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THIRST AND ITS PREDICTORS IN PATIENTS WITH HEART FAILURE

by
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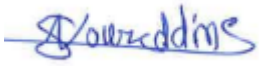

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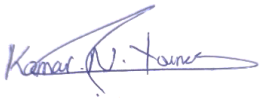

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ABSTRACT
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Title: Thirst and its Predictors in Patients with Heart Failure

Background: Thirst is a subjective sensation of throat and mouth dryness that leads to a powerful craving to drink. In healthy people, thirst is important to maintain fluid volume balance, therefore maintaining homeostasis. This sensation can be strong enough to cause uncontrollable water intake. Thirst is one of the most unpleasant symptoms facing patients with HF. Many factors are associated with thirst such as the prolonged neurohormonal activation, medications, fluid restrictions, and emotions such as anxiety and depression. One fifth of patients with HF experience thirst and this experience might persist for 18 months or more after discharge. HF patients were found to score higher on the Thirst Intensity Scale than patients without HF. Despite its prevalence, thirst has been rarely studied. There are no studies that address the relationship between thirst and salt intake among patients with HF.

Aim: The main aims of the study are to describe the prevalence and characteristics of thirst among patients with HF; examine the association between thirst and behaviors related to salt intake; and identify predictors of thirst using relevant demographic and clinical variables.

Methods: a descriptive correlational study design was used. The study was conducted in the coronary care unit at American University of Beirut Medical Center (AUBMC) and Rafik Hariri University Hospital (RHUH), in addition to the HF outpatient clinic at AUBMC. The targeted population included HF patients with HF-rEF, HE-pEF and midrange EF-HF, and with NYHA class I-III. Data were collected between December 2021 and April 2022.
Institutional review board at AUB and RHUH, in addition to the administration approval in both hospitals were secured. A recruiter (cardiology nurse) was assigned to enroll eligible patients from AUBMC CCU, HF outpatient clinic and RHUH CCU. Patients who approved to participate were directed by the recruiter with their mobile number to the researcher. The researcher called them for the interview and sent the informed consent through WhatsApp. The average interview time was around 25 minutes. The interview included questionnaires related to thirst, as well as knowledge, behaviors, and attitudes related to salt consumption in addition to the patient health questionnaire (PHQ2).

Data Analysis: Statistical analysis included descriptive statistics (means and standard deviations, and frequencies and percentages, depending on the level of measurement). Bivariate analyses included Pearson R correlation coefficient, Spearman Rho correlation coefficient, t-tests, Chi-squared test and ANOVA to examine associations between variables. Multiple linear regression analysis was used to examine the predictors of thirst.

Results: a sample of 90 patients were interviewed (76.92 % response rate). 50% were recruited from CCU and the other half from the clinic. The majority were males (57.8%), married (74.4%), living with partners (70%) and had university education (41.1%). The mean age was 65.83±12.94 years. Most participants were NYHA class II (48.9%) with mean EF 37.55±11.45%. The most frequent comorbidities were diabetes mellitus II (63.3%) and hypertension (67.8%).

The average thirst intensity was 3.82±2.21. The prevalence of thirst was 23 % with most participants reporting thirst a couple of times per week (43.3%) and per month (26.7%). Morning was the most reported time of thirst (41.1%). The mean thirst distress score was 23.58±7.66, with most participants being in the moderate (31.1%) and strong (33.3%) thirst distress groups.

The mean knowledge score was 14.2±4.6, with only few participants identifying processed food as the main source of salt (34.4%), the relationship between salt and sodium (25.6%) and the recommended salt amount per day (20%). The mean attitude score was 3.41±1.34. The two main motivators to reduce salt were change in health condition (43.3%) and doctor's advice (43.3%). Good taste of salt was the most reported barrier against reducing its consumption (63.3%). Majority of the sample (83.3%) are cutting down on salt, and get their health information from their doctor (64.4%). Most participants never add salt on the table (63.3%) and while cooking (40%). The mean PHQ-2 score was 0.77±1.03.

Being prescribed salt restriction was associated with thirst intensity and distress (p-value 0.003 and 0.035, respectively). No clear result regarding the association of fluid restriction with thirst. Ejection fraction, antidepressants and the PHQ2 score were the predictors of thirst distress in the regression model. Whereas, age, ejection fraction, diastolic blood pressures, antidepressants, statins and PHQ-2 score were the predictors of thirst intensity in the regression model.

Conclusion: thirst is prevalent in the sample despite the need for future studies. This study was guided using the theory of unpleasant symptoms. Many factors were associated with thirst, including physiological, psychological, and situational. It was significant that thirst intensity is more associated with younger age and female gender. Depression was highly associated with higher thirst. There is a need for thirst assessment in healthcare facilities as well as proper patients' education. Future studies are essential in our region to understand thirst more thoroughly.

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CHAPTER I

INTRODUCTION

Heart Failure (HF) is a global health problem affecting around 26 million people worldwide (American Heart Association [AHA], 2017). Around 1-2% of the adult population in developed countries have heart failure. An update from the AHA estimated that there were 6.2 million people with HF in the United States between 2013 and 2016 compared to 5.8 million between 2011 and 2013 (Virani et al., 2020). This increase is mainly related to the reduction in mortality due to the improvements in myocardial infarction treatment, the aging population and the increase in the precipitating factors of heart failure such as lifestyle, hypertension, arrhythmias, and myocardial ischemia (McMurray et al., 2012).

In the Middle East region, the prevalence of HF- preserved Ejection Fraction (EF) is 26%- 46% and 54% - 71% for HF- reduced EF (Al-Shamiri, 2013). In Lebanon, the prevalence of heart failure in 2012 was approximately 1.8%, accounting for 72,000 patients, of which 16% were hospitalized in the same year (Tatari, Soubra, Tamim, Akhras and Kabbani, 2015).

Patients living with heart failure (HF) experience many troublesome symptoms such as edema, fatigue and dyspnea (Inamdar, 2016). However, thirst remains one of the most unpleasant symptoms facing patients with HF. Thirst is defined as a subjective sensation of throat and mouth dryness that leads to a powerful craving to drink (Leib, Zimmerman and knight., 2016). In healthy people, thirst is important to maintain fluid volume balance, therefore maintaining homeostasis. However, in patients with heart failure who are often on fluid restriction, thirst may make adherence to the therapeutic regimen challenging.

The thirst sensation can be strong enough to cause uncontrollable water intake. Many factors are associated with thirst, such as the prolonged neurohormonal activation, use of some medications (like diuretics), fluid restriction, and emotions such as anxiety and depression (Allida et al., 2014). Moreover, salt intake may contribute to thirst sensation as all HF patients are on sodium restricted diet because of fluid retention regardless of other comorbidities (Aliti et al., 2013).

Studies have shown that about one fifth of patients with HF experience thirst and this experience might persist for 18 months or more after discharge from the hospital (Waldreus et al., 2014). Patients with HF were found to score significantly higher on the Thirst Intensity Scale than patients without HF (Waldreus et al., 2011). Despite the high prevalence of thirst, this symptom has been rarely studied (Allida et al., 2014). Moreover, there are very few studies that address the relationship between thirst and salt intake among patients with HF. Given the complex pathophysiology of HF, sodium retention might be the direct cause of the troublesome thirst sensation that makes patients drink more fluids, and thus the reason behind further congestion and HF exacerbation. These adverse consequences of thirst may cause frequent readmissions and adversely affect the quality of life of patients with HF (Pellicori et al., 2015).

Worldwide, there is scarcity in studies that examine thirst among HF patients and its association with salt intake. Up to our knowledge, no such studies were done in Lebanon. Studying this topic might shed light on the need to find ways to manage thirst in patients with HF and subsequently promote a better quality of life for them. Thus, the aims of this study are to 1) describe the prevalence and characteristics of thirst among patients with HF; 2) examine the association between thirst and behaviors related to salt intake; and 3) identify predictors of thirst using relevant demographic and clinical variables.

CHAPTER II

LITERATURE REVIEW

A. Heart Failure: general review

Heart Failure is a condition in which the heart is no more able to maintain adequate blood pumping to meet the body's metabolic needs (AHA, 2017). It is a syndrome of abnormality in either the function or structure of the cardiac muscle. This abnormality leads to insufficient blood pumping by the heart and consequently insufficient oxygen delivery to the tissues, creating a systemic state of hypoperfusion.

Heart failure can be divided into three groups: heart failure with reduced ejection fraction (LVEF) that is < 40%, heart failure with preserved ejection fraction (LVEF ≥50%) and heart failure with mid-range ejection fraction (LVEF 40-49%). Ejection fraction is the percentage of blood leaving the heart's ventricles with every contraction (AHA, 2017).

Heart Failure can be caused by either ischemic diseases or non-ischemic diseases. Ischemic heart diseases include myocardial infarction and angina pectoris, whereas non-ischemic diseases include valvular heart disease, arrhythmias, and hypertension (McMurray et al., 2012). Moreover, comorbidities are common in patients with heart failure, such as diabetes mellitus, chronic obstructive pulmonary disease [COPD], renal failure and anemia (McMurray et al.,2012). HF is also more common in men than in women and tends to appear in women at an older age (Dunlay & Roger, 2014). These comorbidities with heart failure are associated with an increase in mortality, with 48% - 65% of heart failure patients estimated to die within five years of diagnosis (Dunlay & Roger, 2014).

According to the New York Heart Association (NYHA), HF patients can be classified according to the severity of their symptoms into four classes (AHA, 2017). NYHA-I patients are those without symptoms and who have no limitations to normal activity. Patients in NYHA II class have mild symptoms of fatigue, dyspnea and palpitations and these symptoms are associated with ordinary activity. In NYHA III class, patients usually have symptoms with less than ordinary activity. Finally, in class NYHA IV patients have severe symptoms even while at rest (AHA, 2017).

According to the American Heart Association (2017), the pharmacological treatment of Heart failure reduced EF (HFrEF) mainly consists of angiotensin converting enzyme inhibitors (ACE-I) and Beta-blockers. Angiotensin receptor blockers (ARB) are recommended for patients who do not tolerate ACE-Is. Mineralocorticoid receptor antagonists (MRA) are recommended for patients who remain symptomatic despite ACE-I and beta blocker treatment. A new alternative to ACE-I or ARB in treating HF is the angiotensin-neprilysin inhibitor. This type of drug showed more reduction in hospitalization and mortality rates compared to ACEI/ARB (Yancy et al., 2017). Moreover, diuretics are also recommended for HF patients who have signs and symptoms of congestion.

Aside from the pharmacological treatment, device therapy is also recommended for HF patients. Implantable cardioverter defibrillator (ICD) is recommended to prevent cardiac arrest in patients with EF less than or equal to 35% and patients with life-threatening arrhythmias (Yancy et al., 2013). Cardiac resynchronization therapy (CRT) is recommended for HF patients with EF less than 35% and wide QRS complex on the ECG (>120 ms) to prevent the risk of early death and reduce hospitalization risk (Yancy et al., 2013). Furthermore, device therapy (ventricular assist device) is recommended for

the management of heart failure stage D that is refractory to optimal medical therapy including inotropic support (Yancy et al., 2013). Patients are classified in stage D, the most advanced stage of their disease, when their NYHA class is IV, their EF less than 30%, they have signs and symptoms of congestion, frequent hospitalization (more than or equal to one hospitalization in the past 6 months) and who have severe impairment in the functional capacity (Yancy et al., 2013). Cardiac transplantation is indicated as a last resort for carefully selected patients with stage D HF who do not respond to medical therapy, device, and surgical management (Yancy et al., 2013).

On the other hand, non-pharmacological approaches are also recommended for HF treatment. Self-care, including adherence to a low salt diet, fluid restriction, symptom recognition and management, is a necessary aspect in the management of HF. Even though no randomized studies have addressed the restriction of salt in HF, restriction to about 2 grams per day is considered useful as an adjunct to treatment in those taking high dose diuretics and if the disease condition is advanced (Gibbs, Jackson & Lip, 2000).

Adequate education about the disease and its management should be provided to HF patients. Moreover, education and counselling about cardiovascular risks reduction should be given to HF patients. For example, advice about moderate alcohol consumption and smoking cessation must be provided. Furthermore, HF patients should be encouraged to exercise. All stable HF patients should be encouraged to participate in a simple and supervised exercise program (Cattadori et al., 2018). The treatment of HF is individualized, based on the patient's clinical stage of the disease (Sun et al., 2019).

B. Thirst definition and description

Thirst is defined as a sensation of dryness in the mouth and throat and is correlated with a craving to drink (Porth & Erickson, 1992). This sensation cannot be neglected as it leads to large consumption of liquids if not satisfied (Toto, 1994). Waldreus, Hahn and Jaarsma (2013) defined thirst as an unpleasant subjective symptom that is associated with craving for liquids. Therefore, for this study thirst will be defined as an unpleasant symptom that is associated with the desire to drink water or liquids.

Thirst is a subjective symptom that can only be known and described by the person feeling it. When a patient feels thirsty this means that there is a change in normal body physiological function, as reviewed by Thornton in 2010. The limited knowledge about thirst in HF patients makes it unlikely that caregivers deliver proper help and advice to patients to reduce this unpleasant symptom (Waldreus et al., 2013).

1. The physiological basis of thirst

The thirst mechanism is mainly related to three causes. These causes are changes in body fluids balance (such as dehydration and hypovolemia), increased sympathetic nervous system stimulation and pharmacological causes (Guyton, 2011). The normal function of thirst in our bodies is to regulate dehydration and water intake (Guyton, 2011). When there is dehydration or hypovolemia, blood osmolality increases and this is the direct stimulus to the brain's osmoreceptors, leading to the sensation of thirst (Guyton, 2011). Moreover, in cases of hypovolemia, less blood is delivered to the kidneys; as a result, the Renin Angiotensin Aldosterone System (RASS) gets activated, by which the renin hormone is released (Arai, Butzlaff, Stotts & Puntillo, 2014). Renin stimulates the release of angiotensin II that promotes the release of aldosterone by the adrenal glands

(Arai et al., 2014). The secretion of aldosterone leads to sodium and water retention, and therefore the thirst sensation occurs. Moreover, hypovolemia and dehydration can affect the salivary flow in the mouth, leading to the sensation of dry mouth (Guyton, 2011). In hypovolemia, there is an ultimate decrease in blood pressure. This leads to stimulation of receptors in blood vessels, leading to increased concentration of angiotensinogen II and therefore thirst.

Neuro-hormonal activation, which is due to low cardiac output and the release of cardiac enzymes, is a key feature that happens in HF, and a main contributing factor to the thirst experience. The result of this activation is angiotensin (Ag) II release. Ag II acts directly in stimulating the thirst pathway by acting directly on the salt appetite center (Arai, Stotts & Puntillo, 2013). Moreover, RAAS activation promotes the release of aldosterone causing water and salt retention (Allida et al., 2015). In addition, low cardiac output in HF always plays a role in increasing Ag II levels due to the hypoperfusion of the kidneys, consequently activating the thirst mechanism in the brain (Fitzsimons, 1992). Additionally, urea, which is a marker of neurohormonal activation, is associated with thirst (Waldreus et al., 2016).

Furthermore, the changes in body fluids status leads to cardiac muscle stretching and this leads to the release of natriuretic peptides (Pro-BNP) in patients with HF (Guyton, 2011). The release of Pro-BNP stimulates the kidney to excrete more sodium and water, which leads to dehydration and therefore thirst sensation. Any condition that affects body fluid balance can cause increased thirst sensation such as vomiting, diabetes, kidney failure, bleeding and heart failure (Guyton, 2011). Usually when the sympathetic nervous system gets activated as is the case in patients with heart failure, it causes vasoconstriction in the salivary gland, leading to less salivary secretion and therefore dry

mouth sensation (Guyton, 2011). Osmotic changes in the mucosa are detected by the thirst center in the brain, leading to an urge to drink liquids (Eccles, Du Plessis, & Dommels, 2013). As for the pharmacological causes of thirst, the most common medications that have thirst as a side effect are anticholinergic drugs, psychoactive drugs (e.g. benzodiazepines, antihistamines and antidepressants), opioids, diuretics and beta blockers (Thomson, 2015).

C. Thirst and Heart Failure: What the literature says

As per the literature, thirst is a common troublesome symptom experienced by patients with HF. This symptom can result in poor adherence to self-care measures, more significantly salt and fluid restriction. This non-adherence leads to worsening in HF signs and symptoms of congestion and therefore HF exacerbation. In most quantitative studies, thirst was described in terms of thirst distress, intensity, frequency, and quality. The Visual Analogue Scale (VAS) was used to measure the intensity of thirst on a range 0-100, with 0 meaning no thirst and 100 meaning worst thirst possible (Holst et al., 2003). The Thirst Distress Scale was used by many investigators; it has a score from 6-30 (Holst et al., 2003). On the other hand, qualitative studies concentrated on describing thirst in terms of how to live with symptoms of HF. Thirst was described by HF patients as an annoying symptom that makes them feel the urge to drink. The most relieving way of thirst was stopping fluid restriction (Allida et al., 2015). The table below (Table 1) summarizes the findings of studies that addressed thirst in patients with heart failure.

Table 1 Studies on thirst and related factors in patients with heart failure

Author	Purpose	Design	Participants	Measures/Intervention	Findings
Van der Wal et al., 2010 (Netherland)	To explore reasons and the motivation for compliance with HF regimen and how patients manage these recommendations	Qualitative Descriptive Study	Stable HF, NYHA II-IV, age 70 years	No intervention	HF patients with thirst were thinking about thirst frequently during the day. They related thirst with fluid restriction. They used ice lollies or peppermints to relieve their thirst.
Reilly et al., 2010 (southeast USA)	To identify the relationship between fluid intake, thirst and quality of life in persons with HF	Quantitative descriptive study	Stable HF patients (mean age 70 years), NYHA II-IV, mean EF 34%	Thirst Distress Scale and QoL were assessed	Moderate to severe thirst distress was reported in 46% of the sample
Waldreus et al., 2018 (Sweden)	To describe thirst intensity and distress trajectories in patients from admission to four weeks after discharge and describe trajectories	Prospective observational study Between January2012 and August 2014.	Patients > 60 years who were admitted due to worsening HF with LVEF ≤50%.	VAS thirst scale and thirst distress scale were used	Intensity and distress of thirst, having fluid restriction and feeling depressed at admission were

	of thirst by patient characteristics				critical in predicting the trajectory of thirst intensity and distress at discharge to home.
Waldreus et al., 2014	To describe the trajectory of thirst during an 18-month period and to identify variables associated with persistent thirst in patients with HF.	Prospective observational study	Data were collected from 649 patients with HF with the use of the Revised Heart Failure Compliance Scale at 1, 6, 12, and 18 months after a period of hospital treatment for worsening HF	VAS thirst scale and thirst distress scale. Logistic regression analysis was used to identify factors independently associated with persistent thirst	33% of the patients reported thirst on ≥1 occasion and 34% continued to have thirst at every follow-up visit. Patients with persistent thirst were more often younger and male and had more HF symptoms. Higher body mass index and high serum urea level increased the risk of thirst.
Waldreus et al., 2016 (Sweden)	To describe changes in thirst intensity and to determine	Prospective observational study.	Patients with HF (66 patients) referred to	Visual Analogue Scale for thirst was used	Thirst intensity increased in two-thirds of

	factors associated with high thirst intensity during optimization of HF medications.	Data collection between September 2012 and August 2014 in two hospitals with HF clinics in Sweden	outpatient clinic for up-titration of HF medications. Data collected at first visit and at the end of the treatment program.		the sample during the optimization period. Fluid restriction and elevated plasma urea levels were associated with high thirst intensity.
Van der Wal et al., 2019 (Netherland, Sweden and Japan)	To describe factors related to thirst, self-reported reasons for thirst and interventions to relieve thirst in three different countries.	Cross-sectional study design.	269 patients with HF at the clinic and in hospital.	Thirst was assessed by Visual analog scale (0-100), and the reasons were assessed by an open-ended question	Thirst intensity was significant in three countries. Mean thirst intensity was 24 ± 24 out of 100, with a mean thirst of 53 ± 15 in the highest tertile (3rd tertile of the VAS score as classified in the study). Thirst was related to higher dose of loop diuretics and fluid restriction. The most reported

					reasons for thirst were salty/spicy food (20%) and low fluid intake (18%). Most of the patients (56%) drank more in case of thirst; 20% only drank a little bit, probably related to a fluid restriction.
Allida et al., 2018 (review) (Australia)	To summarize key empirical research findings related to thirst (prevalence, factors and management)	Systematic review	The databases used were: Medline, cumulative index for nursing and allied health, PubMed and Scopus. Nine studies were included	The AMSTAR measurement tool was used to assess the quality of the included systematic review.	HF syndrome, medications, self-care practices (fluid restriction) and anxiety contribute to increased thirst in HF patients. Predictors were younger age, male gender, high symptom burden

					and serum urea. There are no interventions studies about thirst management. Studies only recommended strategies for clinical practice.
Aliti et al., 2013 (Brazil)	To compare the effect of a fluid restricted and sodium restricted diet vs a diet with no such restriction on weight loss and clinical stability during a 3-day period in patients with acute decompensated HF.	Randomized, parallel-group clinical trial with blinded outcome assessment.	Adult patients with Acute-decompensated HF and systolic dysfunction Setting: inpatients in ER, wards and ICU.	Three variables were measured. -weight by a digital scale (Tanita) -CCS: an instrument composed of 7 items that assess clinical signs and symptoms of congestion (the score is from 1-22). -perceived thirst was measured using a visual analog scale 0-10. Intervention group: fluid intake 800 ml/day, sodium 800 mg/day in patients whose length of stay was less than 7 days, until discharge, or until the 7th day of hospitalization.	Daily perception of thirst was being assessed. Aggressive fluid and sodium restriction had no effect on weight loss or clinical stability at 3 days. The intervention was significantly associated with an increase in perceived thirst.

