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Prevalence and Correlates of Cardiac Cachexia Among Jordanian Patients With Chronic Heart Failure

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Abstract

Background: Cardiac cachexia is considered as an ominous complication that possibly associated with the terminal stages of chronic heart failure as it consumes the protein-calories reserves of the patients.

Aims: The aims of this study were to identify the prevalence, level, and correlates of cardiac cachexia among Jordanian patients with chronic heart failure.

Methods: A cross-sectional design was employed. A convenient sample of 300 chronic heart failure patients was recruited from accessible chronic heart failure patients who regularly visit the cardiac care clinics at two different hospitals that represent two health sectors in Jordan. A self-developed instrument was used to collect the data for the purpose of this study.

Results: The mean of the total cachexia score of the sample was 5.88. Cardiac cachexia was detected in 58.7% (n= 176) about half of them were having mild cachexia. The prevalence of cardiac cachexia was 13.15%. There were statistically significant correlation between the total cachexia score and some variables that include the patients' age, monthly income, and number of years since diagnosed as chronic heart failure patients; however, number of daily smoked cigarettes wasn't significantly correlated with the total cachexia score.

Conclusion: Cardiac cachexia has not been widely investigated yet. The findings of this study can be used as a baseline data since this study is the first of its kind conducted at the national and regional level. In addition, this study can be useful for determining effective therapeutic modalities that can be employed on behalf of those patients among the health care team; particularly nurses.

Keywords: cardiac cachexia, chronic heart failure (CHF), complication, Jordan

1. Introduction and Background

Cardiac cachexia is one of the most prevalent types of cachexia and it is considered as an ominous complication that possibly associated terminal stages of chronic heart failure (CHF), as it consumes the protein-calories reserves of the CHF patients, particularly elderly adults (Tibor Szabó et al., 2013; Tulman, Tripathi, Abel, & Papadimos, 2012). Indeed, several definitions were adopted to identify cardiac cachexia; however most definitions agreed that it is a wasting, catabolic state that affects the bone, muscle, and fat tissues of the CHF patients, which eventually leads to terminal hemodynamic compromise after the body fails to compensate (Cavey, 2011; Tibor Szabó et al., 2013; Tulman et al., 2012).

Cardiac cachexia is diagnosed when non-edematous weight loss of more than 5% of the pre-morbid normal patient's body weight, without the presence of any other cachectic causes like cancer, thyroid diseases and severe liver diseases, that occurred over a period of at least 6 months (Evans et al., 2008; Letilovic & Vrhovac, 2013; Loncar, Omersa, Cvetinovic, Arandjelovic, & Lainscak, 2014).

In fact, the pathophysiology of cachexia that occurred with CHF patients is not fully understood; because the cardiac cachexia occurred as a result of many factors that contribute in complex imbalances in the catabolic and anabolic processes leading to the wasting and catabolic state (Cavey, 2011; Loncar et al., 2014; Tibor Szabó et al., 2013). Activation of complex series of metabolic, neurohormonal, and immunological processes by the development of CHF, are thought to have roles in the imbalances of the catabolic and anabolic processes (Martins et al., 2014).

According to the most recent statistics, approximately 15% of patients of advanced CHF developed cardiac cachexia (Farkas et al., 2013; Stephan von Haehling & Anker, 2014). However, in USA alone, the number of CHF patients currently is about 5 million and is growing annually with 500,000 new cases (Palus et al., 2011; Stephan von Haehling & Anker, 2010). In Jordan and other developing Middle-East countries, heart diseases are emerging health problem with a proportion of deaths range from 25% to 45% due to increased risk factors with a lack of effective preventive measures (Elhneiti & Al-Hussami, 2017). In Jordan specifically, Coronary Heart Diseases (CHD) is responsible on 35% of the overall deaths (WHO, 2013).

Multiple factors contribute in increasing the risk of cachexia in CHF patients and potentiate its complications. Advancing in age is considered as one of the risk factors of heart failure. According to Lloyd-Jones (2009) and von Haehling (2010), about 5.7 million Americans who are older than 65 years old were hospitalized with heart failure. Von Haehling (2007) review study tried to explain the normal pathophysiology of aging among cardiac cachectic patients. The researchers provided evidences to support that the energy expenditure decreased with advancing of age in most of the CHF patients, but the resting energy expenditure in some patients increased as a result of increase cardiac ventilatory work and resting peripheral oxygen consumption. This small portion of patients was the best candidates for developing of cardiac cachexia. Furthermore, the researchers found a significant ($P<0.0001$) annual reduction in lean body mass about 0.1-0.3 kg associates advancing in age of the CHF patients.

Smoking and its disastrous effect on the cardiac muscle and its role in developing cardiac cachexia in CHF patients were discussed also by many studies in the literature (Ebner et al., 2013; Flouris et al., 2014; Plank et al., 2014). Flouris (2014) and his colleagues studied the effect of second hand smoking on 19 healthy nonsmokers adults and they measured Heart Rate Variability (HRV), serum cotinine, and six cardiac markers that include: Troponin I, Myoglobin, Creatine Kinase-MB (CK-MB), Carbonic Anhydrase III, Fatty Acid Binding Protein, and Glycogen Phosphorylase BB in serum samples. They concluded that second hand smoking suppresses heart rate variability (HRV) in response to changes of emotional or physical efforts. Also, second hand smoking has an observed effect on augmentation of CK-MB and Myoglobin that may lead to a generalized lytic state for the cardiac muscle which appeared for at least two hours post exposure to second hand smoking.

