 (27.4%)

10-14: Moderate depression	27 (12.9%)
15-19: Moderately severe depression	8 (3.8%)
20-27: Severe depression	2 (0.9%)

4.2.2. PHQ-9 Internal Consistency

Table 2 presents the results of an item analysis for the PHQ-9. The tool has a high reliability coefficient of 0.823 and a standardized item alpha of 0.821, indicating good internal consistency . Item total correlations ranged between 0.386 and 0.737.

The Cronbach's alpha if item deleted is consistent or slightly reduced across all items, suggesting that no single item is having a disproportionate effect on the overall scale score. All items contribute to the overall measure of depression symptoms, and the scale is consistent in measuring the construct.

Table 2. PHQ-9 Item Analysis

Statistics for Scale	**Mean**	**Variance**	**Std. Deviation**		**N of Items**	
	5.21	21.759	4.665		9	
	Mean	**Minimum**	**Maximum**	**Range**	**Max/Min**	**Variance**
Item Means	.579	.197	.865	.668	4.390	.063
Item Variances	.649	.227	.859	.632	3.789	.056
Inter-Item Correlations	.338	.150	.753	.603	5.014	.015

Item Total Statistics	**Scale Mean if Item Deleted**	**Scale Variance**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if**

		if Item Deleted			Item Deleted
Item1_little.interest	4.46	16.269	.661	.605	.787
Item2_feeling.down	4.44	15.523	.737	.653	.776
Item3_troubles.asleep	4.38	16.797	.540	.344	.804
Item4_feeling.tired	4.34	16.738	.633	.446	.792
Item5_poor.appetite	4.63	17.325	.465	.227	.814
Item6_feelling.bad	4.59	17.605	.482	.275	.810
Item7_trouble.concentrate	5.01	19.874	.391	.231	.820
Item8_speak.slowly	4.83	18.865	.386	.269	.820
Item9_death.thoughts	4.96	19.158	.442	.250	.815
Reliability Coefficient	**Alpha**			**Standardized Item Alpha**	
	.823			.821	

4.2.3. PHQ-9 Cultural Validity

Table 3 provides cultural appropriateness ratings for different items on the PHQ-9 questionnaire. Items 2,3,4, and 7 were considered culturally appropriate by all the three raters. There was some discrepancies in the rating of the other item in terms of cultural appropriateness. As shown in the table, the cultural validity indices of the items, calculated as the proportion of the three raters who rated each item as 3 or 4 ranged between 0.67 and 1, and the overall scale cultural validity rating was 0.93.

The table includes comments highlighting specific concerns with certain items, such as difficulty translating certain phrases, cultural differences in understanding certain concepts, and confusion or ambiguity in certain items.

Table 3. Cultural Appropriateness Ratings

PHQ-9 Items	**Cultural Appropriateness Ratings**				
	Doctoral Student in Neuropsychology	**HF Patient**	**Mental Health Practitioner**	**Cultural validity index**	**Comments**
Item1_little.interest	4	2	4	0.67	• Context of pleasure should be clear. • Consider synonym to = **المتعة اللذة، الملذة**
Item2_feeling.down	4	4	4	1	
Item3_troubles.asleep	4	4	4	1	• Difficult to translate "falling asleep"

					this is very close though (غط في النوم، الأرق)
Item4_feeling.tired	4	4	4	1	
Item5_poor.appetite	3	3	4	1	• Culturally, this taps into a different aspect of a relationship with food. • Sounds contradictory or confusing.
Item6_feelling.bad	3	4	4	1	
Item7_trouble.concentrate	4	4	4	1	

Item8_speak.slowly	3	3	4	1	• Confusing and ambiguous item [second part]. For instance, people will not know what 'tamalmol' is. • Second statement is not clear.
Item9_death.thoughts	2	4	4	0.67	• Not clear, ambiguous, and not appropriate for Lebanese culture in

					terms of mental health stigma/taboos.

Note: The rating is on a 4-point scale using the following criteria: 1=inappropriate, 2=slightly inappropriate, 3=slightly appropriate, and 4=appropriate.

The relevance ratings (see Appendix D) were provided by two experts and a HF patient, and the table includes comments highlighting specific concerns with certain items. Overall, some items were rated as having high relevance (4 out of 4), while others were rated as having lower relevance (2 or 3 out of 4).

The experts recommended changes to the wording and phrasing of certain items in order to better capture the intended meaning in Arabic culture, as well as pointing out linguistic, cultural, and grammatical issues. Two of the raters had comments on the same three items. They commented on the wording in Item 1 for the term "pleasure" in our context [item 1: markedly diminished interest or pleasure in... most activities...]. They proposed revisiting item 5's wording on food intake and appetite [item 5: change in appetite (decrease or increase), weight loss or gain]. They also noted the ambiguity of the word "tamalmol" in item 8 [item 8: slowing in movement or speech].

4.2.4. Construct Validity

The sample size of 208 respondents was sufficient for the application of factor analysis, meeting the requirement of a minimum of 10 participants per item (Nunnally & Bernstein, 1994). The criteria used to identify the factors were Eigen value more than

1 and factor loadings more than 0.4.Kaiser-Meyer-Olkin (KMO) statistics were high for sample adequacy, and Bartlett's Test of Sphericity was significant (Table 4).

Table 4. Kaiser-Meyer-Olkin Measure of Sampling Adequacy _ EFA

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.834
Bartlett's Test of Sphericity	Approx. Chi-Square	577.802
	df	36
	Sig.	.000

The KMO value for this study is 0.834, indicating excellent sample adequacy. It is preferred that KMO results be closer to the value of 1 to reflect good sampling fit. Moreover, Bartlett's test of sphericity checks the correlation among variables. This study's KMO result has a p-value of 0.000, which shows a significant correlation (values less than 0.05 are accepted).

See inter-item correlation matrix in Appendix E.