				Control group: Standard hospital diet with liberal fluid intake (2.5L) and minimal sodium restriction (3-5 gr/day)	
Reilly et al., 2015 (Southeast USA)	To test an educational and behavioral intervention on adherence with prescribed fluid restriction and outcome measures (thirst distress, HF symptoms and quality of life)	Randomized clinical Trial	Stable heart failure patients aged 22-83 years, NYHA II-IV	The Thirst Distress Scale was used The intervention group received the educational and behavioral program The control group: received the standard hospital educational program	The intervention group had increased thirst distress between 3-6 months. Patients who adhered to drinking less fluid experienced less typical HF symptoms, greater thirst distress but they had stable quality of life.
Eng et al., 2020 (Spain)	To describe thirst frequency, duration and intensity, and to identify factors associated with frequent thirst in outpatients with HF in a	Cross-sectional descriptive design	302 patients diagnosed with HF (age 67 ± 12 years) in Spain	VAS scale was used	50% of patients having fluid restriction experienced frequent thirst, and the intensity and duration of thirst were increased.

	Mediterranean country				Factors significantly associated with frequent thirst were: less treatment with ARBs, diuretic dose >40 mg/day, male gender, depression and worse NYHA class.
Holst et al., 2003 (Sweden)	To describe the self-reported fluid intake and its effect on body weight, signs and symptoms of HF, QoL, physical capacity and thirst in patients with chronic HF	Randomized cross over study	NYHA III-IV HF patients and should adhere to fluid intake of 1.5 L/day. Stable HF (70 year) EF <45%	VAS scale for thirst intensity was used. Intervention A: max fluid 1.5L/day for 6 weeks Intervention B: fluid intake 30-35 ml/kg/day for 6 weeks	A larger fluid intake was associated with decreasing thirst without any measurable negative effects on signs and symptoms of HF, diuretic use or physical activity.
Allida et al, 2016 (Australia)	To identify current strategies recommended by health professionals to help relieve thirst	Descriptive study design.	70 attendees of the 8th Annual Scientific Meeting of Australasian	A brief questionnaire developed by the investigators was used and aimed at assessing the effectiveness of various strategies	The most frequently recommended strategy was ice chips.

	in chronic HF patients and their perceived usefulness of these strategies		Cardiovascular Nursing College. Only 42 completed the survey. Majority were registered nurses	recommended to patients with chronic HF to relive their thirst	

Legend: AMSTAR: Checklist tool to assess multiple systematic reviews; EF: Ejection Fraction; ER: Emergency room; HF: Heart Failure; ICU: intensive care unit; NYHA: New York Heart Association; CCS: clinical congestion score; QoL: Quality of Life; RN: Registered Nurse; VAS: visual analogue scale

1. Factors Related to Thirst in Heart Failure Patients

As noted in Table 1, several factors were identified to be associated with thirst experienced by patients who have heart failure. These factors are reviewed below.

a. Heart Failure Treatment

The use of diuretics in HF treatment is associated with thirst. These drugs lead to a decrease in fluid retention and might lead to dehydration and they contribute to increasing Ag II levels (Finkel, Cubeddu & Clark, 2009). Other medications such as ACE-I and ARBs affect thirst by decreasing sodium and water in the body, even though they act against the neuro-hormonal activation and decrease Ag II in the blood (Sica & Prakash, 2001). The decrease in sodium and water levels in the blood leads to sodium appetite, followed by the thirst sensation (Finkel et al., 2009). According to Waldreus et al (2016), 67% of patients experienced more thirst after titrating up the aforementioned types of drugs during the optimization period of heart failure treatment (Waldreus et al., 2016).

b. Fluid Restriction, Salt Intake and Thirst

In a Randomized Clinical Trial (RCT) of patients with acute decompensated HF, aggressive fluid and sodium restriction were significantly associated with increase in perceived thirst (Aliti et al., 2013). Another intervention study done by Holst et al (2003) showed that chronic heart failure patients adhering to fluid restriction scored higher on the visual analog scale (VAS) used to measure thirst compared to those with non-restrictive fluid regimen.

Some investigators have questioned the benefits of fluid restriction. Five clinical trials showed no benefits for fluid restriction on mortality and readmissions in HF patients (De Vecchis, Baldi & Cioppa, 2016). Additionally, six RCTs that compared fluid restriction to liberal fluid intake showed no benefit for restriction on mortality and readmission in HF (Li, Fu, and Qian, 2015). Even though these studies showed no benefits of fluid restriction on mortality and readmissions, they did not address its association with thirst. One RCT showed that fluid restriction, as a part of self-care practices in HF, is highly associated with thirst (Aliti et al., 2013).

In the literature search, no studies were found that specifically addressed the association between thirst and salt intake in heart failure patients. Only Vander Wal et al. (2019) reported that the most reported reasons for thirst were salty/spicy food (20%) in their study of 269 outpatients with HF. Nevertheless, investigators studied salt intake and related behaviors and beliefs in Lebanon. A study was done by Walsh et al (2017) to characterize attitudes, motivators, behaviors, and knowledge related to salt consumption in high-risk Lebanese population (cardiac care patients) and identify factors associated with favorable and non-favorable behaviors associated with salt consumption (Walsh et al., 2017). The investigators administered a questionnaire that addressed the above-

mentioned variables of salt to patients in the cardiac care unit. The results of this study showed that there are multiple knowledge gaps related to salt consumption, in addition to negative behavioral practices (Walsh et al., 2017). Multiple regression analysis showed that gender, attitude score, having diabetes or hypertension and previous advice by a healthcare provider affected some salt-related behaviors (Walsh et al.,2017).

Moreover, Nasreddine, Akl, Al-Shaar, Almedawar and Isma'eel (2014) conducted a study to examine salt-related knowledge, attitudes, and behaviors amongst adult Lebanese consumers and to investigate the association of socio-demographic factors, knowledge, and attitudes with salt-related behaviors. They used the same questionnaire mentioned above. Using systematic random sampling, participants were recruited from nine supermarkets in Beirut (Nasreddine et al., 2014). The study showed major behavioral and knowledge gaps related to salt consumption (Nasreddine et al., 2014). Only 22% of participants identified processed foods as the main source of salt, 55.6% recognized the relationship between salt and sodium, 32.4% recognized the daily limit of salt intake and 44.7% reported their concern about the amount of salt in their diet (Nasreddine et al., 2014). This study also showed that majority of participants had behaviors that increase the consumption of salt, such as not checking for salt content on food labels and less likelihood to buy low-salt products (Nasreddine et al., 2014).

Based on the physiology that underlies thirst, one may assume the effect of salt variables on HF and thirst to be as follows. Poor knowledge, attitudes and behaviors toward salt consumption will lead to salt intake and therefore thirsty feeling induced by high amount of sodium in the blood. Because of thirst, there will be more fluid intake and consequently fluid overload, leading to HF exacerbation and hospitalization. This assumption was not empirically tested, so there is a need to fill this gap in knowledge.

c. Emotions and Thirst

Anxiety was found to be significantly associated with the intensity of thirst in HF patients. A study done to measure thirst in anxious and non-anxious HF patients showed higher thirst score in those with anxiety compared to those without (Waldreus et al., 2011). Waldreus et al (2014) showed in their study that thirst was associated with male gender, higher body mass index (BMI), more HF symptoms and depression (Waldreus et al., 2014). Moreover, in a study by Van der Wal et al (2019), the most frequently reported reasons for thirst by HF patients were stress, salty/spicy food, low fluid intake, dry air, exhaustion, and diabetes (Van der Wal et al., 2019). Additionally, depression was also associated with thirst in a study done by Eng et al., (2020).

2. Demographic and Clinical Variables Associated with Thirst

Waldreus et al (2014) studied the trajectory of thirst during an 18-month period. In this study, age was associated with thirst description. Persistent thirst was more common in younger than in older patients (Waldreus et al., 2014). This finding is maybe explained by the fact that thirst becomes blunted with age (Farrell, Zamarripa & Shade, 2008). Older people have decreased cerebral blood flow, so as a result, osmotic receptors in the brain become less sensitive (Farrell et al., 2008). Thirst awareness becomes diminished in older adults due to thinning in the oral mucosa and changes in salivary composition (Allida et al., 2018).

Another variable associated with thirst is gender. Men with HF were found to have more frequent thirst than females (Allida et al., 2018). This is normally because men are usually slightly dehydrated (Allida et al., 2018), because men tend to sweat more and faster than women; therefore, they lose more fluids (Muth et al., 2019).

An additional variable found to be positively correlated with thirst is high serum urea level (Waldreus et al., 2014). Urea is a marker of dehydration and indicates neurohormonal activation. Finally, patients with HF and other comorbidities such as diabetes mellitus and kidney failure are more prone to increased thirst intensity than those with heart failure only (Allida et al., 2014).

3. Strategies to Alleviate Thirst in Patients with Heart Failure

A qualitative study done by Van der Wal et al (2010) investigated patients' reasons and motivations for compliance with HF regimens from their perspective and studied how patients manage these recommendations in daily life. This study highlighted thirst as a major barrier to compliance, especially with fluid restriction (Van der Wal et al., 2010). Patients were asked to report strategies they use to control thirst. Some reported that they distribute the amount of fluid throughout the day, others use very cold drinks and homemade ''ice-lollies" (Van der Wal et al., 2010). Moreover, some patients reported that they use peppermint or buttermilk, and use less sugar during the day (Van der Wal et al., 2010)

Furthermore, Allida et al. (2016) conducted a study to identify the current strategies recommended by health professionals to help relieve thirst in chronic HF patients and their perceived usefulness of these strategies. The most recommended strategy was ice chips (Allida et al., 2016). Additional recommended strategies were small sips of water, iced water, lozenges, peppermint, artificial saliva, cold water with a slice of lemon and chewing gum (Allida et al., 2016). Other strategies included freezing fruits in ice cube trays and distributing the allowed water amount throughout the day

(Allida et al., 2016). These recommended strategies are similar to the those reported to be used by patients in a study by Van der Wal et al. (2010).

The literature lacks enough intervention studies that address thirst in heart failure patients (Waldreus et al., 2013). Chewing gum is an intervention frequently studied on renal failure patients and newly studied on HF patients in one RCT. A randomized clinical trial was done by Allida et al (2020) to determine the effect of chewing gum on the level of thirst in the short-term (average of 24 hours each day for 4 days) and in the longer-term (Days 7, 14 and 28) in individuals with HF. Seventy-one patients on oral loop diuretics were included and randomized to either receiving the intervention (chewing gum) or control (Allida et al., 2020). Patients were instructed to chew the gum gently, for a minimum of 10 minutes, six times a day and as needed whenever they feel dry mouth or thirsty (Allida et al., 2020). Thirst was assessed using the visual analogue scale (VAS) and the numeric rating scale (NRS) at each time interval (Allida et al., 2020). Both the VAS and NRS scores were decreased at day 4 in both groups; however, there were no significant difference when adjusted for BMI (Allida et al., 2020). However, there were a significant difference in both groups at day 7, 14 and 28. Both VAS and NRS scores significantly decreased in the intervention group compared to the control (Allida et al., 2020).

In summary, studies about thirst in HF did not investigate thirst as the primary outcome measure. Limited information was found about thirst prevalence, distress, intensity, and its effect on HF patients. Few studies highlighted the major factors that are associated with thirst in patients with HF. By examining thirst in this study, the findings are expected to highlight the need for healthcare professionals, most importantly nurses, to assess thirst and its related factors. Consequently, the findings may inform new

interventions to manage this troublesome symptom. Deeper understanding of this symptom will be guided in this study using the Theory of Unpleasant Symptoms in exploring thirst and its predictors in HF (Lenz, Gift, Pugh & Milligan, 2013). The findings are expected to provide the basis for studies that allow the development of interventions to relieve this burdensome symptom in HF patients.

CHAPTER III

THEORETICAL FRAMEWORK

A. The Theory of Unpleasant Symptoms

The middle-range Theory of Unpleasant Symptoms was used in this study to explore thirst in HF patients and describe the interaction between factors associated with this symptom experience. This theory portrays the dimensionality of symptoms and the interaction between these symptoms (Lenz et al., 2013). According to this theory, the interaction between physiological, situational, and psychological factors should precede the development of a symptom (Lenz et al., 2013). The purpose of this theory is to promote better understanding of any symptom, therefore facilitating the creation of new interventions to manage the studied unpleasant symptom (Lenz & Pugh, 2014). The Theory of Unpleasant Symptoms includes three components: the antecedent factors, the symptom experience and the resulting performance of the individual that is affected by the symptom experience (Lenz & Pugh, 2014).

The Antecedent factors: Mainly three groups of factors are thought to influence the symptom's experience. These factors are physiological, psychological and situational factors (Lenz et al., 2013). These factors are not only related individually to the symptom, but they also interact with each other. The more the interaction, the greater the unpleasant experience of the symptom (Lenz & Pugh, 2014). The physiological factors are those that impact the normal body's physiological function such as genetics, pathological diseases, and pharmacological variables (Lenz, Pugh, Milligan & Gift, 1997). The psychological factors include the person's mood, mental status, knowledge and understanding of the symptom and the affective reaction to the illness (Lenz et al., 1997). Finally, the situational factors are external factors, namely the physical and social environment (Lenz

et al., 1997). Moreover, the lifestyle of individuals can affect the experience of the symptom and how it is reported. Examples of situational factors are culture, marital status, social support, diet, exercise and access to healthcare (Lenz et al., 1997). Salt intake, which is prevalent in Lebanon, especially that its most common source, bread, is a major staple in the Lebanese diet and is restricted in HF patients, was studied in this paper.

The symptom Experience: The symptom experience is described based on four aspects: intensity, frequency/time, quality and distress (Lenz et al., 1997). Intensity means the strength of the symptom and can be measured by the visual analogue scale or a numerical grading (Lenz & Pugh, 2014). Time refers to the frequency of symptom occurrence, its duration and pattern (Lenz & Pugh, 2014). Distress represents the degree to which the person is bothered by the symptom (Lenz & Pugh, 2014). Finally, the quality represents the person's feeling and degree of discomfort. Usually, the quality of a symptom is a subjective attribute described by the individual using his/her own words and can be inferred by asking open-ended questions (Lenz & Pugh, 2014). The quality aspect is explored in this research study.

Performance: This component is influenced by the symptom experience (Lenz et al., 1997). Performance includes functional and cognitive aspects. Functional Performance can include physical activity, activities of daily living, as well as social relationships and interactions. Cognitive performance can be the individual's concentration, problem solving and critical thinking (Lenz & Pugh, 2014). The poorer the performance, the greater the negative effect on the antecedent factors, ending up in a loop of interactions all affecting the symptom experience.

In this study, only the first two components of the theory were examined, namely antecedent factors and the symptom experience. The antecedent factors include

physiological and situational factors. Based on the literature and the Theory of Unpleasant Symptom, the following figure (Figure 1) shows the conceptual model for the study.

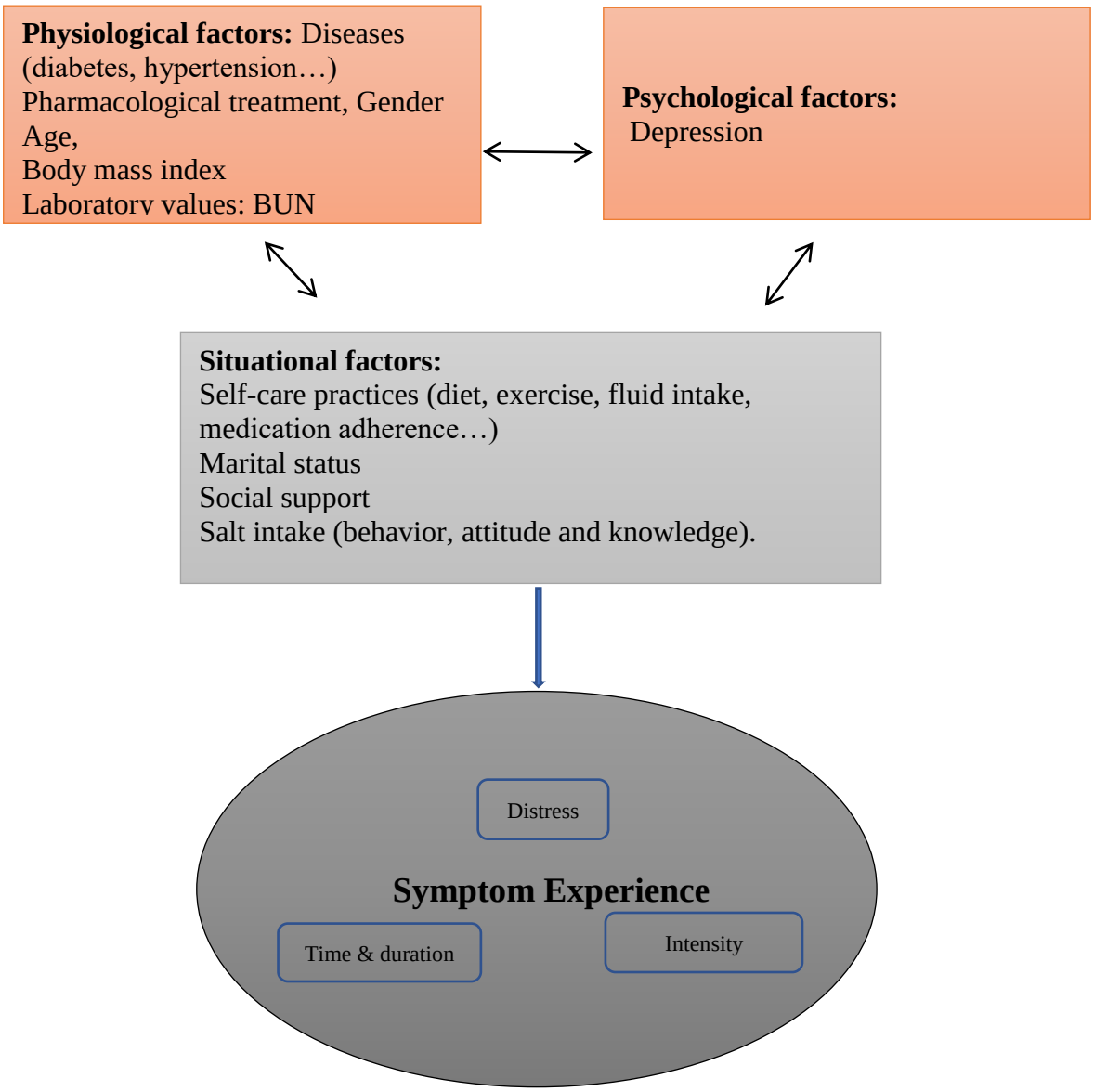


Figure 3.1. The conceptual model for the study that shows the interaction between the antecedent factors (independent variables) and their effect on thirst in terms of intensity, distress, duration and time.

CHAPTER IV

METHODS

A. Design and Setting

A cross-sectional, descriptive, and correlational study design was used to describe thirst and its predictors. The relationship between thirst and its associated factors was examined in this study. All data were prospectively collected. This design was appropriate to answer the research question since the aim was to describe the prevalence, characteristics and factors associated with thirst. There was no intervention being tested, nor control that was needed to be exercised; the study aimed at examining the variables as they occurred and the associations between them.

Data were collected between December 2021 and April 2022 (5 months). It included inpatients admitted with a diagnosis of heart failure (HF) to the Coronary Care Unit at the American University of Beirut Medical Center (AUBMC) and the Rafik Hariri University Hospital (RHUH), in addition to outpatients who visited the HF clinic at AUBMC.

B. Sampling

A convenience sampling design was used in this study. The target sample size was 100 HF patients, including those with HF-rEF, HE-pEF and midrange EF-HF, with NYHA class I-III. A total of 117 patients were approached due to the economic crisis that affected the number of patients who visited health care institutions. Out of the 117 patients, 21 patients refused to participate, 2 patients were recruited but passed away prior to the interview and 4 patients were recruited but they did not answer the phone call for the interview. A total of 90 patients were recruited and interviewed. As per the sample

distribution per location, 25 patients were recruited from the CCU at RHUH and the rest from AUBMC, with 45 and 20 patients from the HF clinic and CCU, respectively. The reason behind this sample distribution is the closure of CCU at RHUH during the time of the study for renovation purposes and the fact that this hospital did not have an outpatient clinic.

Among the patients recruited from the outpatient clinic at AUBMC, only 29 could be recruited during their clinic visit. Thus, a random selection of 20 patients from a list of HF patients, who agreed to be contacted for research studies, was done. Patients were recruited over the phone; 16 patients from that list got enrolled and 4 refused.

Inclusion Criteria of the sample included: 1) Patients diagnosed with HF as documented in their medical record and confirmed by echocardiography; 2) New York Heart Association (NYHA) class I, II or III (Presenting to HF clinic or hospitalized); and 3) Age $\geq$ 30 years (based on clinical and population data). The sample's exclusion criteria were: 1) Patients with kidney failure on hemodialysis ; 2) Patients with severe pulmonary disease who required high oxygen therapy (e.g., intubated patients, patients on high Bilevel Positive Airway Pressure [BIPAP] settings, or patients in distress who could not undergo the interview); 3) Patients with short-life expectancy as documented in their medical record (less than six months); 4) Patients with cognitive impairment who had difficulty understanding questions, such as patients with documented delirium or dementia; and 5) Patients with documented major psychotic disease.