Search in the literature through wide range of electronic data bases engines such as EBSCO, CINAHL and Pub MED was conducted. Unfortunately, no single study about the prevalence, assessment, or management of cardiac cachexia was found among CHF patients in the developing countries in which life styles and cultures expected to influence markedly the research outcomes. The literature revealed contradictions in defining the correlates of cardiac cachexia mostly related to the different sociodemographical characteristics of the CHF patients where the reviewed studies were done.

On the other hand, the variations that existed in the diagnosing of cardiac cachexia, encourage the researcher to dig more in the literature for a non-expensive, valid and reliable instrument which clearly diagnoses cardiac cachexia.

Consequently, the purposes of this study were to identify the prevalence and levels of cardiac cachexia in Jordanian CHF patients and to describe the correlates of cardiac cachexia.

2. Methodology

2.1 Design & Sample

A cross-sectional design was used to conduct this study. The target population was all Jordanian CHF patients who were followed up in the Jordanian hospitals. The accessible population for this study was Jordanian CHF patients who were followed up in two hospitals represent two major health sector in the central part of Jordan; military and governmental.

A convenient sampling technique was used to recruit CHF for the study. The sample size was determined by using power primer analysis based on the statistical tests that will be used to analyze the participants data (Cohen, 1992). A sample size of 200 CHF patients was needed to obtain a power of 0.8, medium effect size, and an alpha of 0.05. To allow for 10% drop-out rate, there was a need to increase the sample by 10 % to reach 220 CHF patients. However, as a result of the availability of participants and to overcome the potential drop-out, the sample size was increased to 300 CHF patients to increase the generalizability of the result and to increase the external validity of the study.

Eligibility criteria were adult Jordanian patients who had chronic heart failure and were able to understand Arabic. Those with known neoplastic, thyroid disorders, nutritional impairments, or any chronic inflammatory conditions were excluded from the study; to exclude other well-known types of cachexia, like cancer and pulmonary cachexia. Furthermore, during the first exposure visit, any patients with signs of fluid overload that may mask the detecting of weight loss were also excluded. Subjects were excluded on the basis of the data gathered from their medical

records that show their eligibility to be recruited for the study. For example, if the records showed that the participant has known neoplastic or nutritional impairment with a repetitive visits to nutritional clinic, the participant will be excluded from the study.

2.2 Instrument

A researcher-developed instrument based on the latest dimensions of cardiac cachexia identification was used in this study (Table 1). Using a combination of anthropometrics measures, biological markers, and clinical manifestations as reported in the available literature was used in this study to detect and diagnose cardiac cachexia among Jordanian CHF patients (Carlson & Dahlin, 2014; Evans et al., 2008; Gabison, Gibbs, Uziely, & Ganz, 2010; Letilovic & Vrhovac, 2013).

The instrument consisted mainly from two parts: patients' sociodemographic data sheet and cardiac cachexia instrument which divided to three main parts: anthropometrics, biomarkers, and clinical manifestation that associated with cardiac cachexia that were measured majorly as what it is followed in cancer cachexia assessment scale based on Common Terminology Criteria for Adverse events (CTCAE) version 4 that were developed by the American National Institute of Health and National Cancer Institute in 2010 (Gabison et al., 2010; NIH & NCI, 2010).

In fact, after extensive search in the literature, no specific instruments were found to measure cardiac cachexia and the targeted variables. Different methods were used to detect cardiac cachexia incidence among CHF patients, which include mainly clinical manifestations, anthropometric measures, biochemical markers, imaging, and functional tests to quantify muscle mass. Unfortunately, there are variations existed in diagnosing cardiac cachexia, even with the use of different methods in detecting cardiac cachexia. However, Gabison and her colleagues built in 2010 a cachexia assessment scale to detect cachexia among cancer patients based on a combination of anthropometric measures, biological markers and clinical manifestations that occurred in cancer cachectic patients similar to the targeted variables for measuring through cardiac cachexia instrument (Gabison et al., 2010). The comprehensive approach and the applicability of assessment that only followed in cancer cachexia scale makes it the building blocks for the cardiac cachexia instrument.

Total cachexia score was calculated by summing up each answered item contained within the cardiac cachexia instrument. The classification of the severity of cardiac cachexia was calculated as per to what is adopted in the cancer cachexia assessment scale based on the CTCAE version 4 (Gabison et al., 2010; NIH & NCI, 2010); where 0 to 2 score = no cachexia; 3 to 18 = mild cachexia; 19 to 24 = moderate cachexia; and 25 to 24 = severe cachexia.