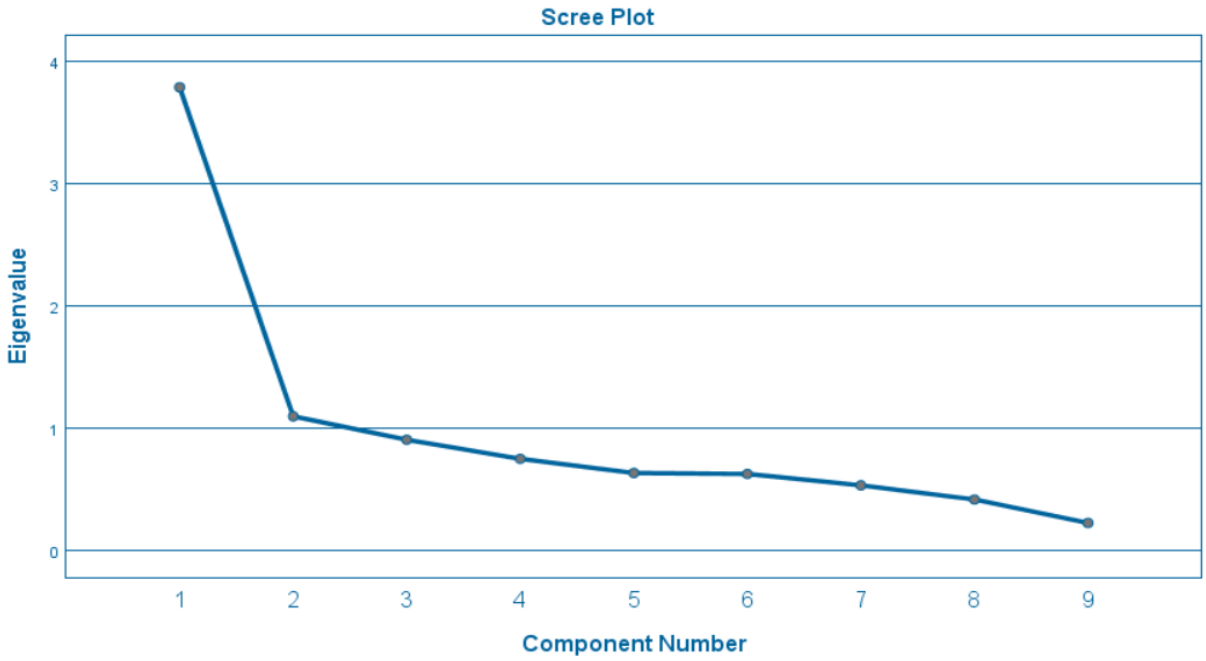


Figure 2. Scree Plot_EFA

As is shown in Figure 2, the scree plot shows the number of components, as per Eigenvalue set at 1. Two components are present above the value of 1, indicating factor division into two main variables for this study. Eigen values of component 1 are 3.792, and the eigen value of component 2 is 1.1.

Table 5. Rotated Component Matrix

Rotated Component Matrix		
	Component	
	1	**2**
PHQ2_feeling.down	.817	.261
PHQ1_little.interest	.790	.197
PHQ4_feeling.tired	.783	.131

PHQ3_troubles.asleep	.722	.082
PHQ5_poor.appetite	.528	.247
PHQ6_feelling.bad	.502	.332
PHQ8_speak.slowly	.077	.854
PHQ7_trouble.concentrate	.180	.666
PHQ9_death.thoughts	.297	.577

One of the most important EFA requirements includes detailed categorization of factor loadings. In fact, research shows that question factor loadings should be analyzed as follows: 0.70 and above are considered excellent; 0.63 and above are very good; 0.55 is good; 0.45 is fair; and 0.32 is poor (Yong & Pearce, 2013). Proper factor loading analysis helped in determining the best assortment of variables. This process also helped in examining item loading, failure to load, and cross loading.

Based on the factor loadings in Table 5, items 1 through 6 fall under psychosomatic indicators (Factor 1), while items 7 through 9 belong under cognitive indicators (Factor 2). Moreover, the numbers show that there were no failures to load or cross-loadings among the factors. This 2-factor loading explained 54.36% of the total variance.

There were no failures to load or cross-loads in the data. Moreover, based on factor loadings, items 1 through 6 fell under psychosomatic symptoms, with factor loadings ranging between 0.502 and 0.817. However, items 7 through 9 fell under cognitive symptoms, with factor loadings ranging between 0.577 and 0.854.

4.2.5. PHQ-9 Score & NYHA Category

There was a significant relationship between the patient's NYHA class and PHQ-9 score, F (2,205) = 38.010, $p = 0.00$. The PHQ-9 score increased with advancing NYHA class (Table 6).

Table 6. PHQ-9 Score & NYHA Class - ANOVA Test

	NYHA Class I	**NYHA Class II**	**NYHA Class III**
PHQ-9 Score	2.66	5.28	9.00

According to a post-hoc (Bonferroni) test, those in NYHA class II had a significantly higher mean PHQ-9 score than those in NYHA class I ($p < 0.001$). Also, those in NYHA class III had significantly higher PHQ-9 scores than those in NYHA class I ($p < 0.001$) and II ($p < 0.001$).

4.2.6. PHQ-2 & PHQ-9 Associations

The PHQ-2 scale contains items on "little interest" and "feeling down." As expected, the scores on PHQ-2 and PHQ-9 are highly positively correlated ($r = 0.846$, $p < 0.001$). A patient with a score equal to or above 2 on the PHQ-2 is considered to have a positive screen for possible depression. A patient with a score equal to or above 10 on the PHQ-9 is considered to have a positive screen for possible depression (Anand et al., 2021). Given the above cutoffs in our sample, 88 patients were positively screened for depression by PHQ-2, while 37 patients were positively screened for depression by PHQ-9.

CHAPTER 5

DISCUSSION

The main purpose of this study was to examine the psychometric properties of the Arabic version of the Patient Health Questionnaire-9 (PHQ-9) as a depression screening tool in HF patients in Lebanon. This study was a secondary analysis of an existing, merged dataset based on data from two other studies. The HF sample in this study had a PHQ-9 mean score of 5.21, reflecting mild depression. Our findings showed that items on the Arabic PHQ-9 exhibited high internal consistency. In terms of construct validity, there was a two-factor solution of psychosomatic and cognitive symptoms in this sample of HF patients. In general, the Arabic PHQ-9 seemed to be culturally acceptable, with few suggestions for modification in wording. Furthermore, there were significant differences in PHQ-9 scores by NYHA class. Screening with the PHQ-9 tool classified fewer patients as having depression as compared to the PHQ-2 tool.