C. Procedure and Data Collection

Institutional review board at AUB and RHUH (Appendix I), in addition to the administration approval in both hospitals were secured. An email was sent to cardiologists to get their permission to recruit their patients (see Appendix II).

A recruiter (cardiology nurse) was assigned to enroll eligible patients from AUBMC CCU, HF outpatient clinic and RHUH CCU. A standardized recruitment script was used whereby the recruiter informed patients briefly about the study (see Appendix III). The only difference in RHUH was that the recruiter was a research assistant with medical background whereas at AUBMC the recruiters were inpatient and HF clinic nurses.

Whenever the patient expressed interest to participate, he/she was referred to the researcher after approving to share his/her phone number with the researcher. The nurse contacted the researcher and sent the list of patients with their phone numbers for the researcher to contact them. The same procedure was followed in both recruitment sites AUBMC and the Rafik Hariri University Hospital.

Once patients approved to participate and were referred to the researcher, the researcher called them by phone and explained the study in detail (See script in Appendix IV), answered any questions they may have had and then sent the informed consent by WhatsApp (see Appendix V). The whole interview, whether for inpatients or those who presented to the clinic, was conducted over the phone. The interview average was around 20 mins with a range 15-40 mins Furthermore, patients who were randomly selected from the HF patients' list were called by the recruiter using the same mentioned script. Those who approved were called again by the researcher for the interview.

In addition to the data collected by interview, some demographic and clinical data were collected from the patient's medical record, using standard EPIC protocols. This

data included gender, age, height and weight, duration of heart failure, vital signs and ejection fraction, NYHA class, BUN, comorbidities, the medications the patient was receiving and their doses, and non-pharmacologic treatments. These data are shown in Appendix VI. Data that were taken from patients' medical record are shown in the patient collection tool. They were included in the consent form and were collected after obtaining the patient's approval.

The interview included questionnaires related to thirst, as well as knowledge, behaviors, and attitudes related to salt consumption in addition to the patient health questionnaire (PHQ2). These questionnaires are described below.

D. Measures

1. Thirst questionnaire

The thirst questionnaire (Waldreus, Jaarsma, Van der Wal & Kato, 2018) has three scales that measure thirst distress, thirst intensity and thirst frequency (see Appendix VII). Thirst distress was measured using the Thirst Distress Scale for HF patients (TDS-HF). TDS-HF is an 8-item, 5-point Likert scale. This tool was previously a 9-item scale, but one item was removed due to redundancy that was evident by higher than maximum Cronbach alpha coefficient. The scale includes the following statements: "My thirst bothers me a lot", "I am very uncomfortable when I am thirsty" and "My thirst feels difficult to overcome". Additional statements about feelings in the mouth include "My mouth feels like sandpaper when I am thirsty", "My mouth feels dry when I am thirsty" and "My saliva is very thick when I am thirsty". Two statements that highlight the tendency to drink more water are also included in this scale, which are "When I drink less water, my thirst gets worse" and "I am so thirsty I could drink water uncontrollably".

Patients were asked to rate their agreement with these statements on thirst ranging from strongly disagree (1) to strongly agree (5). The total score ranges from 8 to 40, with higher scores representing higher thirst distress. In this study, patients were classified into five categories. No thirst distress (score 8), mild thirst distress (9-16), moderate thirst distress (17-24), strong thirst distress (25-32) and severe thirst distress (33-40). This 8-item TDS-HF scale was found to be reliable and valid for measuring thirst in HF patients (Waldreus et al., 2018). Psychometric assessment of this scale showed test-retest reliability coefficient of 0.88 (Waldreus et al., 2018). The Cronbach's alpha coefficient was 0.9 (Waldreus et al., 2018). See TDS-HF Appendix VII. The main version of this scale is in English Language. It was translated to Arabic for this study.

Thirst intensity was measured by a numeric rating scale (NRS). Patients were asked to rate their thirst intensity from 0 to 10, with 0 reflecting no thirst at all and 10 the maximum level of thirst ever experienced (See appendix VII). The visual analog scale was validated for use in HF patients (Holst et al., 2003). Since the data were collected by phone interview, permission was secured from Waldreus, the developer of the scale (personal communication), to use a numeric rating scale rather than a visual analog scale for this study.

The frequency of thirst was assessed by asking three multiple choice questions targeting the frequency of thirst, duration and time point of the day when thirst is felt (see Appendix VII).

2. Knowledge, attitudes, and behaviors related to sodium intake

As mentioned earlier, lifestyle including salt intake behaviors is part of the situational factors associated with thirst according to the theory of unpleasant symptoms. Salt-related topics were measured using a multicomponent questionnaire developed by

Nasreddine, Al-Shaar, Almedawar and Ismaa'el (2014). The questionnaire has three parts: knowledge, attitudes, and behavior questions (see Appendix VIII). The questionnaire was translated into Arabic and pilot tested before its implementation in the field (Nasreddine et al., 2014). All the patients' answers were translated into numerical values to be statistically tested.

Starting with the knowledge component, this section included 27 questions that have one correct answer. Every question is represented by either 0 (wrong answer/don't know) or 1 (correct answer). These questions addressed familiarity with daily salt intake requirements and knowledge of the salt content of different types of foods. It also tackled knowledge of salt/sodium and its associated health conditions (Nasreddine et al., 2014). Participants were asked to identify the statement that best describes the relationship between sodium and salt, the one that best describes the maximal limit for daily salt intake and the one that best describes the main source of salt in the Lebanese food (Nasreddine et al., 2014). Participants were also asked to classify foods according to their salt content (high, medium, or low).

The attitudes' part included four questions that address salt-related attitudes. Three questions were rated on a five-point Likert scale ranging from strongly disagree to strongly agree (Nasreddine et al., 2014). The fourth question inquired whether the participant was concerned about the amount of salt/sodium in his/her diet and answered by "Yes" or "No" (Nasreddine et al., 2014).

Finally, the behaviors' part included two questions about the use of food labels in general, two questions about the use of salt-related food labels and two questions about the frequency of "trying to buy low-salt" products and the frequency of "trying to buy no added salt" foods (Nasreddine et al., 2014). An additional question addressed the

frequency of adding salt during cooking and at the table. Moreover, an additional question examined whether the individual was "cutting down on salt", with yes/No response options (Nasreddine et al., 2014). Responses for the behavior-related questions included "often", "sometimes" and "never".

In addition to the three sections, the participant was asked the following questions: whether he/she thinks that salt-related label information is comprehensible, what information on the food package he/she uses to determine how much salt is in the product and how does the participant think his/her salt intake compares to the daily limit of intake (Nasreddine et al., 2014). The participants were asked whether they are concerned about artificial flavors, artificial colors, sugar, calories, or saturated fat in foods. Participants were also asked whether they received advice from health care professionals about their salt intake (Nasreddine et al., 2014). Finally, fluid restriction was assessed by asking participants if they were prescribed to restrict the amount of fluid they drink per day.

Knowledge and attitude summative scores were calculated. For the knowledge, the score was based on the number of correct answers to knowledge questions, with scores ranging from 0 to 27; the higher the score the higher the knowledge (Nasreddine et al., 2014). In addition, an attitude score was created based on the number of favorable attitude statements, with scores ranging between zero and four; the higher the score, the more favorable is the attitude towards reducing salt intake (Nasreddine et al., 2014). Internal consistency testing for the knowledge and attitude scales showed Cronbach's alpha coefficients 0.75 and 0.72, respectively (Nasreddine et al., 2014).

3. Depression

Depression was assessed using the patient health questionnaire- 2 (PHQ-2) shown in Appendix IX. The PHQ-2 includes the first two items of the original PHQ-9 screening tool for depression (Kroenke, Spitzer & Williams, 2003). The stem question is, "Over the past two weeks, how often have you been bothered by any of the following problems?" The two items are "Little interest or pleasure in doing things" and "Feeling down, depressed, or hopeless." For each item, the response options are "Not at all," "Several days," "More than half the days," and "Nearly every day," scored as 0, 1, 2, and 3, respectively (Kroenke et al., 2003). Thus, the PHQ-2 score can range from 0 to 6 (Kroenke, Spitzer & Williams, 2003). See Appendix IX. A score of 3 points or more on the PHQ-2 has a sensitivity of 83% and a specificity of 92 % for major depressive episode (Thibault & Steiner, 2004). Score interpretation depends on the PHQ-2 score and shows the probability that the patient has major depressive disorder or any depressive disorder, as shown in Appendix IX (Thibault & Steiner, 2004).

The PHQ-9 from which PhQ-2 items are extracted was validated in Arabic and used in Saudi Arabia and Lebanon. The Arabic version of the PHQ-9 reliability and validity were tested in Saudi Arabia, with Cronbach's alpha coefficient of 0.86 (Al Hadi et al., 2017). Moreover, PhQ-9 was also validated in Lebanon on psychiatric outpatients by Sawaya et al., (2016), and the items of the PHQ-9 were highly consistent (Cronbach's alpha 0.88). Moreover, a study by Zahwe et al. (2020) examined the psychometric properties and cultural validity of an Arabic version of the Minnesota Living with Heart Failure Questionnaire (MLHFQ); HF patients were interviewed with the Arabic MLHFQ and the PHQ-9. The Cronbach's alpha coefficient of the PHQ9 was 0.92 (Zahwe et al., 2020). Finally, a study by Deek et al (2020) was done to document in-hospital

management and discharge trends of patients who presented for acute heart failure. In this Lebanese HF snapshot, HF patients were screened for depression using the PHQ-9 (Deek et al., 2020). The mean score of this questionnaire was 14, indicating major depression (Deek et al., 2020). The PHQ-2 (rather than the PHQ9 version) was used in this study to reduce respondent burden. Finally, a PHQ-2 summative score was calculated for each participant.

4. Translation of the Thirst Scales

The thirst scales were developed in English. The process of translation entailed forward and backward translation. Two translators were assigned to perform the forward translation from English to Arabic. The forward translators had the target language as their mother tongue; one translator was a nurse who had expertise on the construct to be measured (thirst/thirst distress) and the second one was a language expert who was naïve on the topic. The translators worked independently from each other, and they were instructed to stay close to the English version. The project team compared the two Arabic versions, combined and reviewed the final Arabic version. There were some differences between the two versions regarding the selection of certain terms, such as the translation of the following statements "I feel uncomfortable when I am thirsty", "my saliva is very thick when I am thirsty", "Thirst intensity", "my mouth feels like sandpaper when I am thirsty" and "around the clock". A dictionary was used to find the most suitable and comprehensible words to finalize the Arabic version.

As for the backward translation (Arabic to English), two translators were recruited. The back translators had the original (English) language as their mother tongue. They were blind for the original version of the questionnaire. The two back translated version were

very close to each other and to the original version. The differences were only in the choice of certain words, for example one translator used the word "glass-paper", the other used "broken glass" while it was "sandpaper" in the original version.

Finally, a pilot test was done to evaluate the interpretation and cultural relevance of the items, and the ease of comprehension. It included only the thirst questionnaire. The pilot testing included two patients who met the eligibility criteria of the study. The pilot study data were not included in the analysis of the main study. The pilot test did not warrant any changes in the study questionnaire.

E. Human subject considerations

This was a minimum risk study as its procedures did not entail any more risk than what is experienced in daily life. To protect the privacy and well-being of participants, several measures were taken. First, recruitment was made by a trained cardiology nurse using a standard script; no coercion nor undue influence were allowed. Referral to the researcher was made only if patients agreed to share their phone number. The data collection was done over the phone to reduce any exposure related to COVID19. Moreover, informed consent was secured over the phone, the form was sent to the participant by WhatsApp and enough time was provided and questions were answered before data were collected. Moreover, participants were informed of their rights as research participants, benefits and risks associated with participation in the study, as well as the voluntary nature of participation. Moreover, to ensure that older adults were providing a valid consent, the researcher asked them if they understood what he/she has explained and asked them to repeat the purpose of the study. Identifying data were stored

separately from the data form. Data shall be destroyed 3 years following completion of the study.

For those patients who displayed emotional distress or score above the cutoff of the PHQ-2, their treating physician was informed via email (see Appendix X). In fact, six patients had a PHQ-2 score ≥3. A notification email was sent to their corresponded doctor. Moreover, these patients were encouraged and reminded to seek psychological support if they want. They were given the contact number of the AUBMC psychiatry department, as well as the hotline number of Embrace, which is an NGO that provides free services. These contact numbers are mentioned in the consent form. Finally, all interviews went smoothly with no signs of distress, only few patients requested to complete what was left from the interview after few hours because they were busy (e.g., at work or cooking)

F. Data Analysis

1. Sample size estimation

For the sample size estimation, the only study that reported predictors of thirst was that by Eng et al. (2020) who used logistic regression analysis to predict the frequency of thirst and reported Naegel Kerke $R^2 = 0.18$, thus providing a moderate effect size. In this study, we used the intensity of thirst as the primary outcome. As per Polit and Beck (2010), sample size calculation was done as follows. For a linear multiple regression with six predictors (age, gender, diabetes, salt intake, fluid restriction, use of diuretics, depression), a moderate effect size, alpha = 0.05 and power 80%, the minimum sample size needed was 98 patients. Considering a 25% refusal rate, we planned to approach 125 patients.

2. Analyses by aim

Descriptive statistics including means, standard deviation, frequencies and percentages (depending on the level of measurement of the variable) were used to describe the demographic characteristics of the sample, the TDS-HF scale results, the VAS-HF results and the behaviors and attitudes toward salt intake in order to answer aim 1 of the study. The primary outcomes were normally distributed, therefore parametric tests were used in the analysis.

For aim 2o on the association between thirst and behaviors related to salt intake, we used for thirst each of the intensity, frequency and distress. For behaviors related to salt intake, we used the following items: are you cutting down on salt? how often do you add salt at the table? how often do you check the salt/sodium content on food labels. For testing the associations, we used chi squared tests, independent sample t tests, and ANOVA. We also tested the association between the thirst variables and the medical record data on prescribed salt restriction using t tests and chi squared tests.

Moreover, a knowledge score was created to each participant by adding the correct answers from each of the 27 questions, with scores ranging from 0-27. The knowledge part includes 32 items, we only used 27 questions in line with a study by Nasreddine et al (2014). Like the knowledge score, an attitude score was calculated based on four questions, the three Likert scale questions and the question related to participants concern about salt/sodium as shown in table 9 The score ranged from 0-4. To come up with a knowledge score, the 27 questions were coded into "correct" and "incorrect". Likewise, for the attitude score, the 4 questions were coded into "favorable" and "non-favorable". Finally, for the 4 questions related to food content label, "I never do grocery" was recoded

into missing data. Similarly, "not applicable/I don't prepare the food" was recoded into missing data in the question related to adding salt on the table.

Bivariate analyses including Chi-Square, ANOVA, t-test and Pearson r correlation coefficient were used to study the associations between predictor variables and the thirst outcome variables (aim 3), depending on the level of measurement of the variables. A multiple linear regression model was used to examine predictors of thirst intensity and distress and their covariates. Those variables with a p value of <0.1 were entered into two backward regression analyses. The two outcome variables (TDS-HF and NRS-HF score) were used for the multiple regression analysis.

CHAPTER V
RESULTS

This chapter presents the result of the study. The results are displayed by aim, starting with an overview of the characteristics of the sample, followed by description of the prevalence of the thirst outcomes, the relationships between these outcomes and behaviors related to salt intake, and ending with associations between thirst outcomes and the study variables to identify predictors of thirst intensity and thirst distress.

A. Sample Socio-demographic and Clinical Characteristics:

Out of the 117 eligible patients who were approached, a sample of 90 patients were interviewed. The response rate was 76.92; 21 patients refused, 4 did not answer the phone call after recruitment and 2 were deceased following recruitment and before the interview. The demographic characteristics of the study participants are shown in Table 2 below. As shown in the table, the majority of participants (57.8%) were males. The mean age of the participants was 65.83±12.94 years. Most of the study participants were married (74.4%) and living with partners (70%). Moreover, almost half the sample (41.1%) had university education.

Table 2 Socio-demographic characteristics of participants (N=90)

Characteristics	**Frequency**	**Percent**
Age (years) Mean± standard deviation	65.83±12.94	
Gender		
Male	52	57.8%
Female	38	42.2%
Marital Status		
Married	67	74.4%
Widowed	20	22.2%
Single	3	3.3%
Living		
Alone	3	3.3%
With partner	63	70%
With Other	24	26.7%
Educational Level		
Illiterate	6	6.7%
Primary school	11	12.2%
Secondary school	30	33.3%
Vocational training	6	6.7%
University education	37	41.1%

The Clinical characteristics of the sample are shown in table 3. Out of the 90 patients, 50% were recruited from the clinic and the other half from CCU. The average duration of heart failure (HF) among participants was 5.79±5.2 years, with the majority of participants classified as NYHA class II (n=44, 48.9%), and mean left ventricular EF of 37.55±11.45%. Moving to the physiologic measures, the mean blood pressure was 118.83±19.03 and 67.63±12.91 for the systolic and diastolic blood pressures, respectively. Moreover, the mean heart rate was 72.19±9.71 beats/min and the mean BUN level was 32.95±20.95 mg/dL. Finally, most of the study participants were overweight with a mean body mass index (BMI) of 28±6. In fact, 44.4% were overweight and 25.6% obese, with 27.8% having normal body weight. Moreover, only 29 patients (32.2%) were current smokers.

Table 3 Clinical Characteristics of Participants (N=90)

Characteristics	**Mean ± Standard Deviation**	
Body mass Index	28.06±6.08	
Duration of Heart Failure (years)	5.79±5.23	
Left ventricular ejection fraction	37.55±11.45	
Blood Pressure (mmHg)		
Systolic blood pressure	118.83±19.03	
Diastolic blood pressure	67.63±12.91	
Heart rate (bpm)	72.19±9.71	
BUN (mg/dL)	32.95±20.95	
Variable	**Frequency**	**Percent**
NYHA Class – N (%)		
NYHA I	24	26.7%
NYHA II	44	48.9%
NYHA III	22	24.4%
Presenting to		
CCU	45	50%
Outpatient clinic	45	50%
Current Smoking	29	32.2%

Legend: BUN: blood urea nitrogen; NYHA: New York Heart Association; CCU: Cardiac Care Unit

B. Sample Comorbidities and Treatments

Table 4 illustrates cardiac and non-cardiac comorbidities reported by the participants. Diabetes Mellitus II (DM II) and hypertension were the most common comorbidities reported in 57 (63.3%) and 61 (67.8%) participants, respectively. The next most common cardiac comorbidity was ischemic heart disease (n=41, 45.6%). Additionally, almost one third of the sample (28.9%) had a history of atrial fibrillation and one fifth (20%) had dyslipidemia.

Table 4 Comorbidities present among study participants (N=90)

Comorbidities	**Frequency**	**(%)**
Non-Cardiac Comorbidities		
Diabetes type 2	57	63.3%
Dyslipidemia	18	20.0%
Anemia	15	16.7%
Chronic Obstructive Pulmonary Disease	8	8.9%
Stroke	7	7.8%
Hypothyroidism	7	7.8%
Chronic renal disease	5	5.6%
Cardiac Comorbidities		
Hypertension	61	67.8%
Ischemic heart disease	41	45.6%
Atrial fibrillation	26	28.9%
Valvular heart disease	15	16.7%
Congenital heart disease	1	1.1%

Table 5 shows the pharmacological and non-pharmacological treatments that the patients were receiving. Fluid (81.1%) and sodium (90%) restriction were frequently prescribed to most participants, as shown in table 5. The mean fluid restriction amount was 792±370 ml/day (excluding missing data). Besides, 24.4% of the sample had an ICD in comparison to 7.8% who had CRT.

In terms of pharmacologic treatments, patients were prescribed standard HF medications; beta blockers were prescribed for 84.4%, loop diuretic (namely Lasix) for 67.8%, and ARNI for 41.1%. Of those who were on diuretics, ten patients had a dose increase in the last 24 hours whereas only four had a dose decrease. Likewise, Plavix, statins, aspirin, omeprazole, oral hypoglycemics and MRAs were all frequently prescribed to study participants. On the other hand, only few patients were taking antidepressants (n=4, 4.4%).

Table 5 Treatments received by study participants (N=90)

Treatments	**Mean ± SD**	**Frequency**	**Percent**
Non-pharmacological treatments			
Fluid restriction		73	81.1%
Amount prescribed (ml/day)	792.68±370.40		
Sodium restriction		81	90.0%
Cardiac resynchronization therapy		7	7.8%
Implantable cardioverter defibrillator		22	24.4 %
Pharmacological Treatment	Frequency	Percentage	
Diuretics	61	67.8%	
Dose increased in the last 24 hrs.	10	16.4%	
Dose decreased in the last 24 hrs.	4	6.5%	
Beta blocker	76	84.4%	
Angiotensin receptor-neprilysin inhibitor (ARNI)	37	41.1%	
Mineralocorticoid receptor antagonist (MRA)	28	31.1%	
Angiotensin-converting enzyme inhibitor (ACEI)	15	16.7%	
Angiotensin receptor blocker (ARB)	14	15.6%	
Omeprazole	71	78.9%	
Antidepressant	4	4.4%	
Aspirin	50	55.6%	
Plavix	19	21.1%	
Amiodarone	6	6.7%	
Statins	57	63.3%	
Hypoglycemics	33	36.7%	

C. Thirst Intensity, Frequency and Distress.

To answer aim 1 of the study, thirst was assessed in terms of intensity, distress, frequency, and duration. The mean thirst intensity score was 3.82±2.21. Results regarding thirst frequency and duration are shown in table 6 The most reported frequencies of thirst were a couple of times per week (43.3%) and a couple of times per month (26.7%). On the other hand, 14.4% and 8.9% of patients reported having thirst almost every day and every day, respectively. Thirst frequency was divided into two groups: never or sometimes thirst (couple of time per month and per week) and frequent thirst (almost every day and every day). Majority of participants were in the never or sometimes-thirst group 76.7%. Furthermore, one third of those who felt thirsty reported that thirst lasts for an hour or less (33.3%), for several hours (31.1%), or some hours (30.0%). Additionally, 41.1% and 36.7% of patients reported being most thirsty in the morning and afternoon, respectively.