The face and scale content validity of the researcher-developed instrument items were checked by panel of specialized experts in cardiac care nursing and nutrition. All selected experts were PhD-prepared faculty members in the nursing schools at various Jordanian universities. For the content validity, the experts evaluated the relevancy of the developed cardiac cachexia instrument items by using a scale of 1 to 4; where 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = highly relevant. The Scale Content Validity Index (S-CVI) were calculated and found to be 0.93.

Table 1. Cardiac Cachexia Instrument

Item		0	1	2	3	4
Anthropometrics	**% Weight loss during 6 months**	<5%	5%-10%	10%-20%	≥20%	
	BMI	Normal (<19)	Moderate (17-19)		Severe weight loss (<17)	
	AMA (mm) **According to age and gender**	Average (>15th but ≤85th)	Below average (>5th but ≤ 15th)		Wasted (≤5th)	
Biomarkers	**Albumin (g/l)**	35-50	30-<35	20- <30	< 20	
	Createnine **"ULN: Upper Limit of Normal"**	Normal	>ULN - 1.5 X ULN	(>1.5 - 3.0) ULN	(>3.0 - 6.0) ULN	>6.0 X ULN
	Hemoglobin (g/dl)	Normal	10	8-9.9	6.5-7.9	<6.5
	Decrease muscle strength **According to age and gender**	Average	Below average		Poor according	
	Fatigue	No fatigue	Fatigue relieved by rest	Fatigue not relieved by rest; limiting instrumental ADL	Fatigue not relieved by rest, limiting self-care ADL	
Clinical Manifestations	**Anorexia**	No anorexia	Loss of appetite without alteration in eating habits	Oral intake altered without significant weight loss or malnutrition; oral nutritional supplements indicated	Associated with significant weight loss or malnutrition (e.g., inadequate oral caloric and/or fluid intake); tube feeding or TPN indicated	Life-threatening consequences; urgent intervention indicated

2.2 Pilot Study

A pilot study was carried out with a sample of 30 CHF patients who met the inclusion criteria at the military hospital to test the clarity, reliability and feasibility of the instrument. Cronbach's alpha that was calculated and found to be 0.92, indicated high internal consistency reliability when applying the instrument during the pilot study.

2.3 Data Collection Procedure

Before administering the instrument for CHF patients, an official approval of institutional Review Board (IRB) was attained. Then, administrative approval from the institutional review board of the selected hospitals and its administrations were obtained.

A convenient and eligible sample was used based on non-probability sampling technique, which recruits all accessible CHF patients until obtaining the specified targeted sample. The primary researcher was the only data collectors who contacted the participants and administered the instrument of the study. To ensure that all the participants are voluntarily involved in the study, consent forms were distributed to participants before applying the instruments to make sure that CHF patients participation has no influence on their quality of care that was provided for them. The primary researcher provided a short debriefing session for each patient to clarify the purpose, the research procedure and researcher's commitment of ensuring confidentiality and privacy of all

potential participants.

The sociodemographic data were collected by direct questions to the participating CHF patients after brief description for the study researcher and his qualification. NYHA class for every participant was identified through asking direct questions by the researcher according to the known criteria of each class; while the cardiac cachexia instrument were filled according to the participants' measurements and verbal answers. Data collection from the participants started in the 12 of April 2016 and ended in 23 of June 2016.

2.4 Methods of Data Analysis

Data was entered and analyzed using the SPSS Statistical package version 22 using a code book to reduce errors during the data entry phase (Bums and Grove, 2009). Data entry was followed by standard data cleaning procedures to check the accuracy of the data and deal with patterns of missing data if there is any (Bums and Grove, 2009). Descriptive statistics were used to describe the patients' levels of cachexia and its prevalence alongside patients' demographic characteristics. Pearson correlation was employed to examine the correlation between total cachexia score and participants' selected sociodemographic characteristics that were measured as continuous variables. An α-level of 0.05 was set as a level of significance for all statistical procedures executed in this study.

3. Results

3.1 Characteristics of the Sample

From the two different hospitals that belong to two different health sectors inside Jordan, this study recruited three hundred Jordanian CHF patients who were conveniently selected according to the inclusion and exclusion criteria to apply the cardiac cachexia instrument on them. One hundred and sixty CHF patients (53.3% of the total study participants) were recruited from the military hospital, while the rest of the study sample, one hundred and forty CHF patients (46.7%) were recruited from the governmental hospital (Table 2).

Table 2. Sample characteristics

Variable	N	%
Hospital		
Military	160	53.3
Governmental	140	46.7
Gender		
Male	198	66.0
Female	102	34.0
Marital status		
Married	238	79.3
Single, widowed or divorced	62	20.7
Level of education		
Low educational level	173	57.7
High educational level	127	42.3
Employment status		
Employee	108	36.0
Retired	192	64.0
Medical insurance		
Yes	213	71.0
No	87	29.0

Chronic diseases		
No chronic diseases	91	30.3
DM	47	15.7
HTN	149	46.3
Both DM and HTN	23	7.7
NYHA classification		
I	58	19.3
II	130	43.3
III	86	28.7
IV	26	8.7
Smoking status		
Smoker	215	71.7
Non-smoker	85	28.3
Variable	**M (SD)**	**Actual Range**
Age	57.76 (10.66)	39-90
Monthly income	398.78 (168.92)	100-1000
Number of years since diagnosed as CHF	8.66 (5.77)	2-31
Number of smoked cigarettes	22.32 (8.39)	3-50