More than 60% of this sample was composed of Lebanese HF patients with NYHA classes II and III; most were males, overweight or obese, and have at least 1 comorbidity. The mean PHQ-9 score was relatively low, but 68% of the sample exhibited minimal to mild depression, which may necessitate further evaluation. Almost 18% of the sample had a PHQ-9 score of ≥10, which is above the cut-off for positive screening for clinical depression as in other studies (Zahid et al., 2018; Moraska et al., 2013; Hammash et al., 2013), and therefore were classified as having moderate, moderately severe, or severe depression. For these patients, close monitoring and a psychiatric referral is warranted. Also, it would be important to know if those patients

were on antidepressants; the latter data is not found in the dataset. Given that there were no differences in PHQ-9 score by CAD or hypertension status and having at least 1 comorbidity, education status, or income, further investigations will need to look into additional factors that may relate to the PHQ-9 score.

In this study, the PHQ-9's internal consistency was evaluated, with a Cronbach's alpha of 0.823, which is similar to the results of other studies on the HF population. Cronbach's alpha values range from 0 to 1, with higher values indicating better internal consistency. A common rule of thumb is that values above 0.7 are considered to be good, indicating that the items on the scale are related to a common underlying construct (Kline, 2010). The study by Pressler et al. (2011) also reported a Cronbach's alpha of 0.82. This suggests that the internal consistency of the PHQ-9 is robust and consistent across different populations of HF patients. Additionally, Hammash et al. (2013) also reported good internal consistency of PHQ-9 in HF patients with a Cronbach's alpha of 0.83. Thus, in our study, the PHQ-9 tool exhibits excellent internal consistency.

Furthermore, previous studies that have used the Arabic version of the PHQ-9 on the Lebanese population have also found good internal consistency for the tool. For example, Sawaya et al. (2016) found that the PHQ-9 had a high level of consistency among psychiatric patients in Lebanon, with a Cronbach's alpha of 0.88. Additionally, Summaka et al. (2019) found that the PHQ-9 also had good internal consistency in a sample of Lebanese patients with spinal cord injuries, with a Cronbach's alpha of 0.71. This confirms that the PHQ-9 is a reliable measure of depression in different subpopulations of Lebanese patients.

Despite the fact that the previous studies that have used the Arabic version of the PHQ-9 in different Arabic-speaking subpopulations (Becker et al., 2002; Sawaya et al., 2016; AlHadi et al., 2017; Summaka et al., 2019) did not evaluate the cultural validity, the Arabic PHQ-9 seems to be a culturally acceptable tool for depression screening in Lebanon. The cultural validity index for each item ranged from 0.67 to 1.0, with higher scores indicating higher cultural appropriateness. The comments section highlights some concerns and recommendations for improvement. Therefore, for those who will be using the instrument in the future, it is advised to use a more appropriate translation for the following items:

- 1 (قلة في الاهتمام أو الاستمتاع بالأمور)
- 3 (صعوبة في النوم أو البقاء نائماً، أو النوم لمدة مفرطة)
- 5 (فقدان الشهية أو الإفراط في الطعام)
- 8 (الحركة أو الكلام ببطء لدرجة لفت انتباه الغير أو العكس أي عصبية لدرجة التحرك أكثر بكثير من العادة)
- 9 (أفكار حول أنه أفضل لك لو كنت ميتاً أو التفكير بإيذاء نفسك بطريقة ما)

Instrument construct validity was examined through EFA by examining factor structure based on respondent replies to the PHQ-9. By using the Eigenvalue Criterion value of > 1, two components were extracted: psychosomatic (mood/emotion and physical variables) and cognitive indicators (thought, concentration, and speech). It is a general recommendation that retained factors explain 60–70% of the variance; the 2 factors in our study explained 54% of the variance, which is somewhat satisfactory.

In the context of HF, physical and emotional symptoms can be highly correlated, which can make it challenging to differentiate between them. Both physical and emotional symptoms of HF may be caused by the same underlying physiological mechanisms, such as inflammation, oxidative stress, and changes in hormonal balance.

This overlap can result in the physical and emotional symptoms appearing as one factor in the factor analysis as they may share common underlying causes. For example, physical symptoms of HF, such as fatigue and shortness of breath, can be indicative of depression, while emotional symptoms of depression, such as anxiety and irritability, can be associated with physical symptoms of HF. By considering physical and emotional symptoms together as one factor in factor analysis, researchers can account for this overlap and better understand the relationships between the symptoms. Additionally, combining physical and emotional symptoms into one factor can provide a more comprehensive and scientifically rigorous understanding of the complex relationships between symptoms in patients with HF. This can inform the development of more effective interventions and treatments for patients with HF by taking into account the interrelated nature of both physical and emotional symptoms.

Moreover, the factors obtained from factor analysis are a function of the sample being analyzed, and the results may differ based on the characteristics of the sample. Different populations can have different patterns of symptoms, and the relationships between physical and emotional symptoms may vary based on the sample. This can result in different factor structures, with different items loading on different factors in different samples.

Cultural differences can also impact the results of factor analysis and should be considered. Different cultures may have different attitudes and beliefs regarding HF and depression, their symptoms, and treatment, which can affect the expression and perception of symptoms. For example, in some cultures, patients with HF may be more likely to seek medical help for physical symptoms, while in others, they may be more likely to seek help for emotional symptoms. Additionally, some cultures may place

greater emphasis on expressing emotions and seeking support from others, while others may discourage it. These cultural differences can affect the factor structure obtained of depression symptoms in patients with HF, as the associations between physical and emotional symptoms may vary based on the culture of the sample.