Table 6 Thirst Frequency among the study participants (N=90)

Frequency	**Frequency**	**Percent**
How often have you been thirsty the last month?		
Everyday	8	8.9%
Almost Everyday	13	14.4%
A couple of times per week	39	43.3%
A couple of times per month	24	26.7%
Never	6	6.7%
When you are thirsty, for how long does your thirst last?		
Around the clock	1	1.1%
Half a day	4	4.4%
For several hours	28	31.1%
For some hours	27	30.0%
For an hour or less	30	33.3%
When thirsty, at which time point of the day are you most thirsty?		
Morning	37	41.1%
Afternoon	33	36.7%
Evening	13	14.4%
Night	7	7.8%

In addition, a thirst distress score was calculated for each participant. The mean score was 23.58±7.66. Scores were divided into five categories: no thirst distress, mild, moderate, strong, and severe thirst distress. The two major groups were moderate and strong thirst distress, reported by 31.1% and 33.3% respectively. Table 7 shows thirst distress frequencies in the eight scale items. In this study, the Cronbach alpha for the thirst distress questionnaire was 0.981.

Table 7 Thirst Distress among Study Participants (N=90)

Items	**N (%)**				
	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
My thirst bothers me a lot	4 (4.4%)	25 (27.8%)	27 (30.0%)	27 (30.0%)	7 (7.8%)
I am very uncomfortable when I am thirsty	6 (6.7%)	25 (27.8%)	25 (27.8%)	27 (30.0%)	7 (7.8%)
My mouth feels like sandpaper when I am thirsty	6 (6.7%)	26 (28.9%)	36 (40.0%)	18 (20.0%)	4 (4.4%)
My mouth feels dry when I am thirsty	7 (7.8%)	23 (25.6%)	26 (28.9%)	28 (31.1%)	6 (6.7%)
My saliva is very thick when I am thirsty	7 (7.8%)	25 (27.8%)	25 (27.8%)	29 (32.2%)	4(4.4%)
When I drink less water, my thirst gets worse	4 (4.4%)	24 (26.7%)	27 (30.0%)	32 (35.6%)	3 (3.3%)
I am so thirsty I could drink water uncontrollably	9 (10.0%)	29 (32.2%)	31 (34.4%)	17 (18.9%)	4 (4.4%)
My thirst feels difficult to overcome	9 (10.0%)	27 (30.0%)	34 (37.8%)	18 (20.0%)	2 (2.2%)

D. Knowledge, Attitudes, and Behaviors related to Salt Consumption

Salt-related knowledge, attitudes and behaviors of study participants are shown in tables 8, 9 and 10, respectively. As shown in Table 8, most participants (92.2%) recognized that salt worsens their health. On the other hand, only one fifth (20%) identified the correct recommended maximum salt amount, with most of them (56.7%) answering "do not know". Yet, 78.9% of participants thought that their daily salt intake is less than or about the maximum recommended. Only one third of participants (34.4%) identified processed foods as the main source of salt in the diet. Moreover, only 25.6% identified the correct relationship between salt and sodium. The mean knowledge score was 14.2±4.6. The Cronbach's alpha of the 27-item knowledge questionnaire was 0.786. The knowledge results are shown in Table 8 below.

Table 8 Knowledge and Awareness related to salt consumption (N=90)

	N (%)
What is the effect of Salt/Sodium in your diet?	
Worsens your health (correct answer)	83 (92.2%)
Which of these health problems can be caused/aggravated by salty foods?	
Yes (correct answer)	
High Blood Pressure	82 (91.1%)
Stroke	47 (52.2%)
Osteoporosis	28 (31.1%)
Fluid Retention	74 (82.2%)
Heart attacks	56 (62.2%)
Stomach Cancer	8 (8.9%)
Kidney Disease	38 (42.2%)
Memory/concentration problems	15 (16.7%)
Asthma	8 (8.9%)
Headaches	38 (42.2%)

What is the maximum daily amount of salt recommended for adults?	
6 grams (1 teaspoonful) (Correct answer)	18 (20.0%)
How does your daily salt intake compare to the recommended amount?	
More than maximum recommended	14 (15.6%)
About maximum recommended	46 (51.1%)
Less than maximum recommended	25 (27.8%)
Do not know	5 (5.6%)
The main source of salt in the diet of Lebanese people?	
Salt in processed foods (correct answer)	31 (34.4%)
What is the relationship between salt and sodium?	
Salt contains sodium (correct answer)	23 (25.6 %)
Identify foods as high, medium, low in terms of salt/sodium content	
Bread (medium)	27 (30.0%)
Mana'esh (high)	66 (73.3%)
Traditional pies (high)	57 (63.3%)
Pizza (high)	60 (66.7%)
Rice (low)	46 (51.1) %
Cheese (high)	36 (40.0%)
Milk (low)	68 (75.6%)
Pear (low)	73 (81.1%)
Vegetables ragouts (medium)	18 (20.0%)
French Fries (medium)	37 (41.1%)
Sandwiches (e.g. shawarma, fajita, hamburger) (high)	56 (62.2%)
Soya sauce (high)	54 (60.0%)
Fresh Carrot (low)	78 (86.7%)
Ketchup (high)	27 (30.0%)
Salad dressings (high)	20 (22.2%)
Roasted nuts (high)	46 (51.1%)
Sausages and hot dogs (high)	43 (47.8%)

The results about salt-related attitudes are shown in table 9. Most participants (84.4%) reported being concerned about the amount of salt/sodium in their diet and agree to the importance of reducing it (81.1%). The two main motivators to reduce salt intake

were doctor's advice and change in the participants' health status (43.3% each). The main reported barrier against reducing salt intake was its good taste (63.3%). Participants report fear of high blood pressure (57.8%) and stroke (34.4%) from eating too much salt, and consider the physician or themselves most responsible (66.7% and 30%, respectively) for helping reduce their salt intake. The mean attitude score was 3.41±1.34.

Table 9 Attitudes related to dietary salt among study participants (N=90)

Items	**N (%)**
Present nutrition information on sodium is comprehensible?	70 (77.8%)
Are you concerned about these aspects of the food you eat?	
Artificial flavors (yes)	22 (24.4%)
Artificial colors (yes)	20 (22.2%)
Salt/Sodium (yes)	76 (84.4%)
Sugar (yes)	72 (80.0%)
Energy (calories) (yes)	33 (36.7%)
Saturated Fats (yes)	46 (51.1%)
Reducing the amount of salt you add to foods is definitely important	4 (4.4%)
Strongly agree	73 (81.1%)
Agree	10 (11.1%)
Neutral	3 (3.3%)
Disagree	
Reducing the amount of processed foods you eat is definitely important	4 (4.4%)
Strongly agree	73 (81.1%)
Agree	10 (11.1%)
Neutral	3 (3.3%)
Disagree	
Reducing your sodium intake is definitely important	
Strongly agree	7 (7.8%)
Agree	70 (77.8%)
Neutral	10 (11.1%)
Disagree	3 (3.3%)
What would motivate you to reduce your salt intake?	
A dramatic change in my health status	39 (43.3%)
If my doctor advised it	39 (43.3%)
If family members or friends advised it	12 (13.3%)

What are the barriers against decreasing your salt intake?	
It tastes good	57 (63.3%)
I am not concerned with decreasing my salt intake	28 (31.1%)
I don't know which foods to avoid	5 (5.6%)
The most frightening thing that could happen if you eat too much salt?	
Nothing bad will happen	7 (7.8%)
I could have a heart attack or stroke	31 (34.4%)
My blood pressure will go up	52 (57.8%)
Who should be MOST responsible for helping you reduce the salt/sodium you eat?	
Companies that make or sell foods with salt in them	3 (3.3%)
Your doctor	60 (66.7%)
Yourself	27 (30.0%)

The results regarding salt-related behaviors are shown in table 10. Majority of the sample (83.3%) reported that they are cutting down on salt, and more than half of them get their health information from their doctor (64.4%). Around half of participants do not do grocery shopping. Out of the 42 participants who do shopping, 33 check the food label in general and the salt/sodium content in specific. Additionally, sodium/salt content affects whether they would purchase the product in one half of those who do grocery shopping.

When it comes to adding salt on the table or while cooking, most participants reported that they never add salt, accounting for 63.3% and 40% respectively. Moreover, out of those who do shopping, most participants reported they sometimes try to buy "low or no added salt foods".

Table 10 Behaviors related to dietary salt among the study participants (N=90)

Item	**N (%)**			
I am cutting down on the amount of salt I eat	75 (83.3%)			
Where do you get your health information from?				
My doctor	58 (64.4%)			
My family and friends	24 (26.7%)			
The internet	6 (6.7%)			
Television	2 (2.2%)			
Item	**Often**	**Sometimes**	**Never**	**I Never Do Grocery Shopping**
Check the food labels when shopping	13 (14.4%)	20 (22.2%)	9 (10.0%)	48 (53.3%)
What is written on the food label affect purchase of a food item?	11 (12.2%)	21 (23.3%)	10 (11.1%)	48 (53.3%)
Look at the salt/sodium content on food labels when shopping?	12 (13.3%)	21 (23.3%)	10 (11.1%)	47 (52.2%)
Salt/sodium content on the food label affect purchase of a product?	12 (13.3%)	19 (21.1%)	12 (13.3%)	47 (52.2%)
Item	**N (%)**			
Do you do any of the following?	**Often**	**Sometimes**	**Never**	**I Don't Prepare Food**
Add salt during cooking	3 (3.3%)	32 (35.6%)	36 (40%)	19 (21.1%)
Add salt at the table	8 (8.9%)	21 (23.3%)	57 (63.3%)	4 (4.4%)
Try to buy 'low salt' foods	19 (21.1%)	25 (27.8%)	7 (7.8%)	39 (43.3%
Try to buy 'no added salt' foods	15 (16.7%)	24 (26.7%)	12 (13.3%)	39 (43.3%)
Item		**Frequency**		**Percent**
Information on the food package you use to determine how much salt is in it				
-The sodium level in the nutrition information panel		17		18.9%
The ingredients list		10		11.1%
Claims for low or reduced salt on the pack		47		52.2%
		16		17.8%

Don't know

E. Patient Health Questionnaire-2 among study participants

The probability to have major depressive disorder or any depressive disorder was assessed by PHQ-2 and results are shown in Table 11. The majority of participants reported not at all being bothered by having little interest/pleasure (53.3%) or feeling down, depressed, or hopeless (80%). The mean summative PHQ-2 score was 0.77±1.03. The scores were zero for 51.1%, one in 31.1%, two in 11.1%, three in 2.2% and four in 4.4%. The Cronbach's alpha of the PHQ-2 questionnaire in our study was 0.711.

Table 11 Patient Health Questionnaire (PHQ-2) Results (N=90)

Item	**N (%)**			
Bothered by	Not at all	Several Days	More than half the days	Nearly every day
Little interest or pleasure in doing things	48 (53.3%)	38 (42.2%)	3 (3.3%)	1 (1.1%)
Feeling down, depressed, or hopeless	72 (80%)	13 (14.4%)	5 (5.6%)	0

F. Thirst and Salt Intake

To answer aim 2 of the study about the association between salt intake and thirst, bivariate analyses were conducted between thirst intensity and thirst distress, and four questions from the salt behavior scale that reflect salt intake. First, independent sample t-tests were done to examine the association between cutting down on salt and thirst intensity and distress. The results showed no significant association between cutting down on salt and thirst intensity ($t_{(88)}$ =0.212, p-value=0.833), nor thirst distress ($t_{(88)}$=0.343, p-value=0.733). Next, spearman's rho was used to study the association

between the two main outcome variables (thirst intensity and thirst distress) and adding salt on the table. Similarly, there were no association between adding salt on the table and thirst intensity (Spearman's rho=0.133, p-value=0.29), nor thirst distress (rho=0.076, p-value 0.476). Likewise, the association between thirst and salt intake was tested using the question about checking sodium/salt content on food labels. There was no association between checking salt/sodium content on the label and thirst intensity (Spearman's rho=0.094, p-value 0.378), nor with thirst distress (Spearman's rho= -0.053, p-value 0.620). Therefore, salt intake was not correlated with thirst using the mentioned three salt questionnaire items.

On the other hand, an independent t-test was done to examine the association between the sodium restriction prescription documented in the patients' medical record, and thirst intensity and distress. Surprisingly, there was a significant association between the prescribed sodium restriction as documented in the patient's medical record and thirst intensity and distress. The mean thirst intensity score in those on sodium restriction was 3.59±2.12 versus 5.89±1.96 in those not on sodium restriction, with $t_{(88)}$ =3.09, p-value 0.003. Likewise, thirst distress mean difference was significant between those on sodium restriction (mean=23±7.61) and those not on such restriction (mean=28.6±28.67), with $t_{(88)}$ = 2.14 and p-value 0.035.

G. Sociodemographic characteristics, Clinical Variables and Thirst

To answer aim 3 regarding predictors of thirst, bivariate analyses were conducted between the primary thirst outcome variables (intensity and distress), demographic, and clinical variables. Initially, the distribution of thirst intensity and thirst distress variables were examined for skewness and kurtosis. Both variables were normally distributed.

Pearson r correlation analysis was done to examine the association of patient clinical characteristics with thirst intensity and distress. This test was used only for characteristics and clinical data that are continuous variables as shown in table 12 below.

Table 12 Correlation of Patient Characteristics and Clinical Data with Thirst

Variable	Thirst Intensity	Thirst Distress
Thirst Intensity	1	
Thirst Distress Score	**0.854**	1
P value	**< 0.001**	
PHQ Score	**0.311**	**0.227**
P value	**0.003**	**0.031**
BMI	0.102	0.140
P value	0.339	0.188
Age	**-0.205**	-.071
P value	**0.053**	0.505
Duration of HF	-0.145	-0.13
P value	0.180	0.229
LVEF	**0.285**	**0.260**
P value	**0.012**	**0.022**
Systolic BP	**-0.222**	-0.163
P value	**0.043**	0.142
Diastolic BP	**-0.204**	**-0.191**
P value	**0.065**	**0.084**
Heart rate	0.112	0.108
P value	0.311	0.330
BUN	0.075	0.150
P value	0.520	0.198

Legend: BMI; body mass index; BP: blood pressure; BUN: blood urea nitrogen; HF: heart failure; LVEF: left ventricular ejection fraction

Most variables were not associated with thirst intensity or distress, including BMI, duration of HF, heart rate and BUN. Age had a borderline significant correlation with thirst intensity (Pearson r =-0.205, p-value 0.053) but no association with thirst distress (Pearson r= -0.071, p-value 0.505). Systolic blood pressure was significantly associated with thirst intensity (Pearson r= -0.222, p-value 0.043) but not with thirst distress (Pearson r=-0.163, p-value=0.142). Moreover, diastolic blood pressure had also a

borderline significant correlation with thirst intensity and thirst distress with Pearson r -0.204 and -0.191, and p-values 0.065 and 0.084, respectively. Furthermore, thirst intensity and distress were compared between CCU patients and outpatients, using an independent t-test. The result showed that CCU patients had more thirst intensity (4.289 vs. 3.35, p-value=0.045) and more thirst distress (26.2 vs. 20.95, p-value <0.001) than HF patients presenting to the clinic.

On the other hand, ejection fraction was significantly associated with both thirst intensity (Pearson r=0.285, p-value=0.012) and thirst distress (Pearson r=0.260, p-value=0.022). Finally, PHQ-2 score was positively associated with thirst intensity (Pearson r= 0.311, p-value 0.003) and thirst distress (Pearson r= 0.227, p-value 0.031). This means that, the higher the PHQ-2 score, the more the intensity and distress of thirst. Therefore, higher probability of depressive disease is significantly associated with thirst.

Regarding other demographic variables and patients' clinical characteristics, the associations between gender, smoking, comorbidities, treatments and medications with thirst intensity and distress were tested using an independent sample t-test. Table 13 shows the significant results for thirst intensity**.**

Table 13 Significant Association between Clinical Variables and Thirst Intensity

Variables	Thirst Intensity			
	Mean ± SD	**t-statistic**	**df**	**P-value**
Gender		-3.11	88	0.003
Males	3.23±1.94			
Females	4.63±2.33			
Smoking		1.631	88	0.053
Smoker	3.228± 1.94			
Non smoker	4.08±2.30			
On Aspirin	3.34±2.23	2.372	88	0.020
Yes	4.43±2.06			
No				
On Statins	3.46±2.09	2.104	88	0.038
Yes	4.45±2.31			
No				
On ARNI	3.03±1.88	2.973	88	0.004
Yes	4.38±2.27			
No				
On Antidepressants	1.50±1.73	2.194	88	0.031
Yes	3.93±2.18			
No				

Legend: ARNI = Angiotensin Receptor-Neprilysin Inhibitor; SD: standard deviation

None of the comorbidities was associated with thirst intensity. As seen in Table 13, thirst intensity differed only by gender, smoking status, and some of the prescribed medications.

The mean thirst intensity differed significantly between males (mean=3.23) and females (4.63) with t=-3.06, p-value 0. 003.The association between smoking and thirst intensity was borderline significant (p=0.053).

As far as the medications were concerned, thirst intensity was significantly different between participants who were receiving aspirin had less thirst intensity (mean=3.45) than those not taking aspirin (mean=4.45), with p = 0.04. Moreover, patients who were taking statins had less thirst intensity than those not taking statins, (3.36 vs. 4.45, p =0.038). Additionally, participants taking ARNI (mean=3.03) had lower

intensity scores than those not taking it (mean=4.38) with t=2.973, p-value 0. 004. Finally, patients taking antidepressants had less thirst intensity (mean=1.5) than those not taking the drug (mean =3.93, p = 0.031).

Table 14 shows the significant results for thirst distress. None of the comorbidities was associated with thirst distress. On the other hand, females reported more thirst distress than males (26.34 versus 21.56, p = 0.005), but smokers reported less distress than nonsmokers (21.48 vs 24.57, p = 0.048). In addition, there was a significant difference in thirst distress between those taking ARNI and those not taking it (21.2 vs. 25.57), p=0.013. Participants receiving aspirin had less distress than those not taking it (22.1 vs. 25.43), p = 0.04 and patients on antidepressants had less thirst distress than those who were not on this drug (14.75 vs.23.99), p = 0.018.

Table 14 Significant Associations with Thirst Distress

Variables	**Thirst Distress**			
	Mean ± SD	**t-statistic**	**df**	**P-value**
Gender		-2.913	88	0.005
Males	21.56±6.23			
Females	26.34±8.61			
Smoking		2.016	88	0.048
Smoker	21.48±6.03			
Non smoker	24.57±8.19			
On ARNI		2.546	88	0.013
Yes	21.19±6.74			
No	25.25±7.89			
On Aspirin		2.084	88	0.040
Yes	22.10±7.58			
No	25.43±7.45			
On Antidepressants		2.421	88	0.018
Yes	14.75±6.99			
No	23.99±4.48			

Legend: ARNI = Angiotensin Receptor-Neprilysin Inhibitor; SD: standard deviation

As for the association between NYHA class and thirst, a one-way ANOVA was conducted. The results showed no association between NYHA class and thirst intensity (F(3,86)=2.342 , p-value=0.102). However, there was a significant association between the NYHA class and thirst distress (F(3,86)=3.653, p-value=0.03). Table 15 shows the results of the ANOVA

Table 15 Difference in Thirst Distress by NYHA Class (N=90)

Dependent Variable	**NYHA I** **Mean ± SD**	**NYHA II** **Mean ± SD**	**NYHA III** **Mean ± SD**	**F**	**P value**
Thirst distress	3.08 ± 2.70	3.91 ± 2.11	4.45 ± 1.60	3.65	0.03

Legend: SD = standard deviation

To determine which groups differed regarding thirst distress, a Bonferroni post hoc test was done. The results showed that patients with NYHA III class have more thirst distress than NYHA I patients (p-value=0.049).

H. Fluid restriction and Thirst

The relationship between thirst and fluid restriction was tested using two questions; one related to whether the patient is on fluid restriction (retrieved from the medical record) and the other is a question that asked patients if they were prescribed to restrict the amount of fluid they drink per day.

To study the association between fluid restriction (as documented in the medical record) and thirst intensity and distress, an independent t-test was conducted. Prescription of fluid restriction was associated with less thirst. The mean difference in thirst intensity in those restricting their fluid intake and those not on fluid restriction was significant (3.6 versus 4.76, t=1.983, p=0.05). Similarly, the mean thirst distress scores in those having

with documented fluid restriction as per the medical record (man=22.7) and those not on fluid restriction (mean=27.17) were also significantly different (t=2.196, p-value 0.031).

To validate the above result, another independent t-test was done between thirst intensity and distress, and the patients' reporting about whether they were prescribed to restrict their daily intake of fluids. In this analysis, there were no significant association between patients' self-report about being prescribed fluid restriction with thirst distress (t=-1.435, p-value=0.155) but borderline significance with thirst intensity (t=-1.936, p-value= 0.056). So, the difference in mean thirst intensity between those who reported fluid restriction (mean=4.18) and those who reported no restriction (mean=3.27) was barely significant. This means that there is a discrepancy between patients' reports about being prescribed fluid restriction and the chart's prescription. To investigate this discrepancy, a Chi Squared test was done to examine the association between these two variables. Both categorical variables were independent with $\chi^2(1) = 1.463$ and p-value=0.227. Therefore, there was no association between patients' self-reports of being prescribed fluid restriction and the fluid restriction documented in their chart. This result could be explained by poor compliance by the patients to what was prescribed, or inaccuracy in documentation in the medical record.