3.2 Prevalence of Cardiac Cachexia among Jordanian CHF Patients

After calculating the total cachexia score for each participating CHF patient by summing up each answered item contained within the cardiac cachexia instrument, the data analysis revealed that the mean of total cachexia scores of the sample was 5.88 (SD= 6.15) with an actual range of 0-26 (Table 3). After applying the cancer cachexia assessment scale scoring system, the data analysis showed that about 58.7% (n=176) of the participants had cardiac cachexia, while 41.3% (n=124) of them had no cachexia. The accessible population that the study's sample was recruited from was estimated from records of the two selected study hospitals and it was found equal to1338 CHF patients that includes the total of the recruited CHF participants, CHF patients who were not enrolled according to their eligibility, those who did not complete the study and those who declined participation in the study. The prevalence of cardiac cachexia with respect to the accessible population was found about 13.15%.

3.3 Level of Cardiac Cachexia among Jordanian CHF Patients

In order to identify the cardiac cachexia levels and to categorize the participants based on their scores, we also used the cancer cachexia assessment scale method of classifying and identifying the levels of cachexia among the participants (Table 3).

The levels of cardiac cachexia were different across the study sample, and about half of the participants (n=155) having mild cardiac cachexia, while 5.7% (n=17) of them having moderate cardiac cachexia, and 1.3% (n=4) of the participants having severe cardiac cachexia.

Table 3. Prevalence and levels of cardiac cachexia among Jordanian Patients with CHF

Variable	**N**	**%**	**M (SD)**	**Actual Range**
Total cardiac cachexia score	300		5.88 (6.15)	0-26
No cardiac cachexia	124	41.3		0-2
Mild cardiac cachexia	155	51.7		3-18
Moderate cardiac cachexia	017	5.7		19-24
Severe cardiac cachexia	004	1.3		25-36

3.4 The Correlation between Cardiac Cachexia and Sociodemographic Characteristics of Jordanian CHF Patients

Results of the correlations analysis indicated strong significant positive correlation between the total cachexia score and participants' age (r= 0.74, p= 0.001). However, weak significant positive correlations were found between total cachexia score and each of monthly income (r = 0.130, p= 0.024), and number of years since the patient firstly diagnosed of CHF (r= 0.188, p= 0.001). Participants who were older, had a higher monthly income, and diagnosed earlier with CHF reported higher total cachexia scores than other participant. On the other hand, number of daily smoked cigarettes didn't significantly correlated with the total cachexia score (r= -0.083, p= 0.226) (Table 4).

Table 4. Pearson's correlation matrix between all continuous variables with total cachexia score

Variable	Total cardiac cachexia score
1. Age	.74**
2. Monthly income	.130*
3. Number of years since the patient firstly diagnosed of CHF	.188**
4. Number of daily smoked cigarettes	-.083

*Correlation is significant at the 0.01 level (2-tailed).

** Correlation is significant at the 0.05 level (2-tailed).

4. Discussion

4.1 Prevalence and Levels of Cardiac Cachexia among Jordanian CHF Patients

This study was the first study conducted in Jordan to examine cardiac cachexia among CHF patients. The analysis showed that the total cardiac cachexia score in Jordanian CHF patients was relatively high (M= 5.88, SD= 6.15), and about 58.7% (n=176) of the study participants had cardiac cachexia. In fact, this high percentage of cardiac cachexia is reflecting a serious problem that needs an immediate intervention in order to improve medical and nursing practice from one perspective, and to improve the CHF patients' knowledge and behaviors from the other perspective.

A few studies that discuss cardiac cachexia prevalence were found in literature. According to the most recent statistics about cardiac cachexia, approximately 15% of patients of advanced CHF developed cardiac cachexia (Farkas et al., 2013; Stephan von Haehling & Anker, 2014). In our study, the prevalence of cardiac cachexia with respect to the accessible population was found about 13.15% which is around the global prevalence. However, the percentage of cachectic patients in our results open the doors about a serious un-noticed problem that in need to be managed and controlled.

In fact, most of the reviewed studies used only weight loss to detect and diagnosed patients with cardiac cachexia with relatively small convenient samples of patients. Szabó (2014) is one of the recent studies that relied on weight loss to identify about 16% cardiac cachectic patients among 111 CHF patients included in the study. However, the small sample size of the cardiac cachectic patients increases the risk of committing type II error and limit the generalizability of study results.

On the other hand, our study high percentage of cardiac cachexia is congruent with other researches' findings that also relied only on the weight loss to diagnose and identify cardiac cachexia. Araújo (2011) and his colleagues in their study found that about 40% (n= 38) of their total sample of CHF patients (n= 94) had cardiac cachexia based on their weight loss during 6 the last six months. However, being a single center study with small relatively convenient sample with low female proportion limit the generalizability of their results.