The study by Pressler et al. (2011) used Confirmatory Factor Analysis (CFA) to establish construct validity of the PHQ-8 in HF patients, excluding the last item on suicidal ideation, and found that a 2-factor model that reflected the emotional and somatic dimensions of depressive symptoms best fit the data. The construct validity was also supported by correlations with the MLHFQ total and subscale scores (Zahwe et al., 2020), as well as differences in scores among patients based on NYHA class.

The study by Hammash et al. (2013) compared the scores of the PHQ-9 and the BDI-II. The researchers found that the PHQ-9 scores were highly correlated with the scores of the BDI-II, which supports the criterion validity of the PHQ-9 as a measure of depression. Additionally, the study also examined the correlation between PHQ-9 scores and level of perceived control using the Control Attitudes Scale (CAS) as an indicator of perceived control. They found that the PHQ-9 scores were negatively correlated with perceived control, which also supports the validity of the PHQ-9 as a measure of depression in patients with HF. The fact that there was a negative correlation between perceived control level and depression scores is consistent with what one would expect in patients with HF. Patients with HF often experience a loss of control over their physical health and daily activities, which can contribute to feelings of depression and a decreased sense of control. This pattern highlights the importance of addressing both physical and mental health in the management of HF, as depression and

decreased perceived control can have a significant impact on patients' overall well-being.

Moreover, the study by Sawaya et al. (2013) examined both the PHQ-9 and GAD-7 questionnaires in psychiatry patients, and established convergent validity. The investigators found that the PHQ-9 had a two-factor structure, with one factor reflecting somatic symptoms (somatization) and another reflecting affective symptoms (mood). This supported the construct validity of the measures, as it indicated that the items on the PHQ-9 are measuring the intended constructs.

Summaka et al. (2018) evaluated construct validity of the PHQ-9 in people with spinal cord injury through EFA, which revealed that the scale had three factors accounting for 66.2% of the total variance. Another method used to establish construct validity was convergent validity, which was tested by comparing the scale's total score with the scores of the HDRS. The results showed a significant correlation between the PHQ-9 and the HDRS ($r = 0.71$), suggesting good convergent validity as it demonstrates that the PHQ-9 is measuring the same construct as the HDRS.

Similarly, Al-Amer et al. (2019) used EFA and CFA to examine the factor structure of the Arabic PHQ-9 among Syrian refugee adolescents aged 13-18 years in Jordan. The EFA identified the nine items from the original version and explained 37% of the variance, while the CFA supported the unidimensional or one-factor structure of the PHQ. Another method used to establish construct validity was discriminant validity, which was established by using multivariate logistic regression analyses to assess the ability of the PHQ-9 to differentiate between patients with and without depression. The goodness of fit statistics for a one-factor structure, Indicators of Financial Integration (IFI)=0.96, Tucker-Lewis Index (TLI)=0.95, comparative fit index (CFI)=0.96, and

Root Mean Square Error of Approximation (RMSEA)=0.057 were considered to be satisfactory. These values also indicate that the one-factor structure is a good representation of the data, and the model fits the data well.

NYHA class is a strong indicator of the likelihood of developing depression, and as HF worsens, depressive symptoms also tend to increase. On the other hand, when depression improves, so do the outcomes for HF (Piepenburg et al., 2015). Notably, worsening NYHA class was significantly related to PHQ-9 score; however, the mean PHQ-9 score of each NYHA class was < 10. This finding suggests that while there is a relationship between worsening HF symptoms (as measured by NYHA class) and depression, the level of depression may not be severe in these patients. It is also noted that the mean PHQ-9 score for each NYHA class is 2.66 for NYHA I (indicating minimal depression), 5.28 for NYHA II (indicating mild depression), and 9.00 for NYHA III (indicating mild depression), and all these scores are below 10, which is considered a threshold for mild depression. This suggests that, although there is a relationship between the worsening of HF symptoms and depression, as indicated by the NYHA class, the level of depression experienced by these patients may not be severe. This highlights the importance of interpreting depression scores in the context of the patient's overall health status and functional status. Given the former association, it will be helpful to better characterize symptoms and functional status to better interpret the depression score in the context of HF in future studies. This is because the depression score alone may not provide a complete picture of the patient's overall health status. By including more information about symptoms and functional status, the depression score can be interpreted in a more context-specific way, giving a more accurate picture of the patient's health. It will be critical to determine whether these patients' HF treatment is

being optimized in accordance with guidelines. The 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure recommends considering psychotherapy, such as cognitive-behavioral therapy, and medication, such as selective serotonin reuptake inhibitors, as effective interventions for managing depression in patients with HF. These interventions could potentially result in improved symptoms and a lower depression score. In addition to these recommendations, the guideline also emphasizes the importance of a comprehensive approach to managing depression, including regular monitoring of symptoms and ensuring that patients are following their treatment plan (Heidenreich et al., 2022). At this point, we are limited by the variables in the existing dataset, and without information on which patients have sought psychotherapy or are taking SSRIs, it may be difficult to determine the specific impact of these interventions on depression scores.

In terms of depression scoring in HF using the shorter PHQ-2 (compared to the PHQ-9), it is possible that the lower cut-off and specific two items are contributing to patients being reclassified as positive for depression. In the study, the PHQ-2 showed higher results, with 88 patients having depressive symptoms with a score equal to or above 2 on the PHQ-2, compared to only 37 patients with a score equal to or above 10 on the PHQ-9 who met depression criteria. Although the findings of this study suggest that the majority of the patients in the sample had depressive symptoms, as per the AHA recommendations, those who are screened positive for depression on the PHQ-2 would then go on to be further screened using the PHQ-9 for a more comprehensive evaluation. Depression in HF often shows up with physical symptoms like fatigue and functional impairment, which are completely missed by PHQ-2. The PHQ-9 includes

items on fatigue, appetite, sleep, and lack of concentration, which could explain why PHQ-9 had a lower screening yield than PHQ-2.