I. Predictors of Thirst

Based on the results of bivariate analyses, all variables that were significantly associated with thirst and those with p-value<0.1 at the level of bivariate analyses were entered in two multiple backward linear regression model to examine the factors associated with thirst intensity and thirst distress. The following variables were included in the thirst intensity linear regression model: age, gender, salt restriction, systolic and

diastolic blood pressure, ejection fraction, PHQ-2 score, antidepressants, statin, smoking, aspirin, ARNI and prescription of fluid restriction. For the thirst intensity linear regression, the final model is shown in table 16. The ANOVA regression model for thirst intensity predictors showed a significant model ($F_{(8,61)} = 8.067$, p-value <.001) that explained 45% of the variance in thirst intensity (adjusted $R^2 = 0.45$). The remaining predictors in the final model were age, ejection fraction, diastolic blood pressure, smoking, salt restriction, antidepressants, statins, and PHQ-2 score. All variables were significant predictors of thirst intensity, except for smoking and salt restriction, which had p-value of 0.074 and 0.076 respectively. Results showed that an increase in ejection fraction and having higher probability of depression are associated with increased thirst intensity. On the other hand, an increase in age and diastolic blood pressure, and being on anti-depressant and statin therapy are associated with less thirst intensity. These results are shown in Table 16 below.

Table 16 Final Linear Regression Model of the Predictors of Thirst Intensity

Predictor	Unstandardized B	Standard error of B	Standardized Coefficient Beta	95% confidence interval	t	P value
Constant	10.59	2.28		6.03, 15.16	4.64	< .001
Age	-0.06	0.02	-0.33	-0.10, -0.02	-3.09	**0.003**
LVEF	0.04	0.02	0.20	.001, 0.08	2.06	**0.044**
DBP	-0.04	0.02	-0.21	-0.077, -.004	-2.24	**0.029**
Smoking	-0.99	0.50	-0.20	-19.0, 0.08	-1.83	0.072
Salt restriction	-1.38	0.76	-0.18	-2.89, 0.130	-1.83	0.072
Antidepressant	-2.28	1.00	-0.21	-4.28, -0.27	-2.27	**0.027**
Statin	-0.89	0.42	-0.19	-1.78, -0.052	-2.11	**0.039**
PHQ-2 score	0.92	0.21	0.42	0.507, 1.353	4.45	**<.001**

Legend. DBP: diastolic blood pressure; LVEF: left ventricular ejection fraction; PHQ-2: patient health questionnaire

For thirst distress linear regression model, the following variables were included: ARNI, salt restriction, smoking, antidepressants, PHQ-score, diastolic blood pressure, ejection fraction, aspirin, NYHA class, and gender. The final model is shown in table 17. The regression model was significant with $F_{(3,66)}=7.02$ and p-value< .001, and it explained 21% of the variance in thirst distress; adjusted $R^2 = 0.21$. The remaining predictors in the final model were ejection fraction, antidepressants and the PHQ2 score. Results are shown in Table 17 below.

Table 17 Final linear regression model testing the predictors of thirst distress

Predictor	Unstandardized B	Standard error of B	Standardized Coefficient Beta	95% confidence interval	t	P value
Constant	14.77	3.05		8.67, 20.86	4.83	<0.001
Ejection fraction	0.200	0.08	0.28	0.05, 0.35	2. 64	**0.010**
Antidepressants	-10.36	4. 14	-0.27	-18.62, -2.10	-2.51	**0.015**
PHQ2 score	1.95	0.83	0.25	0.30, 3.59	2.36	**0.021**

As can be seen in the table, higher ejection fraction and higher depression scores predict higher thirst distress, whereas taking anti-depressant medications predict lower thirst distress.

CHAPTER VI

DISCUSSION

This study described the prevalence and characteristics of thirst among patients with heart failure recruited from the CCU and cardiology clinics of two major medical centers in Beirut. The study also examined the association between thirst and salt-related behaviors and identified the predictors of thirst using relevant demographic and clinical data. The study examined the relationship of thirst with the factors identified in the theory of unpleasant symptoms (situational, physiological, and psychological).

This study is the first to describe the prevalence of thirst and its predictors among patients with heart failure in Lebanon. The main results of the study were that thirst was present among the majority of study sample; with 70% reporting thirst to occur a couple of times per week or a couple of times per month and 23.3% reporting almost every day or everyday frequency of thirst. Moreover, the reported intensity of thirst had a mean of 3.82 out of 10, with the duration of thirst sensation varying between less than an hour and several hours. No association was found between self-reported behaviors related to salt intake and thirst intensity or distress. As for the predictors of thirst, multivariable regression analysis showed that older adults, those with higher diastolic blood pressure, those on antidepressants and statins are less likely to experience intense thirst, whereas those with higher ejection fraction and those with higher depressive symptoms are more likely to experience more intense thirst. As for thirst distress, those with higher ejection fraction or depressive symptoms were more likely to experience thirst distress whereas being on antidepressant drugs protected against thirst distress. This chapter discusses the findings as organized by study aim.

A. The Characteristics of Thirst

The result regarding the frequency of thirst is like that of Gong et al (2022), who reported 70% for several times per week or per month and 23% for almost every day or every day. In comparison, Eng et al (2020) reported higher thirst frequency of 47% (almost every day and every day). As mentioned before, those who reported to have thirst almost every day or every day were considered to have frequent thirst. Therefore, in our study the prevalence of thirst among HF patients is 23.3%, which is less than that of Eng et al (2020) who reported a prevalence of 47%. A study by Waldreus et al (2014) studied thirst trajectory over 18 months. They measured thirst at each occasion by whether the patient reports feeling thirsty (Yes/No). The prevalence of thirst was determined by the number of follow ups in which that patient reports feeling thirsty (Waldreus et al., 2014). In their study. the prevalence of persistent thirst was 19% (which is less than our study), as these patients reported thirst in ≥2 out of 4 follow-up visits. As for the thirst duration, most patients had thirst for one hour or less (33.3%) same as what was reported by Eng. et al (2020).

Moreover, moderate to severe thirst distress (scores 17-40) was experienced by 64.4% of HF patients which is similar to that reported by Waldreus et al (2014) and Gong et al (2022). Morning was the most frequently reported thirst time (41.1%), maybe because the body is usually dehydrated after the night sleep (Thornton, 2010). As per Colwell (2010), vasopressin release increases during the late-night. This result is in congruence with a study that examined thirst in hospitalized HF patients (Waldreus et al., 2011).

Finally, thirst intensity average was 3.82±2.21. If we convert the score to fit a 100 mm VAS scale to be able to compare to other studies, the mean thirst intensity will be

38.2±22.1 mm. This is higher than 24±24 mm that was reported by Van der Wal (2019), but less than 47 mm and 54 mm as reported by Gong et al (2022) and Phillipson et al (2010). The reason behind this difference might be related to the worse condition of participants in other studies. This difference in results is supported by the finding in our study that CCU patients had significantly more thirst intensity and distress than outpatients. Patients who have decompensated HF have increase in the neurohormonal activation and this will cause an increase in Angiotensin II, which in return stimulates thirst center in the brain and leads to thirst sensation (Arai et al., 2013). The latter also explains why higher NYHA class is associated in this study with higher thirst intensity; this association with NYHA class result is similar to that of Waldreus et al (2016), Waldreus et al (2011), Van der Wal et al (2019), Gong et al (2022) and Eng et al (2020), who all concluded that worsening HF patients usually have higher NYHA class and therefore higher thirst sensation.

As this thesis used the "theory of unpleasant symptoms" as its theoretical framework, the following part of the discussion will be organized accordingly. This study examined the three factors that might affect thirst. Most of the studied factors were physiological and situational factors, with depression as the only psychological factor examined as a possible predictor of thirst.

B. Thirst and the Situational Factors

The second study aim examined salt consumption as a situational factor and its association with thirst. As mentioned earlier, the salt questionnaire that tackles knowledge, attitudes and behaviors related to salt was used in this study. The mean knowledge score computed in this study was 14.2±4.55, which is less than 17.6±4.6, the

score reported by Walsh et al (2017) who studied knowledge, behaviors, motivators, and attitudes related to salt intake in a cardiac care unit in Lebanon. Our score is also less than as reported by Nasreddine et al (2014). As this result show a knowledge score less than what was reported in the general population, it is really alarming as it highlights gaps in knowledge among HF patient's population, who should have proper knowledge to maintain self-care practices. Moreover, the attitude score in our study (3.41±1.34) was almost like that of Walsh et al (2017) with a score of 3.38±0.88. Despite these high scores, many knowledge and behavior gaps were found in our study. Few participants (33 out of 42) check sodium content in food labels and less than half the sample are those who try to buy low salt foods. Moreover, most patients (80%) could not identify the correct recommended salt amount. These gaps are similar to the ones reported by Walsh et al (2017). Moreover, in the study by Nasreddine et al (2014) which studied salt related behaviors, attitudes, and knowledge, they targeted supermarket shoppers in Beirut. Although the sample size is larger (n=442), the mean knowledge score (15.2±4.1) was close to our study. In their study, 77.6% of participants able to identify the correct effect of salt on their health which compares to 92.2% in our study. As for the knowledge gaps, both studies identified the same gaps but with varying percentages. Nasreddine et al (2014) reported that 22.6% only were able to identify processed food as the main source of salt, whereas 34.4% was reported in our study. They also reported that 55.9% were able to identify the correct relationship between salt and sodium while our study reported 25.6% only. As 20% of our study participants reported 6 grams (one teaspoon) as the maximum recommended salt intake per day, 32.4% in Nasreddine et al (2014) study reported the same amount. Furthermore, our study reported higher attitude score (3.41±1.34) as compared to 2.7 ± 1.2 that was reported by Nasreddine et al (2014). The

previously reported gaps in behaviors were similar to those reported by Nasreddine et al (2014). The latter study reported that 38.3% check salt content of food labels and 43.7% are influenced by the salt content to buy the food. The aforementioned gaps in knowledge and behaviors highlight the need for proper education to patients, especially those who need salt restriction.

According to the American Heart Association, American College of Cardiology, and the Heart Failure Society of America (AHA/ACC/HFSA) guidelines for the management of HF, it is reasonable to avoid excessive salt intake in patients with stage C to reduce symptoms of congestion (Heidenreich et al., 2022). The AHA recommends sodium intake of less than 2.3 grams/day for cardiovascular health promotion (Heidenreich et al., 2022). The latest guidelines still list salt restriction as "gaps in evidence". An intervention with 2-3 grams of sodium per day, for patients with reduced EF, improved NYHA class and leg edema (Philipson et al., 2013). Most patients did not answer the correct recommended daily intake of salt as per the salt questionnaire and did not know the amount of salt restriction that was prescribed to them. This again highlights the need for proper patient education.

Our study showed that the prescription of sodium restriction is associated with less thirst. This can be explained by the physiological effect of salt on our bodies, which once absorbed, will pull water with it to the vascular system, eventually leading to perception of thirst. The empirical results regarding the effect of sodium restriction in HF are inconclusive and very few investigators tackled the effect of sodium restriction on thirst in HF. Most studies that examined the effect of sodium restriction on thirst included fluid restriction as well. Therefore, we could not really isolate the effect of sodium restriction alone on thirst. In a randomized controlled trial (RCT) by Philipson et al (2013)

where they divided patients into intervention (sodium and fluid restriction) and control (free intake), the intervention had no negative effect on thirst, appetite and quality of life. On the other hand, aggressive sodium and fluid restriction were associated with increased perceived thirst in another RCT by Aliti et al (2013). Again, the latter study included both restrictions and could not give a clear result regarding sodium restriction alone. Finally, Van der Wal (2019) reported that salty and spicy foods are reported by patients as a cause of their thirst.

In this study, although prescription of sodium restriction was significantly associated with thirst, examination of the association between self-reported salt reduction behaviors and thirst did not show significant results. It is worth mentioning that 78.9% of participants reported that their daily salt intake is about or less than the maximum recommended, 83.3% reported cutting down on their salt intake and 66% that they never add salt to the table. The fact that none of these behaviors showed were associated with thirst may be accounted for by the ceiling effect in the responses due to social desirability. Alternatively, it may reflect lack of awareness of their actual salt intake, given their suboptimal knowledge, or the issue may be with the accuracy of the documentation in the medical record.

Another situational factor that may have a bearing on thirst is fluid restriction, which is part of self-care practices in HF. As per the AHA/ACC/HFSA guidelines for the management of HF, the benefit of fluid restriction to reduce HF congestion symptoms remains uncertain (Heidenreich et al., 2022). Although fluid restriction is uncertain, it is still widely used as it is thought to reduce the fluid overload burden on the heart. There has been a debate whether fluid should be totally restricted, partially restricted, or not restricted at all. A meta-analysis done by De Vecchis et al (2016) compared fluid

restriction to free fluid intake. This analysis showed that fluid restriction had no effect on reducing mortality or hospitalization, no effect on thirst, changes in diuretics use and changes in serum creatinine and sodium (De Vecchis et al., 2016). Philipson et al (2013) found that fluid restrictive therapy had no negative effect on thirst.

In this study, fluid restriction (as per the medical record) was associated with less thirst, whereas thirst was barely significant with self-reported fluid restriction. Patients who reported fluid prescription had more thirst; however, this association was not significant, possibly indicating nonadherence to the fluid restriction. Similarly, Waldreus et al (2014) found no association between thirst and fluid restriction. On the other hand, Van der Wal (2019), Waldreus et al (2013) and Waldreus et al (2016) found that patients with high thirst intensity and distress were on fluid restriction. Moreover, adherence to less fluid consumption was associated with less HF symptoms and high thirst distress in an RCT done by Reilly et al (2015). This is similar to the conclusion made by Aliti et al (2013) that fluid restriction is associated with significant increase in perceived thirst in patients with decompensated HF. Moreover, liberal fluid consumption that is based on body mass (30-35 ml/kg) could help in alleviating thirst (Holst et al., 2008). The difference between the findings in this case and that of others could be due to the different samples studied; in the current study the intensity of thirst was not severe. Moreover, the patients were relatively stable, as most were NYHA class I or II and divided between CCU and clinic patients. On the other hand, the patients in the other studies were sicker and mostly inpatients. There is also the possibility of the small sample size in affecting the results about this association.

In conclusion, our study showed unclear result regarding fluid restriction as the relationship of fluid restriction with thirst is not consistent depending on whether the data

is from them medical record or self-reported by patients. This for sure makes us question compliance again and if patients are aware that they are prescribed a specific amount of fluid. Therefore, when fluid restriction is needed, the patients' ability to comply should be considered. As this thesis study showed results that question patients' compliance, doctors and physicians should re-enforce the treatment plan and make sure that patients really understand what is prescribed. Otherwise, poor compliance might lead to readmission. The barriers to compliance should be assessed as well, in addition to providing interventions that help relieve the burden, when fluid restriction is mandated.

C. Thirst and Physiological factors

In our study, age was slightly associated with thirst. Younger patients were more sensitive to thirst than older patients. This result is like that of Waldreus et al (2014). Evidence has shown that thirst becomes blunted with age (Farrel et al., 2008). As the person gets older, cerebral blood flow decreases and so do the receptors that respond to this flow, which in return impairs thirst sensation (Farrel et al., 2008). Moreover, women were found to be more affected by thirst than men. A study by Waldreus et al (2018) also found that women have a higher thirst distress level over time. This might be explained by the fact the women experience more HF symptoms than men (Lee et al., 2010). In contrast, in the study by Waldreus et al (2014) it showed that men are at higher risk for thirst intensity than women. The interpretation of gender differences in thirst intensity and distress can be made using a cultural perspective, whereby women in our culture are more likely to express symptoms than men, who are raised to be stoic and not complain, especially given the age group that characterize this sample.

A surprising result in our study was the effect of being a smoker on thirst. Non-smokers were found to have more thirst distress than smokers. This is contrary to the fact that smoking dries the mouth and makes the saliva thicker. A study by Eng et al (2020) did not find any association between thirst and smoking. Therefore, this result should be questioned and investigated in later research. It is worth noting that these associations between gender and smoking with thirst intensity and distress disappeared in the linear regression analysis, which may be accounted for by the limited sample size.

Although a correlation between thirst and diabetes may be expected given that thirst is one symptom of diabetes as reported by Van der Wal et al (2019), the current study found no association between the two variables. This is in congruence with result of no association reported by Waldreus et al (2014) with a p-value of 0.88. One possible explanation of this finding is the fact that these patients may have glycemic control, and thus are not experiencing diabetes related symptoms; add to this the limited intensity of the thirst reported by these patients.

Furthermore, one of the expected predictors of thirst was BUN level. However, no association was found between BUN and thirst in this study. Urea, a marker of dehydration and neurohormonal activation, was highly correlated with persistent thirst in Eng et al., (2021) study (p-value 0.009) and Waldreus et al., (2014) study. In the latter study, the investigators used other biological markers to assess for dehydration and neurohormonal activation such as urine color and specific gravity, plasma aldosterone, serum osmolality, plasma sodium and natriuretic-proBNP. We were limited in our study to BUN for feasibility purposes. In addition, our results may have been affected by the missing data as we could not find a documented BUN for some patients. The sample size could have affected the result as well, if we look at BUN mean, it is around 32.9 mg/dL

which is higher than normal (6-25 mg/dL). This lack of association with BUN may be due to the fact that there are a number of factors that affect BUN, thus confounding its association with thirst.

Furthermore, higher systolic blood pressure was associated with less thirst intensity in this study. This result is not supported by Waldreus et al (2014) study that showed no association between thirst and systolic and diastolic blood pressure (p- value 0.87 and 0.06, respectively). In low blood pressure, baroreceptors get activated leading to release of vasopressin from the posterior pituitary, in addition to the triggering the release of Angiotensin II that acts on the hypothalamus to induce thirst through inducing sodium and water retention. In this study, systolic blood pressure was not a significant predictor of thirst intensity in the multivariable regression analysis. On the other hand, diastolic blood pressure was a significant predictor of thirst intensity in the multivariable analysis, which is consistent with the physiologic rationale.

The increase in ejection fraction was associated with higher thirst. This result opposes our finding that worse patients with higher NYHA class had worse thirst experience. No studies supported this result as Waldreus et al (2014) and Eng et al (2020) showed no association between the two. The lack of association with ejection fraction can be accounted for by the fact that ejection fraction does not predict the severity of HF in terms of symptom burden and is not correlated with NYHA class. In this sample, NYHA class was associated with thirst distress at the bivariate level of analysis, but not in the multiple regression.

D. HF medications and thirst

Unexpectedly, ACEI, ARB and diuretics had no significant association with thirst. Even though ACE and ARB work to decrease the neurohormonal activation in HF and

therefore are expected to decrease thirst; however, these drugs work on another pathway of decreasing sodium and water retention (Finkel et al., 2009). This mechanism stimulates the body to get in more water and salt by stimulating the salt-appetite and therefore inducing thirst (Fitzsimons, 1992). None of the studies clearly identified an association between thirst and ACE-inhibitors. On the other hand, in a study by Eng et al (2021) that examined thirst in outpatients with HF in Spain, the investigators found that the use of ARB was associated with less thirst (p-value 0.04). They hypothesized that patients experience less thirst with ARBs because they were shifted from ACEI; that in fact has a stronger effect on triggering thirst (Eng et al., 2021). In their opinion, patients who are experiencing severe thirst are advised to switch from ACEI to ARB. The lack of association between intake of ACEis/ARBs and thirst in this study may be explained by the relatively small number of patients prescribed these medications.

To compare our sample's treatments with the latest HF guidelines, not all patients were prescribed ARB/ACEI, most of them were prescribed beta-lockers and the majority were on diuretics (which explains that most patients had symptoms of fluid overload). Moreover, a new recommendation by the American Heart Association (AHA) is the use of ARNI. The shift from ACEI to ARNI was evident in our study; 41.1% were taking ARNI in comparison to 16.7% and 15.6% for ACEI and ARB, respectively. ARNI has been associated with improved morbidity and mortality, which favor them over ACEI (Heidenreich et al., 2022). These new drugs showed improvement in health status as they improve the left ventricular remodeling and reduce natriuretic-proBNP compared to ACEI and ARB (Heidenreich et al., 2022). These drugs are efficient in simplifying management in symptomatic chronic HF patients with reduced ejection fraction (Heidenreich et al., 2022). ARNI is a drug composed of an ARB and a Neprilysin inhibitor

that prevents the degradation of natriuretic peptides and bradykinin. The activation of the natriuretic peptide system (NP system) is associated with vasodilation, natriuresis and decrease in fibrosis and hypertrophy (Braunwald, 2015). ARNI has a dual action on reducing the activation of the RAAS system and enhancing natriuresis; thus, improving symptoms in HF (Braunwald, 2015). With this natriuresis and increase in bradykinin level, ARNIs are thought to induce thirst as more fluids are lost and this exerts negative feedback on the brain to induce thirst. This was not supported in our study as the use of ARNI was associated with less thirst. This may suggest that ARNI are efficient enough to improve HF symptoms including thirst. Still the effect of ARNI did not hold in the multiple regression analysis. None of the studies explained the relationship between ARNI and thirst and this highlights the need for future research.