In our study, we didn't rely only on the weight loss to diagnose cardiac cachexia. We used a combination of variables, including anthropometrics, biomarkers, and clinical manifestations, to identify the cardiac cachectic patients. The influence of additional criteria to the weight loss for diagnosing cardiac cachexia was in contrast with what Letilovic (2013) found in his study when the percentage of cardiac cachexia decreased from 31% (n= 13) based on weight loss only to 24% (n= 10) after adding the additional criteria of other anthropometrics, biomarkers, and clinical manifestations. However, Letilovic (2013) using of a small number of CHF patients limits the generalizability of the study results.

In related to the levels of cardiac cachexia, our study was the first study that tried to classify cardiac cachexia to levels and to identify the frequencies and percentages for each level. Although the majority of our study participants were cachectic patients (58.7%), fortunately the highest percentage of the cachectic patients were classified as mild cachexia that could be managed successfully with better chances of prognosis when it is compared with the more complicated levels of cardiac cachexia, like moderate and severe levels (Carlson & Dahlin, 2014; Cavey, 2011; Gřiva, 2015). In fact, our classification to levels was similar to what Gabison (2010) used in developing her instrument when she studied 90 cancer patients and found that about 41% (n= 37) of her participant were not having cachexia; while 48% (n=43) of them were mild and 11% (n= 10) had moderate to severe cachexia.

Based on the comparison between our results and other literature studies, our rationales for the observed difference in the levels and percentage of cardiac cachexia are that our study relied on other variables to diagnose cardiac cachexia besides losing body weight only in the last six months as other studies relied on. The increasing number of measured variables and scoring system that were used successfully in our study revealed a relatively similar percentage of cardiac cachexia as it is noticed in the cancer cachexia after using the same criteria.

The other possible rational for these variations in prevalence and percentage of cardiac cachexia in comparison to literature could be related to various social, environmental and cultural variables. The unhealthy life styles of the study participants could be clearly observed through the high percentage of smokers. Among them (71.7%) were smokers which could be considered as one of the leading causes for the resulted high percentage of cardiac cachexia among the participating CHF patients.

4.2 The Correlation between Cardiac Cachexia and Sociodemographic Characteristics of Jordanian CHF Patients

The results revealed on a strong significant positive correlation between the total cachexia score and advancing in age of CHF patients ($r=0.74$, $p=0.001$). This result is in line with other studies in the literature that discussed the role of advancing in age of CHF patients in developing cardiac cachexia. Advancing in age is concurrent with decreasing in the levels of protein and fat synthesis inside the body, which resulted from the ongoing decline in the levels of testosterone and other many anabolic hormones with advancing in age (Cavey, 2011; Jankowska et al., 2006; Morley, Thomas, & Wilson, 2006; Yamada et al., 2013). Moreover, von Haehling (2007) found in his study that the energy expenditure decreased with advancing of age in the CHF patient, and he claimed that there was a significant annual reduction in lean body mass ($P<0.0001$), about 0.1-0.3 kg, that is associated the advancing in age of the CHF patients. Yamada (2013) studied 568 healthy men and 1314 healthy women and found that the muscle mass loss increased with advancing in age; especially after the age of 75 year in both genders.

Our results also revealed on a weak significant positive correlations between the total cachexia score and CHF patient's monthly income ($r= 0.130$, $p= 0.024$), and number of years since the patient firstly diagnosed of CHF ($r=0.188$, $p=0.001$). The positive correlation between numbers of years since diagnosed of CHF and the total cachexia score could be attributed to the advancing in age and its accompanying changes that occurred simultaneously with the increasing of number of the years since firstly diagnosed as CHF patients.

Moreover, the positive correlation of the total cachexia score with number of years since firstly diagnosed as CHF patients could be also attributed to the anxiety, stress, and depression that accompanied the chronic diseases in general and increased their levels simultaneously with increasing number of the suffering years of chronic diseases (Al-Gamal, 2014; Lee, Chung, Suh, & Jung, 2015; Min-Su et al., 2015; Popović et al., 2015). In fact, our result of the significant correlation of the number of years since diagnosed as CHF was in contrast with what Araújo (2011) and his colleagues found when they compared 38 cachectic patients with 56 non-cachectic patients. They found that there was no significant difference between the study groups with respect to time since CHF diagnosis ($p= 0.52$). However, being a single center study with a small sample of patients limited the generalizability of their results. In fact, the comparisons of our results with other studies are not equivalent due to various reasons, including cultural and sociodemographic characteristics of the sample that are different from our recruited sample from a Middle East country like Jordan where unique cultural values and sociodemographics govern and affect the behaviors of CHF patients.

The monthly income and its positive correlation with the total cachexia score are in congruent with other studies that discussed and supported that the higher income people had higher healthy lifestyle behaviors which had effects in decreasing the possibilities of the complicating of CHF and reaching the cachectic state (Eshah, 2011; Goeppel, Frenz, Grabenhenrich, Keil, & Tinnemann, 2016). Furthermore, the higher monthly income is usually associated with presence of better quality of life and with a medical insurance that covers the medical needs for the chronic diseases patients like CHF patients (Lemos, Rodrigues, Paulo Veiga, & Veiga, 2015; Salinas, de Heer,

Lapeyrouse, Heyman, & Guillermo Balcázar, 2015).