Arroll et al. (2010) found that the PHQ-2 was highly sensitive (0.96 and 0.86) for identifying major depression in primary care patients when using cutoffs of 1 and 2, but with modest specificity (0.60 and 0.78). However, a cutoff of 3 resulted in lower sensitivity (0.61) but higher specificity (0.92). On the other hand, the PHQ-9 had similar sensitivity, but higher specificity compared to the PHQ-2 (Arroll et al., 2010). Moreover, a study by Levis et al. (2020) found that using PHQ-2 scores followed by PHQ-9 scores in a sample of 4572 participants with MDD resulted in a sensitivity of 0.82 and specificity of 0.87, which was not significantly different from using PHQ-9 scores alone. The authors also suggested that the combination could improve the efficiency of the screening process.

At this point, it is recommended that those who want to screen their patients for depression use the combination of the PHQ-2 and PHQ-9 screening tools, as per AHA recommendations. If a patient scores 2 or higher on the PHQ-2, they should then complete the full PHQ-9, since this elevation in score suggests the presence of an internalizing disorder, requiring follow-up assessment and potential clinical care. Sensitivity and specificity analyses, and testing for convergent validity with other translated tools may better help identify issues with the reclassification of patients with the use of different tools.

It is important to note that the PHQ-9 is not a diagnostic tool but rather a guideline to assist healthcare providers in making treatment recommendations. According to the National Institute for Health and Care Excellence (NICE) guidelines (2022), the PHQ-9 scores range from 0 to 27, with higher scores indicating greater

levels of depression. Based on the patient's score, the clinician can make stepped-care intervention recommendations, including watchful waiting, guided self-help, psychotherapy, medication, or a combination of these (see Appendix F).

It is also important that when healthcare providers are making treatment recommendations for depression, they take the patient's current level of functioning into consideration. This includes their daily activities, relationships, and overall QoL. Previous episodes of depression and their duration, intensity, and treatment received can also play a role in the treatment recommendation. Knowing this information can help the healthcare provider tailor their treatment approach to the patient's specific needs and past experiences. Additionally, the patient's preference for treatment must be considered. Some patients may prefer medication, while others may prefer psychotherapy. It is crucial for the healthcare provider to listen to the patient's concerns and take them into account when making treatment recommendations. By taking these factors into consideration, healthcare providers can provide the most appropriate and effective treatment for their patients with depression.

Finally, in upcoming work, it may also be helpful to split the sample randomly, conduct EFA on part of the sample, and conduct CFA on the second part of the sample. This is suggested because, while EFA helps find patterns (factors) based on the variables measured in a study (Pearce & Yong, 2013), whereas the CFA validates the finding of the EFA regarding the relationship between the observed variables and their latent factor (Prudon, 2015).

5.1. Strengths

To the best of our knowledge, this is the first study conducted to validate a depression screening tool among patients with HF in Lebanon. In our country, there have been no studies on depression focusing on this population, and we also did not come across any in the Arab region. Our findings demonstrate that the Arabic PHQ-9 is a valid and reliable screening tool for depression in Lebanese patients with HF. In fact, the study not only investigated the psychometric properties of the questionnaire but also examined the association between the PHQ-9 scores and the sociodemographic and clinical factors.

5.2.Limitations

We acknowledge several limitations of our study, despite its strengths. To begin with, the dataset consisted of data gathered from one tertiary healthcare center only so our findings cannot be generalized. Importantly, the incidence and prevalence of depression in HF among the Lebanese are unclear due to the lack of epidemiological studies on this particular population, therefore it is challenging to evaluate the depression scores of our sample in context. Furthermore, as the study was a secondary analysis, the existing datasets did not include additional variables that could have influenced the PHQ-9 score in our sample, such as comorbid diabetes and the use of antidepressants. Finally, convergent validity was not tested with a different tool, except for the PHQ-2 whereby items overlap with the PHQ-9.

5.3. Relevance to nursing practice

The results of this study have important implications for nursing practice. As the study found that the Arabic PHQ-9 has good psychometric properties, therefore, it is a useful tool for screening for depression in patients with HF in Lebanon. Importantly, for patients responding positively to item 9 on suicidal thoughts/ideation/plan, the advanced practice nurse would be initiating prompt intervention within a multidisciplinary team in helping prevent dire outcomes.

Finally, the use of the PHQ-9 can help nurses monitor patients' response to treatment over time. Although the PHQ-2 is a shorter, 2-question version of the PHQ-9, it can be used as a screening tool to identify patients who may be at risk for depression. However, it is not as detailed and comprehensive as the PHQ-9 and should be used in conjunction with a more in-depth assessment. This is important as depression is a common comorbidity among patients with HF and can negatively impact the patients' QoL and clinical outcomes.

5.4. Recommendations for future studies

Based on the results of the study on the validity and reliability of the Arabic version of the Patient Health Questionnaire-9 (PHQ-9) in patients with heart failure in Lebanon, there are several suggestions for more research.

1. Replicating the study with a larger sample size: The study's sample size was relatively small, which could limit the generalizability of the results. Therefore, it is recommended to conduct a similar study with a larger sample size from multiple settings to increase the power of the study.

2. Conducting a cross-cultural comparison: Studies should compare the PHQ-9's psychometric properties in patients with heart failure in Lebanon with those in other Arabic-speaking countries. This would help establish the cultural and linguistic equivalence of the questionnaire across different cultures and languages.
3. Longitudinal studies: longitudinal studies that track changes in depression symptoms over time could be conducted in patients with heart failure in Lebanon. These studies would provide valuable insights into the responsiveness of the questionnaire and how it can be used to monitor treatment response.
4. Cost-effectiveness: Future research could also focus on evaluating the cost-effectiveness of using the PHQ-9 in different settings in Lebanon. This would include analyzing the costs and benefits of using the questionnaire in terms of both clinical outcomes and resource utilization.
5. Compare with other assessment tools: Future research could also compare the PHQ-9 with other assessment tools that are commonly used to measure depression in patients with heart failure in Lebanon. This would help to establish the relative utility of the PHQ-9 in comparison to other tools and inform the selection of the most appropriate assessment tool for patients with heart failure in Lebanon.