Despite all the evidence that showed a significant association between diuretics and thirst, both our study and that of Gong et al (2022) found no association between the use of diuretics and thirst. Diuretics were significantly associated with higher thirst in Waldreus et al (2011), Waldreus et al (2014), Waldreus et al (2016), Van der Wal et al (2019), Eng et al (2020) and Eng et al (2021). Diuretics lead to loss of water, causing dehydration and therefore inducing thirst. We might explain this by the fact the patients, specifically outpatients, were bothered by diuretics side effects and therefore they stopped taking their medications. Alternatively, the diuretic dose prescribed may be the limiting factor in the thirst sensation. In this study few patients reported any change in their diuretic dose, which could mean that they have accommodated to the side effects of their prescribed diuretics. Finally, this study showed that aspirin and statin were associated with less thirst. The effect of statins remained in the multiple regression analysis.

However, this relationship remains unexplained as none of the studies reviewed reported any association between thirst and these two drugs.

E. Thirst and the Psychological factors

This study showed a strong association between thirst and depression. Patients who scored higher on the PHQ-2 had significantly higher thirst intensity and distress. Although other studies used different ways to assess for depression, their conclusions were similar to this study. Waldreus et al (2014) found in their study that persistent thirst was associated with higher depression score. Similarly, high-thirst intensity patients in Waldreus et al (2016) study, reported more depressive and anxiety feelings. Moreover, being depressed was associated with the thirst trajectory, as depressed patients had higher thirst over time (Waldreus et al., 2018). Likewise, Eng et al (2020) found that patients diagnosed with depression had frequent thirst. Depression enhances the sensitivity of other symptoms; therefore, those with depression experience more distressing and intense thirst than those without depression (Kanton et al., 2001). Furthermore, thirst might also trigger existing psychological problems and therefore aggravate depression (Kanton et al., 2001). According to the literature, patients taking antidepressants, for whatever reason, have higher thirst (De Almeida et al.,2008). Antidepressants alter the salivary secretion and composition, consequently causing dry mouth and thirst (De Almeida et al., 2008). This is contrary to the result in the current study where the use of antidepressants was associated with less thirst intensity and distress. This can suggest that antidepressants were effective in treating depression, and therefore those patients had less thirst. In contrary, Waldreus et al (2011), Waldreus et al (2014) and Eng et al (2020) found no association between antidepressants and thirst.

In conclusion we assume that the differences in results between our study and others could be related to differences in the demographics, culture, eating habits, climate, and treatments of the samples studied. This is the first study done in the Mediterranean region. Other studies included China, Spain, Japan, Sweden and Netherlands

F. Reflection on the theoretical framework

The theory used throughout the thesis was suitable. It tackled all the dimensions related to any symptom. Antecedent factors and their relation to thirst in terms of intensity, distress and frequency were the focus of this study. This theory adopted a holistic approach to the study of thirst. Moreover, the interaction between all factors had a role in affecting the thirst experience. For example, patients who had depression and were of younger age had more thirst than those without depression. In conclusion, this theory facilitated the understanding of thirst.

G. Study Limitations

First, our sample size is one of the limitations that might affect the generalizability of the study results. The sample size (90) is limited and may be less representative to our target population. Small sample size can lead to type II error where a relationship of no association is concluded when an association exists, this what happened in this study for some of the relationships that were studied. However, this study sample size is larger than that of Waldreus et al (2016) (n=66) and Waldreus et al (2011) (n=48). Moreover, due to economic crisis in Lebanon, it was expected to have less patients coming to the clinic and this for sure affected the sample size. In addition, we were expecting big number of HF patients to present to CCU at RHUH as this hospital is governmental and hospitalization

expenses are less; however, the CCU was closed one month after starting the recruitment process. In this study data were collected from two sites and this might enhance the generalizability of the study' findings. Studies of HF patients are mostly conducted in one medical center in Lebanon, except the one by Deek et al. (2017), which included patients from Makassed General Hospital, RHUH and Mount Lebanon hospital, but that sample included inpatients admitted to CCU with heart failure exacerbation, and none of our study variables were addressed. Still demographic characteristics were similar to this study except for the level of education that was lower in Deek's study. Moreover, most of the data collection was done during a cold weather (December 2021 to April 2022) and this might have resulted in bias towards less thirst, as evidenced by the low intensity score. Furthermore, we had a plan to interview patients before taking their medications, especially diuretics; however, this was not possible for most patients as we had to schedule the interview according to the participants' preference. Additionally, we excluded NYHA IV patients as they we thought they're less like to complete a full interview over the phone, this may have affected our study's generalizability. Finally, we could not know the exact amount of sodium and fluid the patients were taking. This study was based on an interview and some answers are subject to social desirability bias, as evident by the ceiling effect in many questions. This highlights the use of future more objective measure in studies of fluid salt intake. For example, in future studies sodium recall or urine sodium assessment can be considered to check for salt intake rather than checking patients' behaviors and willingness to cut on salt.

H. Implication to Clinical Practice

It is clear now that thirst is an uncomfortable and distressful symptom for many HF patients. Thirst assessment should start in all healthcare facilities, including clinics,

hospitals or even during the telephone follow-up in the population of HF patients. An assessment tool should be adopted by facilities where nurses can play an important role in the assessment. The measure used in this study is brief, easy and pertinent and the Arabic version is provided in this study, so it can be used in the clinical setting. For patients who experience thirst, efficient interventions should be applied to relief their symptoms.

Furthermore, this study showed poor patient education as evidenced by lack of knowledge in some patients regarding fluid and salt restriction. In addition, areas of non-compliance were revealed in this study. This highlights the need for proper patient education in addition to proper follow up. Health care providers should take into consideration the burden of fluid and salt restriction on patients and come up with ways that make patients comply more by the regimen, for example adopting a more liberal fluid intake that is based on body mass rather than strict fluid restriction. In addition, the study highlights the importance of assessing depression among HF patients along with thirst assessment, especially older adults who make up the majority of these patients. We neglect sometimes the psychological concerns in HF patients and focus more on the physiological ones. As noted in this study, depression was significantly correlated with thirst, and this necessitate that healthcare workers should stress more on depression assessment.

Finally, one study in the region is not enough to come up with significant conclusion and get a clear image about thirst in HF. Future studies with higher sample size and including different settings should be done to understand thirst more, so that experimental studies to evaluate the efficacy of tailored interventions can be developed.

I. Clinical Nurse Specialist Role

As an advance practice nurse, the clinical nurse specialist (CNS) can play an important role in bringing a change to the facility. The CNS can develop or adapt a thirst assessment tool that is evidence based and pilot it in her/his facility. The CNS can perform proper education to nurses on how to use the assessment tool. As the CNS is involved in direct patient care, he/she can take a role in assessing thirst among HF patients. Moreover, he/she can provide proper education about the treatment regimen. In addition, the CNS plays an important role in research where he/she can initiate studies to understand thirst and come up with interventions to alleviate this bothersome symptom. Also, the CNS can play an important role in reviewing the current practices to find the gaps and inconsistencies that are not aligned with the guidelines and recent evidence-based recommendation and come up with solutions

J. Conclusion

This thesis study described the multidimensionality of thirst including its intensity, distress, and frequency. It showed that thirst is prevalent in the sample despite the need for future studies. This study was guided using the theory of unpleasant symptoms. High thirst intensity was found in 23% of our sample and moderate to severe thirst distress was found in 64.4% of HF patients. Many factors were associated with thirst, including physiological, psychological, and situational. It was significant that thirst intensity is more associated with younger age and female gender. One thing that we could not really explain is the association of higher ejection fraction with higher thirst. Significantly, depression was highly associated with higher thirst and this result was consistent with most studies. Besides answering the aims of the study, issues with patient

knowledge and behaviors related to salt and fluid restriction were identified and implications for practice recommended. Finally, this study necessitates the need for thirst assessment in all healthcare facilities as well as proper patients' education. Future studies are essential in our region to understand thirst more thoroughly so we can intervene accordingly.

APPENDIX I

AMERICAN UNIVERSITY OF BEIRUT
INSTITUTIONAL REVIEW BOARD (IRB)

APPROVAL OF RESEARCH

November 8, 2021

Dr. Samar Noureddine
American University of Beirut 01-350000 ext. 5966
sn00@aub.edu.lb

Dear Dr. Noureddine,

On November 8, 2021, the IRB reviewed the following protocol:

Type of Review:	Initial; Expedited
Project Title:	Thirst and Its Predictors in Patients with Heart Failure
Investigator:	Samar Noureddine
IRB ID	SBS-2021-0108
Funding Agency:	None
Documents reviewed:	Received September 20 & November 4 & 8, 2021: Response Letter, Amended IRB Application, Amended Proposal, Amended Recruitment Script (Arabic & English versions), Email to be sent to physicians-outpatients, Phone Script (Arabic & English versions), Amended Consent Form (Arabic & English versions), Amended Data Collection Tools (Arabic & English versions).

The IRB approved the protocol from **November 8, 2021,** to **November 7, 2022,** inclusive for **AUB Site ONLY**. Before September 7, 2022, or within 30 days of study close, whichever is earlier, you are to submit a completed "FORM: Continuing Review Progress Report" and required attachments to request continuing approval or study closure.

If continuing review approval is not granted before the expiration date of **November 8, 2022**, approval of this research expires on that date.

Please find attached the stamped approved documents:

- Proposal (received November 8, 2021),
- Recruitment Script Arabic & English versions (received September 20, 2021),
- Email to be sent to physicians-outpatients (received September 20, 2021),

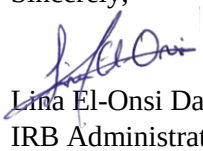
- Phone Script (Arabic & English versions (received September 20, 2021),
- Consent Form Arabic & English versions (received September 20, 2021),
- Data Collection Tools Arabic & English versions (received September 20, 2021).

Only these IRB approved consent forms and documents can be used for this research study.

Thank you.

The American University of Beirut and its Institutional Review Board, under the Institution's Federal Wide Assurance with OHRP, comply with the Department of Health and Human Services (DHHS) Code of Federal Regulations for the Protection of Human Subjects ("The Common Rule") 45CFR46, subparts A, B, C, and D, with 21CFR56; and operate in a manner consistent with the Belmont report, FDA guidance, Good Clinical Practices under the ICH guidelines, and applicable national/local regulations.

Sincerely,



Lina El-Onsi Daouk, MSc, CIM
IRB Administrator, Social & Behavioral Sciences

Cc:

Michael Clinton, PhD
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Fuad Ziyadeh, MD, FACP, FRCP
Professor of Medicine and Biochemistry
Chairperson of the IRB

Ali K. Abu-Alfa, MD, FASN, FAHA
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Director, Human Research Protection Program
Director for Research Affairs (AUBMC)

RAFIK HARIRI UNIVERSITY HOSPITAL مستشفى رفيق الحريري الجامعي

Date: 01-Dec-2021
Reference: 2021-1201

To: Kamar Younes
MSN student
Rafic Hariri School of Nursing
American University of Beirut

From: Iyad Issa, MD
President of Institutional Review Board
Rafik Hariri University Hospital
Bir Hasan-Jnah, Lebanon

Research Title: Thirst and its Predictors in Heart Failure Patients.

Thank you for submitting to the Institutional Review Board (IRB) the above entitled research and related documents for review:

- Submission letter
- University approval (AUB IRB Approval)
- Research proposal
- Questionnaire (English and Arabic)
- informed consent (English and Arabic)

The IRB reviewed the above documents and grants you the approval to the research entitled:

"Thirst and its Predictors in Heart Failure Patients"

The membership of this Institutional Review Board complies with the membership requirements in the US Code of Federal Regulations (21CFR56 and 45CFR46) of the Food and Drug Administration. In addition, the IRB operates in a manner consistent with Good Clinical Practices under the ICH guidelines, with FDA and applicable national/local regulations.

Sincerely,

Iyad A. Issa, MD.
Internal Medicine
Gastroenterology

Iyad Issa, MD
President of the IRB
Rafik Hariri University Hospital

Institutional Review Board
Rafik Hariri University Hospital
03 - Dec - 2021
APPROVED

APPENDIX II

Email Template to be sent to physicians to approach their patients

This email message is sent on behalf of Dr. Samar Noureddine in regard to a research study he/she plans to conduct at AUBMC, and in accordance with an approved pathway by the Medical Board to directly approach patients that have no defined characteristics nor a specific inclusion criterion, in waiting areas at AUBMC to participate in research studies.

Dear Colleagues,

We are about to launch a study entitled: Thirst and Its Predictors in Hear Failure

The aims of this study are to 1) describe the prevalence and characteristics of thirst among patients with HF; 2) examine the association between thirst and salt intake; and 3) identify predictors of thirst using relevant demographic and clinical variables.

This email is to seek permission to approach and invite your patients to partake in the study. The study involves no more than minimum risk to the participants, informed consent will be sought through WhatsApp. In addition and in accordance with Medical Board decision for minimal risk studies you have the option to opt out without the need for a justification if you prefer your patients not to be approached. Should you have any concern or objection, please directly email the Principal Investigator, Dr Samar Noureddine by date simply stating your desire not to have your patients approached for this study.

APPENDIX III

“Hello, my name is-----, I am a nurse at this clinic/unit at the American University of Beirut Medical Center. A researcher is conducting a study about thirst in patients with heart failure in this hospital and I am inviting you to participate because you are a patient at this hospital who has heart failure.

Participation in this research includes a phone interview with the researcher Kamar Younes in which she will be asking you several questions. This will approximately take 30 minutes. Participation in this study is voluntary and your identity as a participant will remain confidential during and after the study. Please inform me if you would like to participate in this study and if yes, please provide me with your phone number so I can give it to the researcher to contact you.
If you have any questions, please feel free to ask. Thank you for your time.”

مرحباً ، اسمي ----- ، أنا ممرضة في هذه العيادة / الوحدة في المركز الطبي للجامعة الأمريكية في بيروت. يقوم باحث بإجراء دراسة حول العطش لدى مرضى قصور القلب في هذا المستشفى وأنا أدعوك للمشاركة لأنك مريض في هذا المستشفى يعاني من قصور في القلب.

تتضمن المشاركة في هذا البحث مقابلة هاتفية مع الباحثة قمر يونس تطرح عليك فيها عدة أسئلة. سيستغرق هذا حوالي 30 دقيقة. المشاركة في هذه الدراسة طوعية وستظل هويتك كمشارك سرية أثناء وبعد الدراسة. يرجى إعلامي إذا كنت ترغب في المشاركة في هذه الدراسة ، وإذا كانت الإجابة بنعم ، فيرجى تزويدي برقم هاتفك حتى أتمكن من إعطائه للباحثة للاتصال بك.

إذا كان لديك أي أسئلة ، فلا تتردد في طرحها.

APPENDIX IV

This notice is for an AUB-IRB Approved Research Study

for Dr. Samar Noureddine Professor at the Hariri School of Nursing, American University of Beirut.

It is not an Official Message from AUB

I am inviting you to participate in a research study about thirst and its predictor in heart failure. This study aims to 1) describe the prevalence and characteristics of thirst among patients with heart problems; 2) examine the association between thirst and salt intake; and 3) identify predictors of thirst using relevant demographic and clinical variables.
You will be asked to complete some questionnaires with demographic information through an interview over the phone.

You are invited because you are 30 years or older; you are diagnosed with Heart Problem as documented in your chart and confirmed by echocardiography; are classified as New York Heart Association (NYHA) class I, II or III. The NYHA Classification is used universally to classify patients with your condition according to their symptoms.

The estimated time to complete this survey is approximately 20-30 min.
Please read the consent form and consider whether you want to be involved in the study. If you have any questions about this study, you may contact the investigator Samar Noureddine, mobile number 03/579451 for further information regarding the study.

دعوة للمشاركة في دراسة بحثية

هذا الإشعار مخصص لدراسة بحثية معتمدة من مجلس الأخلاقيات المتعلقة بالأبحاث العلمية في الجامعة الأمريكية

في بيروت

للدكتورة سمر نور الدين ، أستاذة في مدرسة الحريري للتمريض في الجامعة الأميركية في بيروت.

* هذه ليست رسالة رسمية من الجامعة الأمريكية في بيروت *

أنا أدعوك للمشاركة في دراسة بحثية حول العطش والعوامل التي تُنبئ به في حال قصور القلب، وتهدف هذه الدراسة إلى
1) وصف انتشار وخصائص العطش
2) فحص العلاقة بين تناول الملح و العطش

3) تحديد والعوامل التي تُنبئ بالعطش من ضمن المتغيرات الديموغرافية والسريرية

سيُطلب منك إكمال بعض الاستبيانات بالمعلومات الديموغرافية من خلال مقابلة معك عبر الهاتف.

أنت مدعو لأنك تبلغ من العمر 30 عامًا أو أكبر ؛ تم تشخيصك بمشكلة في القلب كما هو موثق في الرسم البياني

الخاص بك وتم تأكيده بواسطة تخطيط صدى القلب ؛ مصنفة على أنها جمعية القلب في نيويورك (NYHA) من

الدرجة الأولى أو الثانية أو الثالثة. يُستخدم تصنيف NYHA عالميًا لتصنيف المرضى الذين يعانون من حالتك وفقًا لأعراضهم.

الوقت المقدّر لإكمال هذا الاستبيان هو حوالي 20-30 دقيقة
يرجى قراءة نموذج الموافقة والتفكير فيما إذا كنت تريد المشاركة في الدراسة
إذا كان لديك أي أسئلة حول هذه الدراسة، يمكنك الاتصال بالباحثة د. سمر نور الدين ، رقم الهاتف 579451/03 لمزيد من المعلومات حول الدراسة.

APPENDIX V

Informed Consent to participate in an Interview Research Study (Oral Consent)

Study title: Thirst and Its Predictors in patients with Heart Failure

Investigators: Samar Noureddine, Angela Massouh, Lara Nasreddine, Hiba El Deek, Kamar Younes

Research site: American University of Beirut

I am a graduate student the Hariri School of Nursing at the American University of Beirut. I am inviting you to participate in a research study that I am conducting about patients who have a heart problem and their experience of thirst under the supervision of Dr. Samar Noureddine. Your participation will provide us with valuable information because you have experience with a heart problem.

Before we begin, I would like to explain why I am inviting you to participate and what I will be doing with the information you provide to me. Please stop me at any time if you have any questions. After I have told you a bit more about my study, you can decide whether you would like to participate.
The aims of the study are to 1) describe the prevalence and characteristics of thirst among patients with heart failure; 2) examine the association between thirst and salt intake; and 3) identify predictors of thirst. I am doing this study as part of my Master study in the Hariri School of Nursing at the American University of Beirut. I will be interviewing a sample of 100 patients about thirst and its predictors. You were referred to me by the nurse who briefed you about the study and got your permission to give me your phone number.

Inclusion and exclusion criteria:

Inclusion criteria: 1) Patients diagnosed with HF as documented in their chart and confirmed by echocardiography; 2) New York Heart Association (NYHA) class I, II or III (Presenting to HF clinic or hospitalized); and 3) Age $\geq$ 30 years.

Exclusion criteria: 1) Patients with kidney failure on hemodialysis ; 2) Patients with severe pulmonary disease requiring high oxygen therapy (e.g., intubated patients, patients on high Bilevel Positive Airway Pressure [BIPAP] settings, or patients in distress who cannot undergo the interview); 3) Patients with short-life expectancy as documented in their chart; 4) Patients with cognitive impairment who have difficulty understanding questions, such as patients with documented delirium or dementia; and 5) Patients with documented major psychotic disease.

If you agree to participate, I will interview you over the phone for about **20-30 minutes.** I will be asking you questions about your symptoms and related condition. Your participation is on a purely **voluntary** basis. **Refusal** to participate will not affect your relationship with your physician, or AUB Medical Center in any possible way. If you do not wish to answer any question, you may skip it. If you consent, we will directly start the interview.

The following data will be retrieved from your medical record:

-Your height, weight, age and gender, duration of your disease
-pulse and blood pressure
-ejection fraction; extent of your symptoms and recent hospitalizations because of your condition
-other medical conditions you may have and the level of BUN in your blood
-pharmacological and non-pharmacological treatments

Potential benefits:
There will be no direct benefit to you from participating in this research study. However, the data you will provide will help us understand better thirst in patients like you and allow us to find new interventions to control and alleviate this unpleasant symptom.

Potential Risks:
The risks of the study are minimal. Your participation in this survey does not involve any risk beyond the risks of daily life.

In case you need psychological support, you can refer to the Psychiatry Specialty Clinics at AUBMC:
Tel: 961 1 759620
961 1 350000, Ext. 5650
You can also consult Embrace, a non-governmental organization that provides free psychological services and can be reached at +961 1 346 226 or at the Lifeline: 1564

Confidentiality:
All data collected will be treated as anonymous and confidential information. Your name or any identifiers will not be included in any report or presentation of the study findings. No identifying information will be included on the data collection form. The study records will be monitored and may be audited by the IRB while ensuring the confidentiality of data.

Withdrawal:
If at any time and for any reason, you would prefer not to answer any questions, please feel free not to. If at any time you would like to stop participating, please tell me. We can take a break, stop and continue at a later date, or stop the interview altogether. If you withdraw from participating or completing the study, this will not affect your relationship with or the care you are receiving at the medical center and you will not lose any benefits to which you are entitled

Questions:
If you have questions, you are free to ask them now. If you have questions related to this interview before or after you consent, you may contact the primary investigator Dr. Samar Noureddine, Hariri School of Nursing, American University of Beirut, Lebanon. Telephone: 03/579451. Email: sn00@aub.edu.lb

If you have further questions about your rights as a participant in this study, you can contact the social and behavioral office of the institutional review board at 01-350000, extension 5454.

Are you interested in participating in this study?

