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Leptin Hormone and Some Cardiac Biomarkers Among Congestive Heart Failure patients' in Gaza Governorate – Palestine.

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Abstract: Leptin is considered as adipose tissue hormone and released from many other tissues. It may also exerts actions related to cardiovascular homeostasis that are potentially atherogenic, thrombotic and angiogenic. So it has been established as new laboratory marker for cardiovascular disease (CVD) patients especially congestive heart failure (CHF). **Aims**: to assess leptin hormone level among CHF patients, and to evaluate its relation to other classical cardiac biomarkers. **Method:** Retrospective (case-control) study was used to collect data from 65 patients with CHF (case group), and 65 healthy normal individuals (control group). Self report structure interview was used for filling in questionnaire and blood samples were obtained from both groups. ELISA was used for measurement of leptin hormone. SPSS-13 was used to analyze the obtained data. **Results:** CHF was more prevalent among less educated, unemployment, and low income individuals as well as among individuals with family history of CVD. CHF is more prevalent among cigarettes smoking individuals, inactivity, uncontrolled diet individuals as well as among individuals with history of DM and hypertension. Biochemical results showed that leptin hormone level is higher in CHF patients. Positive significant correlations were obtained between leptin and BMI (P=0.000), cholesterol, triglyceride (P=0.000 for both), LDH and CK-MB (P=0.000, and P=0.002 respectively). In contrast, negative correlation was obtained between leptin with HDL-c (P=0.000). **Conclusion:** leptin level is higher among CHF patients; it suggesting that the measurement of leptin hormone may be helpful in the diagnosis and prognosis of CHF patients.

Keywords: Leptin hormone, Congestive Heart Failure (CHF), Cardiac Biomarkers, Gaza strip.

هرمون اللبتين و بعض علامات القلب الحيوية لدى مرضى فشل القلب المحتقن في قطاع غزة – فلسطين

ملخص: اللبتين هو هرمون النسيج الدهني و يفرز أيضا من عدة أنسجة أخري داخل الجسم ، و يعتقد بان له تأثير مرتبط باتزان الدورة الدموية سو اء بتأثيره على الأوعية الدموية الذي يؤدي لرفع ضغط الدم أو تكوين الخثرة الدموية . لذلك تم اعتماده كفحص مخبري جديد لمرضى القلب خاصة مرضى فشل القلب المحتقن.

الهدف: لتقييم منسوب هرمون اللبتين ل دى مرضى فشل القلب ال محتقن ، و تهدف الدراسة لتقييم العلاقة التي تربط هذا الهرمون مع علامات القلب الحيوية الأخرى. خضع لهذا البحث مجموعتين ، اشتملت المجموعة الأولي على 65 حالة من مرضى يعانون من مرض فشل القلب المحتقن (موضوع الدراسة)، كما اشتملت المجموعة الثانية الضابطة على 65 شخص أصحاء لا يعانون من أمراض مزمنة أو طارئة وقت البحث.

البيانات المطلوبة تم جمعها من خلال مقابلة و تعبئة استبيان، كما سحبت عينات دم لفحص منسوب هرمون اللبتين و بعض المعاملات الأخرى من كلا المجموعتين المرضية و الضابطة ، و تم قياس هرمون اللبتين من خلال طريقة إل **ELISA**. البيانات التي جمعت تم تحليلها بواسطة برنامج (**SPSS.13**). أظهرت النتائج أن مرض فشل القلب المحتقن أكثر انتشارا بين البطالة والأقل تعليما، والأفراد ذوي الدخل المنخفض، وكذلك بين الأفراد ذو تاريخ عائلي م ع الأمراض القلبية الوعائية. و أن الأكثر عرضة للإصابة بمرض CHF هم المدخنين والأقل أداء للنشاط البدني، والأفراد ذوي النظام الغذائي غير المنضبط وكذلك بين الأفراد المصابين مسبقا بمرض السكري أو الضغط . و أظهر تحليل النتائج البيوكيميائية جود علاقة ذات دلالة إحصائية ف ي ارتفاع نسبة هرمون اللبتين لدى مرضى فشل القلب المحتقن، كذلك وجود ارتباط إيجابي ذو دلالة إحصائية بين هرمون اللبتين و مؤشر كتلة الجسم و بعض علامات القلب الحيوية الأخرى مثل : الكوليستيرول الكلي و الدهون الثلاثية و **LDH** و **CK-MB** بالإضافة لوجود علاقة عكسية ذات دلالة إحصائية بين هرمون اللبتين و إل **HDL-c**.

وبذلك أظهرت الدراسة مدى أهمية قياس هرمون اللبتين في تشخيص و متابعة تطور المرض لدى مرضى فشل القلب المحتقن.

Introduction:

Cardiovascular disease (CVD) is considered as the first leading cause of death in the world. More people die yearly from CVD than from any other cause (**Anderson, 2007**). According to world health organization (WHO), about 30% of all global deaths are due to coronary artery disease (**WHO, 2004**). By 2001, CVD had become the leading cause of death in the developing world, as it has been in the developed world since the mid 1900s (**Mathers et al., 2001**). In Palestine, heart disease is the first leading cause of death among Palestinians in 2010 (**Ministry of Health, MOH, 2011**). About 1088 case from 3,406 in Gaza strip, with proportion of 31.9% of total deaths died from CVD while mortality among males was higher than females (591 males Vs 497 females, 54.3% in males Vs 45.7% in females), and 1707 from 5581 with proportion of 30.5% in the west bank died from CVD while mortality among males was higher than females (966 males Vs 742 females, 56.5% in males Vs 43.5% in females) **(MOH 2011, Mortality Report 2011**).