5.5. Conclusion

Depression is closely linked with HF; screening for depression can help mitigate the detrimental consequences of this comorbid state. The Arabic PHQ-9 questionnaire was found to be reliable and valid for use in Lebanese patients with HF. Minor

modifications may further improve cultural appropriateness. The results of this study can be used to plan the implementation of depression screening in HF clinics in Lebanon. Advanced practice nurses may use the Arabic PHQ-9 to assess patients for depression, refer to psychiatry as needed, ensure compliance with antidepressants and psychotherapy, and monitor patient response over time.

APPENDIX A

ARABIC VERSION OF THE PATIENT HEALTH QUESTIONNAIRE-9 (PHQ-9)

الاسم:_____ العمر:_____ الجنس: ☐ذكر ☐ أنثى تاريخ اليوم:_____

ما مدى تكرار انزعاجك من أي مشكلة من المشكلات التالية خلال الأسبوعين الأخيرين؟	أبداً 0	عدة أيام 1	أكثر من نصف الأيام 2	كل يوم تقريبا 3
أ- قلة الاهتمام أو المتعة عند القيام بالأشياء.	☐	☐	☐	☐
ب- الشعور بالضيقة أو الاكتئاب أو اليأس.	☐	☐	☐	☐
ج- صعوبات في النوم أو في الاستمرار في النوم أو كثرة النوم.	☐	☐	☐	☐
د- الشعور بالتعب أو قلة النشاط.	☐	☐	☐	☐
هـ- قلة الشهية أو شراهة الأكل.	☐	☐	☐	☐
و- الشعور بعدم الرضا عن نفسك أو الشعور بأنك إنسان فاشل أو بأنك خذلت نفسك أو عائلتك.	☐	☐	☐	☐
ز- صعوبات في التركيز على الأشياء كقراءة الجريدة أو مشاهدة التلفاز.	☐	☐	☐	☐
ح- التحرك أو التحدث ببطء شديد لدرجة ملحوظة، أو العكس: التململ وعدم القدرة على الاستقرار لدرجة التحرك من مكان لآخر أكثر من المعتاد.	☐	☐	☐	☐
ط- التفكير بأنه من الأفضل لك الموت أو التفكير بإيذاء نفسك بطريقة ما.	☐	☐	☐	☐

9-5 اكتئاب بسيط

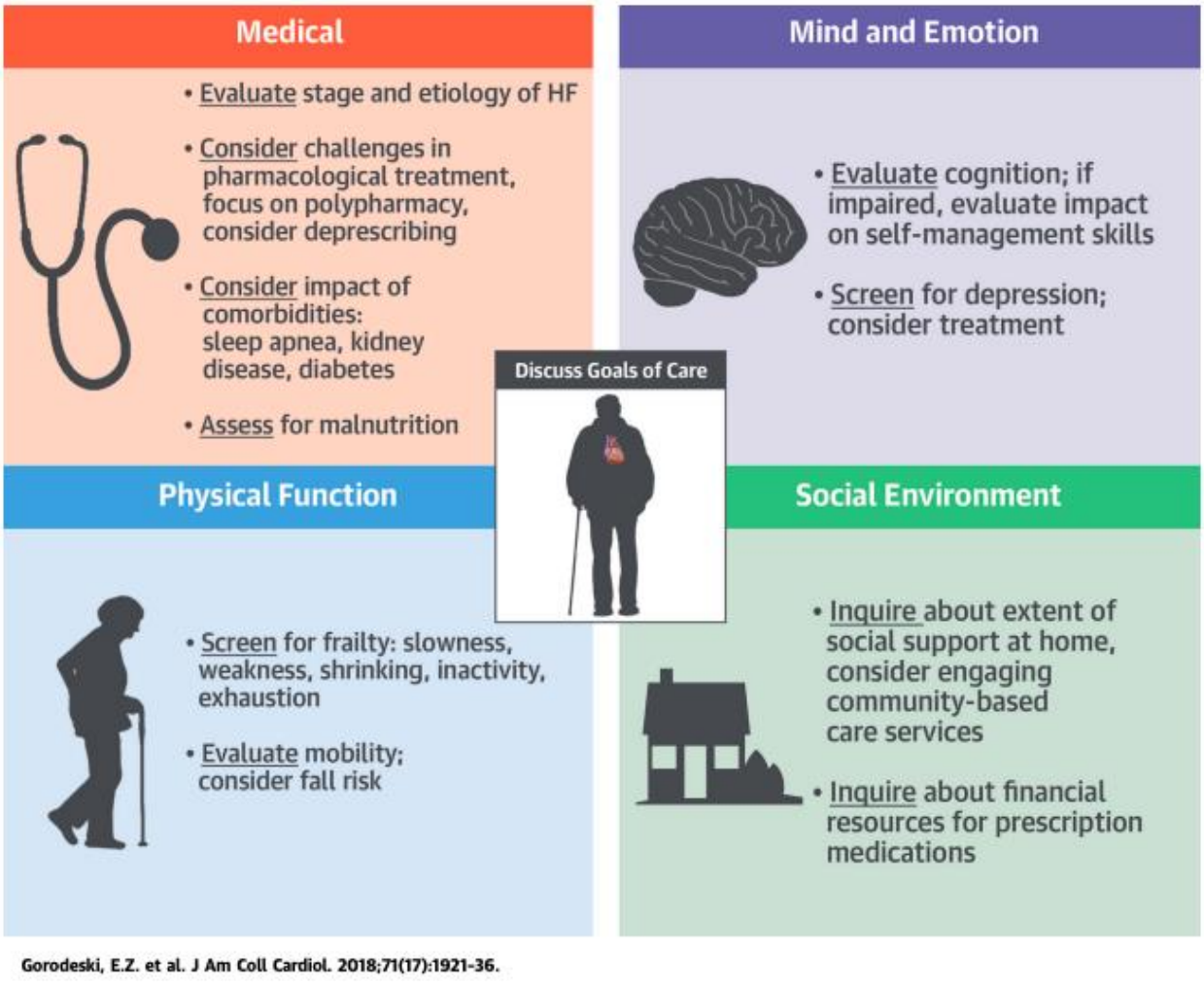
14-10 اكتئاب متوسط

19-15 اكتئاب متوسط إلى شديد

27-20 اكتئاب شديد

APPENDIX B

DOMAIN MANAGEMENT APPROACH TO HF IN THE GERIATRIC PATIENT



Gorodeski, E.Z. et al. J Am Coll Cardiol. 2018;71(17):1921-36.