موافقة على المشاركة في دراسة بحثية (موافقة شفوية)

عنوان الدراسة: العطش والعوامل التي تساهم بحدوثه عند مرضى قصور القلب
الباحثون: سمر نور الدين، أنجيلا مسوح، لارا نصر الدين، هبة الديك، قمر يونس
مركز البحث: الجامعة الأمريكية في بيروت
أنا تلميذة ماجستير في كلية الحريري للتمريض في الجامعة الأمريكية في بيروت. أنا هنا لأدعوك للمشاركة في دراسة بحثية أقوم بها تحت إشراف د. سمر نور الدين عن المرضى الذين يعانون من مشاكل في القلب وأعراض العطش لديهم. أن مشاركتك ستعطينا معلومات قيّمة لأنك قد اختبرت مشكلة في القلب.
قبل أن نبدأ، أود أن أشرح لك سبب دعوتي للمشاركة وما الذي سأفعله بالمعلومات التي تزودني بها. من فضلك أوقفني في أي وقت إذا كان لديك أي أسئلة. بعد أن أخبرك بالمزيد عن دراستي، يمكنك أن تقرر ما إذا كنت ترغب في المشاركة.
تهدف الدراسة إلى: 1) وصف انتشار وخصائص العطش بين مرضى القلب 2) فحص العلاقة بين تناول الملح والعطش و3) تحديد مؤشرات العطش وما يؤدي اليه. أقوم بهذه الدراسة كجزء من دراستي الماجستير في كلية الحريري للتمريض في الجامعة الأمريكية في بيروت. سوف أقوم بإجراء مقابلات مع عيّنة من 100 مريض حول العطش وما ينبئ به. لقد تمت إحالتك إلي من قبل الممرضة التي أطلعتك على الدراسة وحصلت على إذن منك .لإعطائي رقم هاتفك.
الأهلية للانضمام الى هذه الدراسة تشمل:
1- المرضى الذين تم تشخيصهم بمشاكل القلب كما هو موثق بملف المريض الخاص و تم تأكيده بواسطة تخطيط صدى القلب
2-تصنيف المريض في جمعية نيويورك لقصور القلب في المجموعة الأولى أو الثانية أو الثالثة
3-العمر ≤ 30 سنة.
معايير الاستبعاد من الدراسة:
1- مرضى الفشل الكلوي الذين هم بحاجة لغسيل الكلى
2- المرضى الذين يعانون من مرض رئوي حاد يحتاجون إلى علاج أكسجين مكثّف
3- المرضى ذو متوسط العمر المتوقع القصير كما هو موثق في الملف الخاص بهم
4- المرضى الذين يعانون من ضعف في الإدراك والذين يجدون صعوبة في فهم الأسئلة
5- المرضى الذين يعانون من مرض ذهاني مذكور في بياناتهم الخاصة
إذا وافقت على المشاركة، فسوف أقوم بإجراء مقابلة معك عبر الهاتف لمدة تتراوح بين 20 و 30 دقيقة. سوف أطرح عليك أسئلة حول أعراضك وحالتك المتعلقة بها. مشاركتك في الدراسة هي على أساس تطوعي بحت. إذا رفضت المشاركة في البحث، لن يؤثر ذلك على علاقتك بطبيبك أو بالمركز الطبي في الجامعة الأمريكية في بيروت بأي طريقة
إذا كنت لا ترغب في الإجابة على أي سؤال، فيمكنك تخطيه. إذا وافقت، سنبدأ المقابلة مباشرة.
سيتم أخذ البيانات التالية من سجلك الطبي:
طولك ووزنك، العمر والجنس، ومدة مرضك
النبض وضغط الدم
نسبة قذف الدم من عضلة القلب؛ مدى عوارضك ودخولك المستشفى بسبب مرض القلب لديك
الأمراض المزمنة لديك ونسبة الملح في الدم (نيتروجين اليوريا في الدم)
العلاجات الدوائية وغير الدوائية
الفوائد المحتملة:
لن تكون هناك فائدة مباشرة لك من المشاركة في هذه الدراسة البحثية. ومع ذلك، ستساعدنا البيانات التي ستقدمها على فهم العطش بشكل أفضل لدى المرضى مثلك وتسمح لنا بالعثور على تدخلات جديدة للسيطرة على هذه الأعراض المزعجة والتخفيف منها.

المخاطر المحتملة:
مخاطر الدراسة ضئيلة. مشاركتك في هذا الاستطلاع لا تنطوي على أي مخاطر تتجاوز مخاطر الحياة اليومية.
إذا شعرت أنك بحاجة لدعم نفسي، يمكنك استشارة
961 1 759620
961 1 350000, Ext. 5650 . **أو بإمكانك التواصل مع**
منظمة embrace الغير حكومية:
+961 1 346 226
الخط الساخن: 1564
السرية:
يتم التعامل مع جميع البيانات التي تم جمعها على أنها معلومات مجهولة المصدر وسرية. لن يتم إدراج اسمك أو أي معرّفات في أي تقرير أو عرض تقديمي لنتائج الدراسة. لن يتم تضمين أي معلومات تعريفية في ستتم مراقبة سجلات الدراسة وقد يتم تدقيقها من قبل مجلس أخلاقيات الأبحاث مع ضمان سريّة البيانات.
الانسحاب:
إذا كنت تفضل في أي وقت ولأي سبب عدم الإجابة على أي أسئلة، فلا تتردد في عدم الإجابة. إذا كنت ترغب في أي وقت في التوقف عن المشاركة، من فضلك قل لي. يمكننا أخذ قسط من الراحة، والتوقف والاستمرار في وقت لاحق، أو إيقاف المقابلة تمامًا. إذا انسحبت من المشاركة أو إكمال الدراسة ، فلن يؤثر ذلك على علاقتك أو الرعاية التي تتلقاها في المركز الطبي ولن تفقد أي مزايا يحق لك الحصول عليها.
عيادات الطب النفسي التخصصية في المركز الطبي في الجامعة الأمريكية في بيروت:
أسئلة:
إذا كانت لديك أسئلة، فأنت حر في طرحها الآن. إذا كانت لديك أسئلة تتعلق بهذه المقابلة قبل موافقتك أو بعدها، يمكنك الاتصال بالباحثة الأولية الدكتورة سمر نور الدين، كلية الطب، كلية الحريري للتمريض ، الجامعة الأمريكية في بيروت ، لبنان. التليفون: 03/579451، البريد الالكتروني sn00@aub.edu.lb
إذا كانت لديك أسئلة أخرى حول حقوقك كمشارك في هذه الدراسة ، فيمكنك الاتصال بالمكتب الاجتماعي والسلوكي لمجلس المراجعة المؤسسية على 01-350000 ، داخلي 5454
هل أنت مهتم بالمشاركة في هذه الدراسة؟

APPENDIX VI

Patient demographics and clinical characteristics

Date and temperature		
Date of filling in the questionnaire	(DD/MM/YYYY)	__ __ / __ __ / __ __
Time of filling in the questionnaire	(hour, 24)	____
Temperature outside at time of thirst measurement	(Celsius)	____
Clinical data (from the medical record)		
Gender	Woman	____
	Man	____
Age	(years)	__ __
Height	(centimetre)	____
Weight	(kilogram)	____
Duration of Heart Failure	(years)	____
Left Ventricular Ejection Fraction	(%)	____ ()
Blood pressure	systole/diastole (mmHg)	__ __ __/ __ __ __
Pulse	(beats/min)	__ __ __
New York Heart Association Classification	I =	____
	II =	____
	III =	____
BUN		____
Hospital admission due to Heart Failure deterioration in the last 3 days	No=____	Yes=_____
Sociodemographic data		
Marital status (from the medical record)		
Living	Alone:	____
	With partner:	____
	With others:	____
Education level	Primary school:	_____
	Secondary school:	_____
	Vocational training:	_____
	University education:	____
Current smoking	Yes =	____
	No =	____

Primary school, where children receive primary or elementary education; Secondary school, education after primary school, such as high school.

History of Non-cardiac comorbidities (from the medical records)	**Yes**	**No**
Diabetes type 1		
Diabetes type 2		
Anemia		
Chronic Obstructive Pulmonary Disease		
Stroke		
Chronic renal disease		
Other:		
History of Cardiac comorbidities (from the medical records)	**Yes**	**No**
Hypertension		
Atrial fibrillation		
Ischemic heart disease		
Valvular heart disease		
Congenital heart disease		

Non-pharmacological treatment (From the medical records for inpatients)	**Yes**	**Amount/day**	**No**
Fluid restriction		_____ml/day	
Sodium restriction		_____mg/day	

	Yes	**No**
Cardiac resynchronization therapy		
Implantable cardioverter defibrillator		

Pharmacological treatment (From the medical records)	**Yes**	**No**
Diuretics dose change in the last 24 hours?		
If yes, was the dose change=	Increased	Reduced
If yes, describe the dose change (from e.g. mg/day to mg/day) =		

	Yes	**Substance *name* and *dose/day***	**No**
Diuretics			
Angiotensin-converting enzyme inhibitor			
Angiotensin receptor blocker			
Angiotensin receptor-neprilysin inhibitor			
Beta blocker			
Mineralocorticoid receptor antagonist			
Vasopressin V2 receptor blocker			
Omeprazole			
Opioid			
Antidepressant			
Other medications			
If yes, list them			

APPENDIX VII

Thirst Distress Scale for patients with Heart Failure (TDS-HF)

Below you will find statements about your experience of thirst during the last 2-3 days. Read each statement carefully. Choose one of five possible answers for each statement that best describes your experience of thirst between strongly disagree (number 1) and strongly agree (number 5). Mark your chosen number with a circle.

Statement	Strongly disagree				Strongly agree
1. My thirst bothers me a lot	1	2	3	4	5
2. I am very uncomfortable when I am thirsty	1	2	3	4	5
3. My mouth feels like sandpaper when I am thirsty	1	2	3	4	5
4. My mouth feels dry when I am thirsty	1	2	3	4	5
5. My saliva is very thick when I am thirsty	1	2	3	4	5
6. When I drink less water, my thirst gets worse	1	2	3	4	5
7. I am so thirsty I could drink water uncontrollably	1	2	3	4	5
8. My thirst feels difficult to overcome	1	2	3	4	5

Waldréus N, Jaarsma T, van der Wal M, Kato N. Development and psychometric evaluation of the Thirst Distress Scale for patients with heart failure. Eur J Cardiovasc Nurs 2018: 17(3): 226-234.

Thirst Intensity

Use the rating below to indicate the severity of thirst that you feel.
Rate between no thirst (at the far left) to worst possible thirst (at the far right).

No thirst										The worst possible thirst
0	1	2	3	4	5	6	7	8	9	10

Thirst Frequency

Below you find questions about thirst. Mark the answer that best describes your experience of thirst with a cross on the left column that corresponds to your choice.

How often have you been thirsty the last month?

	Every day
	Almost every day
	A couple of times per week
	A couple of times per month
	Never

When you are thirsty, for how long does your thirst last?

	Around-the-clock
	Half a day
	For several hours
	For some hours
	For an hour or less

When you are thirsty, at which time point of the day are you most thirsty?

	Morning
	Afternoon
	Evening
	Night
	Whole day

APPENDIX VIII

Knowledge, Attitudes and Behaviors related to Sodium Intake of Lebanese Adults

1	**Which of these best describe what you think is the effect of Salt/Sodium in your diet?**	A	Improves your health	B	Has no effect on health
		C	Worsens your health	D	Do Not Know

	Do you think these health problems can be caused or aggravated by salty foods?							
		Yes	**No**	**Don't know**		**Yes**	**No**	**Don't know**
2	High Blood Pressure				Stomach Cancer			
	Stroke				Kidney Disease			
	Osteoporosis				Memory/Concentration problems			
	Fluid Retention				Asthma			
	Heart Attacks				Headaches			

3	**What is the maximum daily amount of salt recommended for adults?**	A	3 grams (½ teaspoonful)	B	6 grams (1 teaspoonful)
		C	9 grams (1½ teaspoonful)	D	12 grams (2 teaspoonful)
		E	15 grams (2½ teaspoonful)	F	I Do Not Know

4	**How do you think your daily salt intake compares to the optimal amount recommended?**	A	More than maximum recommended	B	About maximum recommended
		C	Less than maximum recommended	D	Do Not Know

5	**Which of the following statements best describes the relationship between salt and sodium?**	A	They are exactly the same	B	Salt contains sodium
		C	Sodium contains salt	D	Do Not Know

6	**For each of the items below, please indicate whether you consider these foods to be: high, medium or low in terms of salt/sodium content.**									
		High	**Medium**	**Low**	**DNK**		**High**	**Medium**	**Low**	**DNK**
	Bread					French Fries				
	Mana'esh					Sandwiches				
	Traditional Pies					Soya Sauce				
	Pizza					Fresh Carrot				
	Rice					Ketchup				
	Cheese					Salad Dressings				
	Milk					Roasted Nuts				
	Pear					Sausages and Hot Dogs				
	Vegetables Ragout/stew									

7	**Which of the following do you think is the main source of salt in the diet of Lebanese people?**	A	Salt added during cooking	B	Salt added at table
		C	Salt in processed foods such as breads, cured meats, canned foods and takeaway	D	Salt from natural sources such as vegetables and fruits
				E	I Do Not Know

		Often	**Sometimes**	**Never**	**I never do grocery shopping**
8	How often do you check the food content labels when you are shopping?				
9	How often does what is written on the food content label affect whether or not you purchase a food item?				
10	How often do you look at the salt/sodium content on food labels when you are shopping?				
11	How often does the salt/sodium content on the food label affect whether or not you purchase a product?				

12	**What information on the food package do you use to determine how much salt is in the product?**	□ The sodium level in the nutrition information panel	□ The ingredients list
		□ Claims for low or reduced salt on the pack	□ Don't know
		Other (specify): _____	

13	**Do you think present nutrition information on sodium is comprehensible?**			A	Yes		B	No	
14	**Are you concerned about these aspects of the food you eat?**	**Yes**	**No**				**Yes**	**No**	
	Artificial Flavors				Sugar				
	Artificial Colors				Energy (Calories)				
	Salt/ Sodium				Saturated Fat				
Do you do any of the following?		**Often**		**Sometimes**	**Never**		**Not Applicable** (I don't prepare the food)		
15	Add salt during cooking								
	Add salt at the table								
	Try to buy 'low salt' foods								
	Try to buy 'no added salt' foods								
16	**Are you cutting down on the amount of salt you eat?**			A	Yes	B	No	C	I do not know

If yes, why are you cutting down on salt?		
□ I was told to by a doctor/ health professional	□ To reduce my risk of a heart attack or stroke	□ Another family member has been told to
□ I do not like the taste of it	□ Because it's bad for you	□ Saw an advert/article about it/something on TV
□ Because I am on a diet	□ Trying to eat more healthily	□ To help lower my blood pressure
□ Because I have health problems	□ I do not know	Other:
If no, why are you not cutting down on salt?		
□ I recently cut back and don't need to cut back any further	□ You need to eat salt to stay healthy	□ I didn't know I should

□ I don't have too much salt in my diet	□ I eat a healthy diet and know that I'm not eating too much salt	□ I don't add salt to my food (anymore)
□ I am not concerned by it	□ I don't eat food high in salt	□ I haven't been told to cut salt from my diet
□ No particular reason; hadn't really thought about it	□ I do not know	Other:

Rate how much you agree or disagree on the items below using the rating scale: 1 = strongly disagree; 5= strongly agree.

		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
17	Reducing the amount of salt you add to foods is definitely important to you.	1	2	3	4	5
18	Reducing the amount of processed foods you eat is definitely important to you.	1	2	3	4	5
19	Reducing your sodium intake is definitely important to you.	1	2	3	4	5

20	**What would motivate you to reduce your salt intake?**	A	A dramatic change in my health status	B	If my doctor advised it
		C	If family members or friends advised it	D	Others (specify):

21	**What are the barriers against decreasing your salt intake?**	A	It tastes good	B	I am not concerned with decreasing my salt intake
		C	I don't know which foods to avoid	D	Others (specify):

22	**What is the most frightening thing that could happen if you eat too much salt?**	A	Nothing bad will happen	B	I could have a heart attack or stroke
		C	My blood pressure will go up	D	Others (specify):
23	**Where do you get your health information from?**	A	My doctor	B	My family and friends
		C	The internet	D	The media; specify: television, radio, newspapers, magazines, or other:
		E	Others (specify):		

24	**If excess Salt/Sodium in the diet were known to cause a serious disease, who do you think should be MOST responsible for helping you reduce the salt/sodium you eat?**	A	The government (public health campaign)	B	Companies that make or sell foods with salt in them
		C	Your doctor	D	Yourself

25	**Have you been previously advised by a physician, nurse or dietitian about the risks of a salt-rich diet and the need to moderate salt intake?**	A	Yes	B	No
26	**Have you been prescribed to restrict the amount of fluids you drink per day?**	A	Yes	B	No

معرفة والمواقف والسلوكيات المتعلقة بتناول الصوديوم للبالغين اللبنانيين

1	**اختر من الآتي ما تظنه قد يكون تأثير الملح على غذائك وصحتك**	**A**	**مفيد للصحة**	**C**	**لا تأثير له على الصحة**		
		B	**مضر للصحة**	**D**	**لا أعرف**		

2	**هل تظن/ تعتقد أن المشاكل الصحية التالية قد تكون ناتجة أو قد تسوء بسبب تناول الأطعمة المملحة؟ الرجاء اختيار خانة واحدة لكل مشكلة صحية:**								
		نعم	**كلا**	**لا أعرف**		**نعم**	**كلا**	**لا أعرف**	
	ضغط الدم المرتفع				**سرطان الأمعاء**				
	الجلطة الدماغية				**أمراض الكلية**				
	ترقق العظام				**مشاكل الذاكرة/التركيز**				
	احتباس المياه				**الربو**				
	نوبة قلبية				**أوجاع الرأس**				

3	**ما هو المعدل اليومي الأقصى لتناول الملح عند البالغين؟**	**A**	**3 غرام (نصف ملعقة صغيرة)**	**B**	**6 غرام (ملعقة صغيرة)**		
		C	**9 غرام (ملعقة ونصف صغيرة)**	**D**	**12 غرام (2 ملعقة صغيرة)**		
		E	**15 غرام (ملعقتان ونصف الملعقة صغيرة)**	**F**	**لا أعرف**		

4	قارن معدل تناولك اليومي للملح بالنسبة لما هو مسموح	A	أكثر من المسموح	B	يعادل المسموح
		C	أقل من المسموح	D	لا اعرف

5	أي من العبارات التالية تصف علاقة الملح بالصوديوم؟	A	لا فرق بينهم	B	الملح يحتوي على الصوديوم
		C	الصوديوم يحتوي على الملح	D	لا أعرف

	هذه لائحة بأنواع المأكولات اليومية. الرجاء تحديد نسبة الملح الموجودة في هذه الأطعمة من نسبة عالية، متوسطة أو قليلة من الملح/الصوديوم.							
		عالية	متوسطة	قليلة	لا أعرف		عالية	متوسطة	قليلة	لا أعرف
6	خبز					بطاطا مقلية				
	مناقيش					ساندويش (شاورما، هامبرغر، فاهيتا)				
	فطائر					صويا صوص				
	بيتزا					جزر				
	أرز					كاتشاب				
	جبنة					صلصة السلطة				
	حليب					بزورات محمصة				
	أجاص					مقانق ونقانق				
	خضروات									

7	ما هو برأيك المصدر الرئيسي للملح من حمية اللبنانيين الغذائية	A	إضافة الملح أثناء الطبخ	B	إضافة الملح على طاولة الطعام
		C	الملح الموجود في المأكولات مثل الخبز، المأكولات المعلبة، الأكل الجاهز	D	الملح الموجود في المأكولات الطبيعية مثل الخضار والفواكه
				E	لا اعرف

	قراءة المحتويات الغذائية	غالباً	في بعض الأحيان	أبداً	لا أتسوق عادةً
8	كم غالباً ما تتحقق من إشارة المحتويات الغذائية عندما تتسوق؟				
9	هل لقراءة الإشارة الغذائية تأثير على شرائك المنتوجات الغذائية؟				

10	كم غالباً ما تتحقق من محتوى الملح/الصوديوم على الإشارة الغذائية عندما تتسوق؟				

11	كم غالباً ما تؤثر قراءتك المحتوى الملح/الصوديوم من على الإشارات الغذائية، على شرائك للمنتج الغذائي؟				

12	**ما هي المعلومة الموجودة على الإشارة الغذائية التي تدلك على محتوى الملح؟**	☐	**معدل الصوديوم في المعلومات الغذائية**	☐	المكونات		
		☐	**الإشارات والادعاءات الواضحة للملح القليل على العلبة**	☐	غير ذلك:_____		
				☐	لا أعرف		

13	**هل تظن أن المعلومات المتعارف عليها عن استهلاك الملح كافية ومفهومة؟**	**A**	**نعم**	**B**	**كلا**		

14	**هل أنت مهتم بشأن هذه الجوانب من الطعام الذي تتناوله؟**						
		نعم	**كلا**		**نعم**	**كلا**	
	المنكه الاصطناعي			**السكر**			
	الملون الاصطناعي			**الوحدات الحرارية (الطاقة)**			
	الملح/الصوديوم			**الدهون المشبعة**			

15	**هل تفعل أي من الآتي؟**	**غالباً**	**أحياناً**	**أبداً**	**غير قابل للتطبيق**
	إضافة الملح أثناء الطبخ				
	إضافة الملح في صحن الطعام على الطاولة				
	محاولة شراء منتجات قليلة الملح				
	محاولة شراء منتجات خالية من الملح				

16	**هل تحاول التخفيف من كمية الملح التي تتناولها**	**A**	**نعم**	**B**	**كلا**	**C**	لا أعرف

إذا كان الجواب نعم، لماذا؟		
☐ **بناءً على إرشادات الطبيب/مرشد غذائي**	☐ لتخفيف إصابتي بأزمة قلبية أو جلطة	☐ بناءً على إرشادات أحد أفراد عائلتي
☐ لا أحب نكهته	☐ لأن الملح مضر بالصحة	☐ بناءً على إعلان/مقال/إعلان متلف
☐ لأني أتبع حمية غذائية	☐ لكي يكون أكلي أكثر صحة	☐ لتخفيف ضغط دمي
☐ لأني أعاني من مشاكل صحية	☐ لا أعرف	☐ غير ذلك: .....
إذا كان الجواب كلا، لماذا؟		
☐ لقد خففت بما فيه الكفاية ولا أريد التخفيف أكثر من ذلك مرة أخرى	☐ الجسم بحاجة للملح من أجل سلامة صحته	☐ لم أعرف أنه يجب تخفيف الملح
☐ لا يوجد الكثير من الملح في الغذائية	☐ لأني أتناول طعاماً صحياً ولا أظن أنني أكثر من تناول الملح	☐ لا أضيف الملح على أكلي
☐ لا يهمني الموضوع	☐ لا أتناول الأصناف الغنية بالملح	☐ لم أسمع من أحد أنه يجب تخفيف الملح
☐ لم أفكر في الموضوع من قبل	☐ لا أعرف	☐ غير ذلك: .....