The insignificant correlation between number of daily smoked cigarettes and total cachexia score was unpredicted and in contrast with some literature studies that found that the number of daily smoked cigarettes positively correlated with CHF complications like cardiac cachexia (Ebner et al., 2013). Ebner and his colleagues concluded that serum cotinine levels increase when the number of smoked cigarettes increases, and this has a major role in the progression of cardiovascular and metabolic dysfunction in CHF patient that may be complicated in comparison to cardiac cachexia.

4.3 Strengths and Limitations

The major strength of the study lies in the overall number of the sample (n= 300) in comparison with most of the reviewed studies that were conducted with a few number of participants. However, the convenient sampling technique was used to recruit the study participants from only two health sectors without including the private or university-affiliated health sector causes limitation in the external validity and limits the generalizability of the results.

Another major limitation of the current study was related to the main study instrument which developed by the researcher. In fact, after extensive search in the literature, no specific instruments were found to measure cardiac cachexia and the targeted variables. So, the study instrument was built after a thorough and extensive search in the literature to find the measured variables that contribute in cardiac cachexia incidence. However, further testing of psychometric properties is recommended to ensure accurate and valid measurement of the cardiac cachexia.

5. Conclusion & Implications

Cardiac cachexia has not been widely measured and studied yet world widely. The results of this study shed the lights on the cardiac cachexia as a prevalent problem in Jordanian CHF patients that in need for urgent collaborative efforts to fight and decrease its prevalence and pathological consequences. Sociodemographic characteristics of the CHF patients and their chronic diseases have roles in developing cardiac cachexia and should be taken into consideration when dealing with CHF patients and when developing and implementing treatment plans of cardiac cachexia.

5.1 Relevance to Clinical Practice

Indeed, the results of this study can be used as a baseline data about the prevalence and level of cardiac cachexia among Jordanian CHF patients since this study is the first of its kind conducted to examine cardiac cachexia at the national and even the regional level. Establishing baseline data about cardiac cachexia paved the way in front of future researches for it helps the researchers to conduct additional more controlled research studies in terms of their designs and methodologies. In addition, this study can be useful for determining effective therapeutic modalities that can be employed on behalf of cachectic patients among the health care team; particularly nurses, that could be used effectively in decreasing the cardiac cachexia incidence among the CHF patients, like nutritional or patients' educational and patient's families educational programs (Agren, Evangelista, Hjelm, & Strömberg, 2012; Cavey, 2011; Holmes, 2009; Lycholip, Celutkiene, Rudys, Steponenieni, & Laucevicius, 2010; Strasser, 2012).

Nurses and other health care members must have the necessary knowledge and trainings to correctly recognize the cardiac cachexia and differentiate it from other similar disorders, like malnutrition or sarcopenia. Indeed, the researcher's developed instrument to detect and diagnose cachectic CHF patients can be used easily by the nurses and other health team members; since it relied on easily measurable variables that can be assessed rapidly during the routinely follow-up visits or even in the acute care settings.

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Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

References

Agren, S., Evangelista, L. S., Hjelm, C., & Strömberg, A. (2012). Dyads affected by chronic heart failure: A randomized study evaluating effects of education and psychosocial support to patients with heart failure and their partners. *Journal of Cardiac Failure, 18*(5), 359-366 358p.

Al-Gamal, E. (2014). Quality of Life, Anxiety and Depression among Patients with Chronic Obstructive Pulmonary Disease and their Spouses. *Issues in Mental Health Nursing, 35*(10), 761-767.

https://doi.org/10.3109/01612840.2014.908440

Araújo, J. P., Lourenço, P., Rocha-Gonçalves, F., Ferreira, A., & Bettencourt, P. (2011). Nutritional markers and prognosis in cardiac cachexia. *International Journal of Cardiology, 146*(3), 359-363. https://doi.org/10.1016/j.ijcard.2009.07.042

Burns, N., & Groove, S. (2009). *The Practice of Nursing Research Conduct, Critique and Utilization* (5th ed.). Philadelphia: W.B. Saunders.

Carlson, H., & Dahlin, C. M. (2014). Managing the Effects of Cardiac Cachexia. *Journal of Hospice & Palliative Nursing, 16*(1), 15-22. https://doi.org/10.1097/NJH.0000000000000039

Cavey, J. (2011). Cardiac Cachexia. *Journal for Nurse Practitioners, 7*(7), 578-581. https://doi.org/10.1016/j.nurpra.2011.04.018

Cohen, J. (1992). A Power Primer. *Psychological Bulletin, 112*(1), 155-159. https://doi.org/10.1037/0033-2909.112.1.155

Ebner, N., Földes, G., Szabo, T., Tacke, M., Fülster, S., Sandek, A., . . . von Haehling, S. (2013). Assessment of serum cotinine in patients with chronic heart failure: self-reported versus objective smoking behaviour. *Clinical Research In Cardiology: Official Journal Of The German Cardiac Society, 102*(2), 95-101. https://doi.org/10.1007/s00392-012-0499-0