APPENDIX C

ARABIC PHQ-9 CULTURAL APPROPRIATENESS AND RELEVANCE

Thank you for agreeing to evaluate the Arabic translation of the Patient Health Questionnaire-9 (PHQ-9) for my thesis, "Validity and reliability of the Arabic version of the Patient Health Questionnaire-9 (PHQ-9) in Patients with Heart Failure (HF) in Lebanon." Your input is much appreciated.

Context: Depression is defined in the attached document. The Patient Health Questionnaire-9 (PHQ-9, also attached) is a commonly used 9-item depression screening tool. Questionnaire items represent depressive symptoms; each item is evaluated on a Likert scale ranging from 0 (not at all) to 3 (nearly every day). The overall score can range from 0 to 27. The PHQ-9 has been validated in the U.S. for use in the HF population. The Arabic version of the PHQ-9 has been evaluated in people with psychiatric conditions and spinal cord injuries in Lebanon, however, it has not been tested in patients with HF. My thesis addresses the latter gap.

You are kindly asked to rate each of the nine items of the Arabic PHQ-9 depression screening tool for cultural appropriateness and conceptual relevance.

Appropriateness is the extent to which the item is clear, unambiguous, and appropriate for the Lebanese population. The rating is on a 4-point scale using the following criteria: 1 = inappropriate, 2 = slightly inappropriate, 3 = slightly appropriate, and 4 = appropriate. Please use the table below to rate the items for appropriateness and note under "Comments" any changes in wording or other that you think are needed.

Item	Appropriateness Rating	Comments
1. قلة الاهتمام أو المتعة عند القيام بالأشياء		
2. الشعور بالضيقة أو الاكتئاب أو اليأس		
3. صعوبات في النوم أو في الاستمرار في النوم أو كثرة النوم		
4. الشعور بالتعب أو قلة النشاط		
5. قلة الشهية أو شراهة الأكل		
6. الشعور بعدم الرضا عن نفسك أو الشعور بأنك إنسان فاشل أو بأنك خذلت نفسك أو عائلتك		
7. صعوبات في التركيز على الأشياء كقراءة الجريدة أو		

مشاهدة التلفاز		
8. التحرك أو التحدث ببطء شديد لدرجة ملحوظة، أو العكس: التململ وعدم القدرة على الاستقرار لدرجة التحرك من مكان آخر أكثر من المعتاد		
9. التفكير بأنه من الأفضل لك الموت أو التفكير بإيذاء نفسك بطريقة ما		

The item's **relevance** is its fit with a concept pertinent to depression as a construct (diagnostic criteria attached). Please rate each item for relevance from 1 to 4 using the following criteria: 1 = irrelevant; 2 = inability to assess relevance without revision; 3 = relevant but requiring minor modification; 4 = extremely relevant.

Item	**Relevance Rating**	**Comments**
1. قلة الاهتمام أو المتعة عند القيام بالأشياء		
2. الشعور بالضيقة أو الاكتئاب أو اليأس		
3. صعوبات في النوم أو في الاستمرار في النوم أو كثرة النوم		
4. الشعور بالتعب أو قلة النشاط		
5. قلة الشهية أو شراهة الأكل		
6. الشعور بعدم الرضا عن نفسك أو الشعور بأنك إنسان فاشل أو بأنك خذلت نفسك أو عائلتك		
7. صعوبات في التركيز على الأشياء كقراءة الجريدة أو مشاهدة التلفاز		
8. التحرك أو التحدث ببطء شديد لدرجة ملحوظة، أو العكس: التململ وعدم القدرة على الاستقرار لدرجة التحرك من مكان آخر أكثر من المعتاد		
9. التفكير بأنه من الأفضل لك الموت أو التفكير بإيذاء نفسك بطريقة ما		

Do you have any suggestion regarding possible omission of items, modification or rewording, or addition of any other items?

Thank you!

Attachment

Definition: Depression (otherwise, major depressive disorder) is a mood disorder diagnosed based on the Diagnostic and Statistical Manual (DSM-V) criteria (below). The patient would be experiencing five or more symptoms over a 2-week interval, including depressed mood, sadness or loss of interest or pleasure.

DSM-V Criteria (section A):

- Depressed mood most of the day, nearly every day.
- Markedly diminished interest or pleasure in all, or almost all, activities most of the day, nearly every day.
- Change in appetite (decrease or increase), significant weight loss when not dieting or weight gain (change in more than 5% body weight in a month).
- Sleeping too much or not sleeping well.
- A slowing down of thought and a reduction of physical movement, or restlessness (observable by others).
- Fatigue or low energy on most day.
- Feelings of worthlessness, hopelessness, or excessive or inappropriate guilt nearly every day.
- Diminished ability to think or concentrate, or indecisiveness- nearly every day (subjective account or observed by others)
- Recurrent thoughts of death, recurrent suicidal ideation/plan, or suicidal attempts.