قيم مدى موافقتك أو عدم موافقتك على العناصر أدناه باستخدام مقياس التصنيف: 1 = لا أوافق بشدة

		لا أوافق بشدة	لا أوافق	حيادي	أوافق	أوافق بشدة
17	تخفيف إضافة الملح هو حتماً مفيد لصحتك	1	2	3	4	5
18	تخفيف المأكولات التي تحتوي على الملح هو حتماً مهم لصحتك	1	2	3	4	5
19	تخفيف تناول الملح هو حتماً مهم لصحتي	1	2	3	4	5

20	**ما الذي يدفعك لتخفيف كمية الملح**	**A**	حدوث تغيير في وضعي الصحي	**B**	إرشادات الطبيب/مرشد غذائي	
		C	إرشادات أحد أفراد عائلتي أو أصدقائي	**D**	غير ذلك:	

21	**ما هي العوائق التي تحول دون تقليل تناول الملح؟**	**A**	أحب نكهته	**B**	لا يهمني الموضوع	
		C	أنا لا أعرف الأطعمة التي يجب أن أتجنبها	**D**	غير ذلك:	
22	**ما هو أخطر أمر ممكن أن يحصل إذا أكثرت من تناول الملح؟**	**A**	لا شيء	**B**	أتعرض الى ازمة قلبية أو جلطة	
		C	أتعرض الى ارتفاع في ضغط الدم	**D**	غير ذلك:	

23	**من أين تحصل على المعلومات الصحية؟**	**A**	الطبيب/مرشد غذائي	**B**	**أسرتي/أصدقائي**	
		C	الانترنت	**D**	وسائل الاعلام(حدد): ☐ تلفزيون ☐ راديو	
		E	غير ذلك:			

					☐ الصحف ☐ المجلات غير ذلك: .....
24	إذا كانت زيادة الملح/الصوديوم في الحمية الغذائية سبباً لمرض خطير معيّن، من المسؤول عن مساعدتك في تخفيف الملح فيما تأكل؟	A	الجهات الرسمية (حملات توعية صحية عامة)	B	الشركات المنتجة للمأكولات (صناعة المأكولات)
		C	الطبيب	D	أنا
25	هل سبق أن نصحك طبيب أو ممرضة أو اختصاصي تغذية بشأن مخاطر اتباع نظام غذائي غني بالملح والحاجة إلى تناول الملح باعتدال؟	A	نعم	B	كلا
26	هل وصف لك الطبيب كمية محددة من السوائل التي تشربها يوميًا؟	A	نعم	B	كلا

APPENDIX IX

Patient Health Questionnaire-2 (PHQ-2)

Over the last *2 weeks*, how often have you been bothered by any of the following problems?	**Not at all**	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things	**0**	**1**	**2**	**3**
2. Feeling down, depressed, or hopeless	**0**	**1**	**2**	**3**

For office coding: _____*0*_____+_____+_____+_____
Total Score =

Arabic version of PHQ-2

تقريباً كلّ يوم	**أكثر من نصف الأيّام**	**عدّة أيّام**	**أبداً**	**خلال الأسبوعين الماضيين، ما مدى تكرار إنزعاجك إثر أي من المشاكل التالية ؟**
3	2	1	0	**.1** فقدان المتعة و الفرح في تأدية كافة الأمور
3	2	1	0	**.2** الشعور بالحزن، أو الإكتئاب أو اليأس

PHQ-2 Score Interpretaion

PHQ-2 Score	**Probability of major depressive disorder (%)**	**Probability of any depressive disorder (%)**
1	15.4	36.9
2	21.1	48.3
3	38.4	75
4	45.5	81.2
5	56.4	84.6
6	78.6	92.9

APPENDIX X

Email to inform the physcian about his/her patients' emotional distress if needed

Dear Dr. .....

I have interviewed your patient X on (specify date) for the study titled 'Thirst and its predictors in heart failure. This patient scored.... on the PHQ-2 scale that screens for depression, which means that this patient is at risk/has depression. As per IRB requirements, we informed the patient of the availability of psychological services at the psychiatry department at AUBMC and community services, namely Embrace. In this email we are informing you in order to follow up as deemed appropriate. Thank you

Samar Noureddine, PI

Kamar Younes, MSN student

REFERENCES

Al Hadi, A. N., AlAteeq, D. A., Al-Sharif, E., Bawazeer, H. M., Alanazi, H., AlShomrani, A. T., Shuqdar, R. M., & AlOwaybil, R. (2017). An arabic translation, reliability, and validation of Patient Health Questionnaire in a Saudi sample. *Annals of general psychiatry*, *16*, 32. https://doi.org/10.1186/s12991-017-0155-1

Aliti, G. B., Rabelo, E. R., Clausell, N., Rohde, L. E., Biolo, A., & Beck-da-Silva, L. (2013). Aggressive fluid and sodium restriction in acute decompensated heart failure: a randomized clinical trial. *JAMA Internal Medicine*, *173*(12), 1058-1064.

Allida, S. M., Hayward, C. S., & Newton, P. J. (2018). Thirst in heart failure: what do we know so far?. *Current Opinion in Supportive and Palliative Care*, *12*(1), 4-9.

Allida, S. M., Inglis, S. C., Davidson, P. M., Hayward, C. S., Shehab, S., & Newton, P. J. (2016). A survey of views and opinions of health professionals managing thirst in chronic heart failure. *Contemporary Nurse*, *52*(2-3), 244-252.

Allida, S. M., Inglis, S. C., Davidson, P. M., Lal, S., Hayward, C. S., & Newton, P. J. (2015). Thirst in chronic heart failure: a review. *Journal of Clinical Nursing*, *24*(7-8), 916-926.

Allida, S. M., Inglis, S. C., Davidson, P. M., Hayward, C. S., & Newton, P. J. (2014). Measurement of thirst in chronic heart failure–A review. *Contemporary Nurse*, *48*(1), 2-9.

Allida, S. M., Shehab, S., Inglis, S. C., Davidson, P. M., Hayward, C. S., & Newton, P. J. (2020). A Randomised Controlled Trial of Chewing Gum to Relieve Thirst in

Chronic Heart Failure (RELIEVE-CHF). *Heart, Lung and Circulation*, *30*(4), 516-524.

doi: 10.1016/j.hlc.2020.09.004. Epub 2020 Oct 5.

Al-Shamiri M. Q. (2013). Heart failure in the Middle East. *Current Cardiology Reviews*, *9*(2), 174–178. https://doi.org/10.2174/1573403x11309020009

Arai, S., Stotts, N., & Puntillo, K. (2013). Thirst in critically ill patients: from physiology to sensation. *American Journal of Critical Care*, *22*(4), 328-335.

Arai, S. R., Butzlaff, A., Stotts, N. A., & Puntillo, K. A. (2014). Quench the thirst: lessons from clinical thirst trials. *Biological Research for Nursing*, *16*(4), 456-466.

Braunwald, E. (2015). The path to an angiotensin receptor antagonist-neprilysin inhibitor in the treatment of heart failure. *Journal of the American College of Cardiology*, *65*(10), 1029-1041.

Cattadori, G., Segurini, C., Picozzi, A., Padeletti, L., & Anzà, C. (2018). Exercise and heart failure: an update. *ESC heart failure*, *5*(2), 222-232.

Colwell, C. S. (2010). Preventing dehydration during sleep. *Nature neuroscience*, *13*(4), 403-404.

De Almeida, P. D. V., Grégio, A. M. T., Brancher, J. A., Ignácio, S. A., Machado, M. Â. N., de Lima, A. A. S., & Azevedo, L. R. (2008). Effects of antidepressants and benzodiazepines on stimulated salivary flow rate and biochemistry composition of the saliva. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*, *106*(1), 58-65.

De Vecchis, R., Baldi, C., Cioppa, C., Giasi, A., & Fusco, A. (2016). Effects of limiting fluid intake on clinical and laboratory outcomes in patients with heart failure. *Herz*, *41*(1), 63-75.

Deek, H., Chang, S., Newton, P. J., Noureddine, S., Inglis, S. C., Al Arab, G., ... & Davidson, P. M. (2017). An evaluation of involving family caregivers in the self-care of heart failure patients on hospital readmission: Randomised controlled trial (the FAMILY study). *International journal of nursing studies*, *75*, 101-111.

Deek, H., Newton, P. J., Kabbani, S., Hassouna, B., Macdonald, P. S., & Davidson, P. M. (2020). The Lebanese Heart Failure Snapshot: A National Presentation of Acute Heart Failure Admissions. *Journal of Nursing Scholarship*, *52*(5), 506-514.

Dunlay, S. M., & Roger, V. L. (2014). Understanding the epidemic of heart failure: past, present, and future. *Current Heart Failure Reports*, *11*(4), 404-415.

Eccles, R., Du-Plessis, L., Dommels, Y., & Wilkinson, J. E. (2013). Cold pleasure. Why we like ice drinks, ice-lollies and ice cream. *Appetite*, *71*, 357-360.

Eng, S. H., Jaarsma, T., Lupón, J., González, B., Ehrlin, J., Díaz, V., ... & Waldréus, N. (2020). Thirst and factors associated with frequent thirst in patients with heart failure in Spain. *Heart & Lung*, *50*(1), 86-91.

Eng, S. H., Waldréus, N., González, B., Ehrlin, J., Díaz, V., Rivas, C., ... & Jaarsma, T. (2021). Thirst distress in outpatients with heart failure in a Mediterranean zone of Spain. *ESC heart failure*, *8*(4), 2492-2501.

Farrell, M. J., Zamarripa, F., Shade, R., Phillips, P. A., McKinley, M., Fox, P. T., ... & Egan, G. F. (2008). Effect of aging on regional cerebral blood flow responses

associated with osmotic thirst and its satiation by water drinking: a PET study. *Proceedings of the National Academy of Sciences*, *105*(1), 382-387.

Finkel, R., Clark, M. A., & Cubeddu, L. X. (Eds.). (2009). *Pharmacology*. Lippincott Williams & Wilkins.

Fitzsimons, J. T. (1992). Physiology and pathophysiology of thirst and sodium appetite. *The Kidney: Physiology And Pathophysiology*, *78*(3), 1615-1648.

Gibbs, C. R., Jackson, G., & Lip, G. Y. (2000). ABC of heart failure. Non-drug management. *BMJ (Clinical research ed.)*, *320*(7231), 366–369. https://doi.org/10.1136/bmj.320.7231.366

Gong, J., Waldréus, N., Hu, S., Luo, Z., Xu, M., & Zhu, L. (2022). Thirst and factors associated with thirst in hospitalized patients with heart failure in China. *Heart & Lung*, *53*, 83-88.

Guyton, A.C., & Hall, J.E. (2011). *Textbook of Medical Physiology*. 12 ed. Philadelphia: Saunders, Elsevier.

Heidenreich, P. A., Bozkurt, B., Aguilar, D., Allen, L. A., Byun, J. J., Colvin, M. M., ... & Yancy, C. W. (2022). 2022 AHA/ACC/HFSA guideline for the management of heart failure: a report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*, 10-1161.

Holst, M., Strömberg, A., Lindholm, M., Uden, G., & Willenheimer, R. (2003). Fluid restriction in heart failure patients: is it useful? The design of a prospective, randomised study. *European Journal of Cardiovascular Nursing*, *2*(3), 237-242.

Holst, M., Strömberg, A., Lindholm, M., & Willenheimer, R. (2008). Description of self-reported fluid intake and its effects on body weight, symptoms, quality of

life and physical capacity in patients with stable chronic heart failure. *Journal of Clinical Nursing (Wiley-Blackwell), 17*(17), 2318–2326.

Inamdar, A. A., & Inamdar, A. C. (2016). Heart failure: diagnosis, management and utilization. *Journal of Clinical Medicine*, *5*(7), 62.

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2003). The Patient Health Questionnaire-2: validity of a two-item depression screener. *Medical care*, 1284-1292.

Lee, K. S., Song, E. K., Lennie, T. A., Frazier, S. K., Chung, M. L., Heo, S., ... & Moser, D. K. (2010). Symptom clusters in men and women with heart failure and their impact on cardiac event-free survival. *Journal of Cardiovascular Nursing*, *25*(4), 263-272.

Leib, D. E., Zimmerman, C. A., & Knight, Z. A. (2016). Thirst. *Current Biology*, *26*(24), R1260-R1265.

Lenz, E. R., & Pugh, L. C. (2014). *The theory of unpleasant symptoms*. *Middle range theory for nursing*, In: Smith MJ, Liehr PR, eds. Middle range theory for nursing 3rd ed. New York, US: Springer Publishing Company; 2014: 165-195.

Lenz, E. R., Pugh, L. C., Milligan, R. A., Gift, A., & Suppe, F. (1997). The middle-range theory of unpleasant symptoms: an update. *Advances in Nursing Science*, *19*(3), 14-27.

Lenz, E. R., Gift, A., Pugh, L. C., & Milligan, R. A. (2013). Unpleasant symptoms. *Middle Range Theories: Application to Nursing Research. 3rd ed. Philadelphia, PA: Lippincott Williams & Wilkins*, 68-81.

Li, Y., Fu, B., & Qian, X. (2015). Liberal versus restricted fluid administration in heart failure patients. *International Heart Journal*, *56*(2), 192-195.

McMurray, J. J., Adamopoulos, S., Anker, S. D., Auricchio, A., Böhm, M., ... & Gomez-Sanchez, M. A. (2012). ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC. *European Heart Journal*, *33*(14), 1787-1847.

Muth, T., Pritchett, R., Pritchett, K., Depaepe, J., & Blank, R. (2019). Hydration Status and Perception of Fluid Loss in Male and Female University Rugby Union Players. *International journal of exercise science*, *12*(3), 859–870.

Nasreddine, L., Akl, C., Al-Shaar, L., Almedawar, M. M., & Isma'eel, H. (2014). Consumer knowledge, attitudes and salt-related behavior in the Middle-East: the case of Lebanon. *Nutrients*, *6*(11), 5079-5102.

Pellicori, P., Kaur, K., & Clark, A. L. (2015). Fluid management in patients with chronic heart failure. *Cardiac Failure Review*, *1*(2), 90.

Philipson, H., Ekman, I., Forslund, H. B., Swedberg, K., & Schaufelberger, M. (2013). Salt and fluid restriction is effective in patients with chronic heart failure. *European journal of heart failure*, *15*(11), 1304-1310.

Polit, D. F., & Beck, C. T. (2010). Essentials of NURSING RESEARCH: Appraising evidence for nursing PRACTICE 7th ed. In *Essentials of nursing research: Appraising evidence for nursing practice 7th ed.: CD-ROM* (pp. 316-317). Philadelphia: Wolters Kluwer Lippincott Williams & Wilkins.

Porth, C. M., & Erickson, M. (1992). Physiology of thirst and drinking: implication for nursing practice. *Heart & Lung: The Journal of Critical Care*, *21*(3), 273.

Reilly, C. M., Higgins, M., Smith, A., Culler, S. D., & Dunbar, S. B. (2015). Isolating the benefits of fluid restriction in patients with heart failure: a pilot study. *European Journal of Cardiovascular Nursing*, *14*(6), 495-505.

Reilly, C. M., Meadows, K., Dunbar, S., Culler, S., & Smith, A. (2010). Thirst and QOL in persons with heart failure. *Heart & Lung: The Journal of Cardiopulmonary and Acute Care*, *39*(4), 353.

Sawaya, H., Atoui, M., Hamadeh, A., Zeinoun, P., & Nahas, Z. (2016). Adaptation and initial validation of the Patient Health Questionnaire–9 (PHQ-9) and the Generalized Anxiety Disorder–7 Questionnaire (GAD-7) in an Arabic speaking Lebanese psychiatric outpatient sample. *Psychiatry research*, *239*, 245-252.

Sun, J., Zhang, Z. W., Ma, Y. X., Liu, W., & Wang, C. Y. (2019). Application of self-care based on full-course individualized health education in patients with chronic heart failure and its influencing factors. *World journal of clinical cases*, *7*(16), 2165.

Tatari, S., Soubra, L., Tamim, H., Akhras, K., & Kabbani, S. (2015). The economic impact of patients with heart failure on the Lebanese healthcare system. *ESC Heart Failure*, *2*(3), 178-183.

Thibault, J. M., & Steiner, R. W. P. (2004). Efficient identification of adults with depression and dementia. *American Family Physician*, *70*(6), 1101-1110.

Thomson, W. M. (2015). Dry mouth and older people. *Australian Dental Journal*, *60*, 54-63.

Thornton, S. N. (2010). Thirst and hydration: physiology and consequences of dysfunction. *Physiology & Behavior*, *100*(1), 15-21.

Toto, K. H. (1994). Regulation of plasma osmolality: thirst and vasopressin. *Critical Care Nursing Clinics*, *6*(4), 661-674.

Van der Wal, M. H., Jaarsma, T., Moser, D. K., van Gilst, W. H., & van Veldhuisen, D. J. (2010). Qualitative examination of compliance in heart failure patients in The Netherlands. *Heart & Lung*, *39*(2), 121-130.

Van der Wal, M. H., Waldréus, N., Jaarsma, T., & Kato, N. P. (2019). Thirst in patients with heart failure in Sweden, the Netherlands, and Japan. *Journal of Cardiovascular Nursing*, *35*(1), 19-25.

Virani, S. S., Alonso, A., Benjamin, E. J., Bittencourt, M. S., Callaway, C. W., Carson, A. P., ... & Heard, D. G. (2020). Heart disease and stroke statistics—2020 update: a report from the American Heart Association. *Circulation*, E139-E596.

Waldreus, N., Chung, M. L., van der Wal, M. H., & Jaarsma, T. (2018). Trajectory of thirst intensity and distress from admission to 4-weeks follow up at home in patients with heart failure. *Patient Preference and Adherence*, *12*, 2223.

Waldreus, N., Hahn, R. G., & Jaarsma, T. (2013). Thirst in heart failure: a systematic literature review. *European Journal of Heart Failure*, *15*(2), 141-149.

Waldréus, N., Hahn, R. G., Lyngå, P., van der Wal, M. H., Hägglund, E., & Jaarsma, T. (2016). Changes in thirst intensity during optimization of heart failure medical therapy by nurses at the outpatient clinic. *Journal of Cardiovascular Nursing*, *31*(5), E17-E24.

Waldreus, N., Jaarsma, T., van der Wal, M. H., & Kato, N. P. (2018). Development and psychometric evaluation of the Thirst Distress Scale for patients with heart failure. *European Journal of Cardiovascular Nursing*, *17*(3), 226-234.

Waldréus, N., Sjöstrand, F., & Hahn, R. G. (2011). Thirst in the elderly with and without heart failure. *Archives of Gerontology and Geriatrics*, *53*(2), 174-178.

Waldréus, N., van der Wal, M. H., Hahn, R. G., van Veldhuisen, D. J., & Jaarsma, T. (2014). Thirst trajectory and factors associated with persistent thirst in patients with heart failure. *Journal of Cardiac Failure*, *20*(9), 689-695.

Walsh, J. L., Fathallah, J., Al-Shaar, L., Alam, S., Nasreddine, L., & Isma'eel, H. (2017). Knowledge, attitudes, motivators and salt-related behaviour in a cardiac care unit population: A cross-sectional study in Lebanon. *Mediterranean Journal of Nutrition and Metabolism*, *10*(1), 79-91.

Yancy, C. W., Jessup, M., Bozkurt, B., Butler, J., Casey, D. E., Colvin, M. M., ... & Westlake, C. (2017). 2017 ACC/AHA/HFSA focused update of the 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines and the Heart Failure Society of America. *Journal of the American College of Cardiology*, *70*(6), 776-803.

Yancy, C. W., Jessup, M., Bozkurt, B., Butler, J., Casey Jr, D. E., Drazner, M. H., ... & Wilkoff, B. L. (2013). 2013 ACCF/AHA guideline for the management of heart failure: executive summary: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. *Circulation*, *128*(16), 1810-1852.

Zahwe, M., Isma'eel, H., Skouri, H., Al-Hajje, A., Rachidi, S., Tamim, H., & Noureddine, S. (2020). Validation of the arabic version of the Minnesota living with heart failure questionnaire. *Heart & Lung*, *49*(1), 36-41.