Elhneiti, M., & Al-Hussami, M. (2017). Predicting Risk Factors of Heart Disease among Jordanian Patients. *Health, 9*(2), 237-251. https://doi.org/10.4236/health.2017.92016

Eshah, N. F. (2011). Lifestyle and health promoting behaviours in Jordanian subjects without prior history of coronary heart disease. *International Journal of Nursing Practice, 17*(1), 27-35. https://doi.org/10.1111/j.1440-172X.2010.01902.x

Evans, W. J., Morley, J. E., Argilés, J., Bales, C., Baracos, V., Guttridge, D., . . . Anker, S. D. (2008). Cachexia: a new definition. *Clinical Nutrition, 27*(6), 793-799. https://doi.org/10.1016/j.clnu.2008.06.013

Farkas, J. A., von Haehling, S., Kalantar-Zadeh, K., Morley, J. E., Anker, S. D., & Lainscak, M. (2013). Cachexia as a major public health problem: frequent, costly, and deadly. *Journal of Cachexia, Sarcopenia and Muscle, 4*(3), 173-178. https://doi.org/10.1007/s13539-013-0105-y

Flouris, A. D., Dinas, P. C., Tzatzarakis, M. N., Metsios, G. S., Kostikas, K., Jamurtas, A. Z., . . . Koutedakis, Y. (2014). Exposure to secondhand smoke promotes sympathetic activity and cardiac muscle cachexia. *International Journal of Environmental Health Research, 24*(3), 189-194. https://doi.org/10.1080/09603123.2013.800966

Gabison, R., Gibbs, M., Uziely, B., & Ganz, F. D. (2010). The Cachexia Assessment Scale: Development and Psychometric Properties. *Oncology Nursing Forum, 37*(5), 635-640. https://doi.org/10.1188/10.ONF.635-640

Goeppel, C., Frenz, P., Grabenhenrich, L., Keil, T., & Tinnemann, P. (2016). Assessment of universal health coverage for adults aged 50 years or older with chronic illness in six middle-income countries. *Bulletin of the World Health Organization, 94*(4), 276-285 213p. https://doi.org/10.2471/BLT.15.163832

Gřiva, M. (2015). *Cardiac cachexia – Up-to-date 2015. Cor et Vasa*. https://doi.org/10.1016/j.crvasa.2015.08.003

Holmes, S. (2009). A difficult clinical problem: diagnosis, impact and clinical management of cachexia in palliative care. *International Journal of Palliative Nursing, 15*(7), 320. https://doi.org/10.12968/ijpn.2009.15.7.43421

Jankowska, E. A., Biel, B., Majda, J., Szklarska, A., Lopuszanska, M., Medras, M., . . . Ponikowski, P. (2006). Anabolic deficiency in men with chronic heart failure: prevalence and detrimental impact on survival. *Circulation, 114*(17), 1829-1837. https://doi.org/10.1161/CIRCULATIONAHA.106.649426

Lee, E.-H., Chung, B. Y., Suh, Ch.-H., & Jung, J.-Y. (2015). Korean versions of the Perceived Stress Scale (PSS-14, 10 and 4): psychometric evaluation in patients with chronic disease. *Scandinavian Journal of Caring Sciences, 29*(1), 183-192 110p. https://doi.org/10.1111/scs.12131

Lemos, C. F., Rodrigues, M. P., Paulo, V., Joel, R., & Veiga, J. R. P. (2015). Family income is associated with quality of life in patients with chronic kidney disease in the pre-dialysis phase: a cross sectional study. *Health & Quality of Life Outcomes, 13*, 1-9. https://doi.org/10.1186/s12955-015-0390-6

Letilovic, T., & Vrhovac, R. (2013). Influence of additional criteria from a definition of cachexia on its

prevalence--good or bad thing? *European Journal of Clinical Nutrition, 67*(8), 797-801. https://doi.org/10.1038/ejcn.2013.121

Lloyd-Jones, D., Adams, R., Carnethon, M., De Simone, G., Ferguson, T. B., Flegal, K., . . . Hong, Y. (2009). Heart disease and stroke statistics -- 2009 update: a report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee. *Circulation, 119*(3), 480-486. https://doi.org/10.1161/CIRCULATIONAHA.108.191259

Loncar, G., Omersa, D., Cvetinovic, N., Arandjelovic, A., & Lainscak, M. (2014). Emerging Biomarkers in Heart Failure and Cardiac Cachexia. *International Journal of Molecular Sciences, 15*(12), 23878-23896. https://doi.org/10.3390/ijms151223878

Lycholip, E., Celutkiene, J., Rudys, A., Steponenieni, R., & Laucevicius, A. (2010). Patient education significantly improves quality of life, exercise capacity and BNP level in stable heart failure patients. *Acta Cardiologica, 65*(5), 549-556. https://doi.org/10.1080/AC.65.5.2056242

Martins, T., Vitorino, R., Moreira-Gonçalves, D., Amado, F., Duarte, J. A., & Ferreira, R. (2014). Recent insights on the molecular mechanisms and therapeutic approaches for cardiac cachexia. *Clinical Biochemistry, 47*(1-2), 8-15. https://doi.org/10.1016/j.clinbiochem.2013.10.025

Min-Su, L., Joon-Shik, S., Jinho, L., Yoon Jae, L., Me-riong, K., Ki Byung, P., . . . Ha, I.-H. (2015). The association between mental health, chronic disease and sleep duration in Koreans: a cross-sectional study. *BMC Public Health, 15*, 1200-1209 1210p. https://doi.org/10.1186/s12889-015-2542-3

Morley, J. E., Thomas, D. R., & Wilson, M. G. (2006). Cachexia: pathophysiology and clinical relevance. *American Journal of Clinical Nutrition, 83*(4), 735.