Arabic PHQ-9 scale:

الاسم:_____ العمر:_____ الجنس: ☐ ذكر ☐ أنثى تاريخ اليوم:_____

ما مدى تكرار انزعاجك من أي مشكلة من المشكلات التالية خلال الأسبوعين الأخيرين؟	أبداً 0	عدة أيام 1	أكثر من نصف الأيام 2	كل يوم تقريبا 3
أ- قلة الاهتمام أو المتعة عند القيام بالأشياء.	☐	☐	☐	☐
ب- الشعور بالضيقة أو الاكتئاب أو اليأس.	☐	☐	☐	☐
ج- صعوبات في النوم أو في الاستمرار في النوم أو كثرة النوم.	☐	☐	☐	☐
د- الشعور بالتعب أو قلة النشاط.	☐	☐	☐	☐
هـ- قلة الشهية أو شراهة الأكل.	☐	☐	☐	☐
و- الشعور بعدم الرضا عن نفسك أو الشعور بأنك إنسان فاشل أو بأنك خذلت نفسك أو عائلتك.	☐	☐	☐	☐
ز- صعوبات في التركيز على الأشياء كقراءة الجريدة أو مشاهدة التلفاز.	☐	☐	☐	☐
ح- التحرك أو التحدث ببطء شديد لدرجة ملحوظة، أو العكس: التململ وعدم القدرة على الاستقرار لدرجة التحرك من مكان لآخر أكثر من المعتاد.	☐	☐	☐	☐
ط- التفكير بأنه من الأفضل لك الموت أو التفكير بإيذاء نفسك بطريقة ما.	☐	☐	☐	☐

9-5 اكتئاب بسيط

14-10 اكتئاب متوسط

19-15 اكتئاب متوسط إلى شديد

27-20 اكتئاب شديد

APPENDIX D

RELEVANCE RATINGS

PHQ-9 Items	Relevance Ratings			
	Doctoral Student in Neuropsychology	HF Patient	Mental Health Practitioner	Comments
Item1_little.interest	3	3	4	• Sentencing must be reworded, change it to *عدم المتعة* • 'interest' is not in the context of '*اهتمام*, it is rather in the context of '*رغبة* [i.e., desire].
Item2_feeling.down	3	4	4	• '*ضيقة* translates to 'distress' in the context of mental health. the following captures what the item intends to capture: *الشعور بالاكتئاب أو اليأس*
Item3_troubles.asleep	3	4	4	• For 'staying asleep', it should be '*البقاء* rather than '*الاستمرار*.
Item4_feeling.tired	4	4	4	
Item5_poor.appetite	2	4	4	• This item asks about 'poor appetite or overeating'. The Arabic item here taps into 'binge' eating primarily. Consider ' *الإفراط في الأكل* for that segment. Additionally, grammatically

				there are errors, also specify '*شهية*' in relation to what [as this is at times understood in the context of sexual desire]
Item6_feelling.bad	3	4	4	• '*الرضا*' is different from 'bad' in the context of depression. Also, in Arab culture letting 'oneself' down is intertwined with letting 'family' down. Suggestion: ***الشعور بالسوء تجاه نفسك – أو أنك شخص فاشل أو أنك خذلت نفسك***
Item7_trouble.concentrate	3	4	4	• Linguistically in Arabic [as opposed to the English version], this can be understood as visually fixating/focusing on something, rather than cognitively. Suggesting removing '***على الأشياء***'
Item8_speak.slowly	2	3	4	• Second statement is not clear. • First part until '*ملحوظ*' is good. The second part taps more into hyperactivity aspect of function [which

				is false in the case of depression]. To capture better, the suggestion for the second part will be ' ***أو العكس – التحرك أكثر بكثير من المعتاد بسبب عدم القدرة على تهدئة/استقرار جسدك'***
Item 9	2	4	4	• Does not capture properly 'thoughts around' versus 'actively thinking of'. Suggestion somehow: ***تراود أفكار حول إيذاء نفسك بطريقة ما، أو أنك سترتاح إذا مت***

Note: The rating is on a 4-point scale using the following criteria: 1=inappropriate, 2=slightly inappropriate, 3=slightly appropriate, and 4=appropriate.

APPENDIX E

INTER-ITEM CORRELATION MATRIX

Inter-Item Correlation Matrix									
	PHQ1_little.interest	**PHQ2_feeling.down**	**PHQ3_troubles.asleep**	**PHQ4_feeling.tired**	**PHQ5_poor.appetite**	**PHQ6_feelling.bad**	**PHQ7_trouble.concentrate**	**PHQ8_speak.slowly**	**PHQ9_death.thoughts**
PHQ1_little.interest	1.000	0.753	0.424	0.563	0.351	0.332	0.327	0.237	0.300
PHQ2_feeling.down	0.753	1.000	0.504	0.565	0.378	0.437	0.314	0.289	0.385
PHQ3_troubles.asleep	0.424	0.504	1.000	0.482	0.347	0.314	0.264	0.150	0.258
PHQ4_feeling.tired	0.563	0.565	0.482	1.000	0.388	0.390	0.225	0.256	0.247
PHQ5_poor.appetite	0.351	0.378	0.347	0.388	1.000	0.245	0.215	0.253	0.240
PHQ6_feelling.bad	0.332	0.437	0.314	0.390	0.245	1.000	0.165	0.264	0.367
PHQ7_trouble.concentrate	0.327	0.314	0.264	0.225	0.215	0.165	1.000	0.394	0.190
PHQ8_speak.slowly	0.237	0.289	0.150	0.256	0.253	0.264	0.394	1.000	0.348
PHQ9_death.thoughts	0.300	0.385	0.258	0.247	0.240	0.367	0.190	0.348	1.000

APPENDIX F

DEPRESSION TREATMENT RECOMMENDATIONS

PHQ Score	Level of Depression	NICE Guidelines for Intervention
0-4	None-Minimal	***None:*** Minimal symptoms present.
5-9	Mild	***Watchful waiting:*** If symptoms persist in 2 weeks, refer to next level of care. ***Note:*** If the patient's subthreshold symptoms have been persistent or if the patient has had a previous history of severe depression, consider referring them directly to the next level of care.
10-14	Moderate	***Guided Self-Help:*** Patients are provided with readings based on the principles of CBT. Additionally the patient has 3-4 sessions (in person or by phone) to check in with a Clinical Consultant. The consultant supports the patient with the self-help materials, and monitors them for improvement. ***Medication:*** Consider medication if the patient's symptoms have persisted for more than 2 years or if they have a previous history of severe depression.
15+	Severe	***Psychotherapy:*** Patients meet with a therapist to undergo empirically validated treatments for depression (CBT, IPT). Alternatively, consider ***Medication.*** If the patient has an inadequate response to either psychotherapy or medication alone, consider combining treatments.

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