NIH & NCI. (2010). *Common Terminology Criteria*.

Palus, S., Schur, R., Akashi, Y. J., Bockmeyer, B., Datta, R., Halem, H., . . . Springer, J.. (2011). Ghrelin and Its Analogues, BIM-28131 and BIM-28125, Improve Body Weight and Regulate the Expression of MuRF-1 and MAFbx in a Rat Heart Failure Model. *PLoS ONE, 6*(11), 1-7. https://doi.org/10.1371/journal.pone.0026865

Plank, B., Kutyifa, V., Moss, A. J., Huang, D. T., Ruwald, A.-C. H., McNitt, S., . . . Aktas, M. K. (2014). Smoking is associated with an increased risk of first and recurrent ventricular tachyarrhythmias in ischemic and nonischemic patients with mild heart failure: A MADIT-CRT substudy. *Heart Rhythm, 11*(5), 822-827 826p. https://doi.org/10.1016/j.hrthm.2014.02.007

Popović, D. D., Ćulafić, D. M., Tepavčević, D. B. K., Kovačević, N. V., Špuran, M. M., Djuranović, S. P., . . . Pekmezović, T. D. (2015). Assessment of depression and anxiety in patients with chronic liver disease. *Vojnosanitetski Pregled, 72*(5), 414-420. https://doi.org/10.2298/VSP130904007P

Salinas, J. J., de Heer, H. D., Lapeyrouse, L. M., Heyman, J. M., & Guillermo Balcázar, H. (2015). Insurance Status Is a Greater Barrier Than Income or Acculturation to Chronic Disease Screening in the Mexican Origin Population in El Paso, Texas. *Hispanic Health Care International, 13*(4), 197-208 112p. https://doi.org/10.1891/1540-4153.13.4.197

Strasser, F. (2012). Clinical application of ghrelin. *Current Pharmaceutical Design, 18*(31), 4800-4812. https://doi.org/10.2174/138161212803216870

Szabó, T., Scherbakov, N., Sandek, A., Kung, T., von Haehling, S., Lainscak, M., . . . Doehner, W. (2014). Plasma adiponectin in heart failure with and without cachexia: Catabolic signal linking catabolism, symptomatic status, and prognosis. *Nutrition, Metabolism & Cardiovascular Diseases, 24*(1), 50-56. https://doi.org/10.1016/j.numecd.2013.04.015

Szabó, T., Postrach, E., Mähler, A., Kung, T., Turhan, G., von Haehling, S., . . . Doehner, W. (2013). Increased catabolic activity in adipose tissue of patients with chronic heart failure. *European Journal of Heart Failure, 15*(10), 1131-1137. https://doi.org/10.1093/eurjhf/hft067

Tulman, D. B., Tripathi, R.S., Abel, E. E., & Papadimos, T. J. (2012). Cardiac Cachexia and the Aged: Death by Water, Wind, Earth, and Fire. *Journal of the American Geriatrics Society, 60*(10), 1999-2000. https://doi.org/10.1111/j.1532-5415.2012.04162.x

von Haehling, S., Doehner, W., & Anker, S. D. (2007). Nutrition, metabolism, and the complex pathophysiology of cachexia in chronic heart failure. *Cardiovasc Res, 73*(2), 298-309. https://doi.org/10.1016/j.cardiores.2006.08.018

von Haehling, S., & Anker, S. D. (2010). Cachexia as a major underestimated and unmet medical need: facts and numbers. *Journal of Cachexia, Sarcopenia and Muscle, 1*(1), 1-5. https://doi.org/10.1007/s13539-010-0002-6

von Haehling, S., & Anker, S. D. (2014). Prevalence, incidence and clinical impact of cachexia: facts and numbers-update 2014. *Journal of Cachexia, Sarcopenia and Muscle, 5*(4), 261-263. https://doi.org/10.1007/s13539-014-0164-8

World Health Organisation. [WHO] (2013). *Jordan: Health Profile*. Retrieved January 3rd, 2018, from http://www.who.int/nmh/countries/jor_en.pdf?ua=1

Yamada, M., Nishiguchi, S., Fukutani, N., Tanigawa, T., Yukutake, T., Kayama, H., . . . Arai, H. (2013). Prevalence of Sarcopenia in Community-Dwelling Japanese Older Adults. *Journal of the American Medical Directors Association, 14*(12), 911-915. https://doi.org/10.1016/j.jamda.2013.08.015