Leptin Hormone and Some Cardiac Biomarkers

Heart failure (HF) is considered as a clinical syndrome that is progressive, develops slowly, and is chronic once established. The condition may follow damage to cardiac tissue secondary to myocardial infarction, chronic hypertension, viral infection, structural abnormalities, or other factors (**HFPM, 2005**).

Leptin is the 16,000 Dalton protein product of the obesity gene (ob) (**Zhang et al, 1994**). It is released into the blood stream and binds to its receptors and exerts its action on the hypothalamus. Leptin considered as adipose tissue hormone and released from many other tissues (i.e, placenta, ovaries, mammary, epithelium, bone marrow, lymphoid tissues, skeletal muscle, liver, heart (myocytes), the fondues of the stomach, gastric epithelium**,** and the brain**).** It's considered as body energy regulator. Leptin may also exert actions related to cardiovascular homeostasis that are potentially atherogenic, thrombotic, and angiogenic (**Correia and Haynes 2004, Werner and Nickenig 2004, and Beltowski 2006**). It has peripheral actions to stimulate vascular inflammation, oxidative stress, and vascular smooth muscle hypertrophy that may contribute to pathogenesis of type 2 diabetes mellitus, hypertension, atherosclerosis, and coronary heart disease (**Seufert 2004, and Beltowski 2006, 2007**). The aim of this study is to understand leptin hormone with some cardiac biomarkers and lipid profile among CHF patients in Gaza Governorate and risk factors associated to CHF.

Methodology: Retrospective (case-control) study was used in this research. The control group matched the case group by age and sex.

Target population and sample size: The target population for this study was any (35-75 years old) patients who live in Gaza strip, diagnosed as a heart failure patient and were admitted to one of the three governmental hospitals at Gaza strip (Al-Shifa, Nasir and European Gaza Hospital (EGH)).

Data collection: Participants were interviewed and asked to answer the questionnaire after agreement to participate in the study. The questionnaire included issues about socio-demographic characters, history of disease, type of diet and physical activity frequencies. Data was collected from 65 patients with CHF (case group), and 65 healthy normal individuals (control group). Blood samples were obtained from both groups. The separated serum was divided into two plastic tubes. One sample was stored at 2-5°C for no more than 24 hours prior to blood parameters analysis, and the other was stored frozen at -70°C for leptin serum determination.

Lipid profile and cardiac biomarkers analysis: lipid profile analysis included total cholesterol (T.Chol.), high density lipoprotein-cholesterol (HDL-c), low density lipoprotein-cholesterol (LDL-c) and triglyceride (TG).

Cardiac biomarkers analysis included creatine kinase (CK), creatine kinase-MB (CK-MB), lactate dehydrogenase (LDH), and Aspartate aminotransferase (AST). All were carried out using commercially available diagnostic system (All chemistry reagents (Diasys) company, except AST Biosystems).

Serum leptin analysis: Frozen serum samples were thawed at 4-8°C and then mixed by gentle shaking at room temperature prior to use. Determination of human leptin was carried out by competitive enzyme immunoassay technique using ELISA kits from (Diagnostic System Laboratories (DSL, USA).

Data analysis: The obtained data were analyzed by using SPSS-13 program.

Results:

The study population was distributed as, 76.9% (50) of the case group were hospitalized in Al-Shifa hospital either in out patient department (OPD) or coronary care unit (CCU), while 20% were admitted to Nasir hospital and the other 3.1% of cases were from EGH. In addition 70.8% of the control group were from Al- Shifa, 23.1% from Nasir, and the lowest percentage 6.2% were from EGH. The mean age for control group was (61.13±5.75 years) and (63.04±6.96 years) for CHF group. Nearly half (49.6%) of the control group and 55.4% of the case group were over than 60 years old.

Data showed that 63.1% of the control group were males constituted 56.9% from case group (females 36.9%, and 43.1%, respectively. Nearly half of the control group and 5.4% of the case group were aged more than 60 years old.

Regarding to the BMI, its found that the case group had a higher mean (30.68±4.66) than the control group (27.16±1.25), with significant difference between two groups (P-value =0.000).

Concerning for the education level, it was found that 47.7% of the control group had finished their secondary education, while the majority 55.4% of the case group was illiterate.

On the other hand 76.9% of the controls were employees and 69.2% of the other group was unemployed. In addition 58.5% of the control group had monthly income level between "1000-2000 NIS", while about two third of the case group had less than 1000 NIS.

While the percentage of smokers among the study population is shown in table 3. All of controls weren't smoking while, 50.8% of the case group were, (P=0.000).

Table 3: Distribution of the study population by the cigarettes smoking

Cigarettes Smoking	Control		Case		X^2	P-value
	n	(%)	n	(%)		
Yes	0	(0.0)	33	(50.8)	44.227	0.000
No	65	(100.0)	32	(49.2)		

P<0.05: significant.

On responding to physical activity and diet habits illustrated in table 4. Results showed that, most of the case group were physically inactive, (P=0.000), and most of them were eaten high fat diet compared to the control group, as it considered as a risk factor for CVD (P=0.000).

Table 4: Distribution of the study population (n=130) by physical activity, dietary program, and frequency intakes of main animal food

Character	Control group		Case group		Test	P-value
	n	(%)	N	(%)		
Physical activity						
None	0	(0.0)	49	(75.4)	F=78.69	0.000
Twice per	51	(78.4)	12	(18.5)		
Daily	14	(6.2)	4	(6.2)		
Going to diet						
Yes	52	(80.0)	8	(12.3)	X^2= 59.92	0.000
No	13	(20.0)	57	(87.7)		
Meat						
Daily	0	(0.0)	4	(6.2)	F= 15.36	0.000
Twice \	5	(7.7)	53	(81.5)		
Once \ week	60	(92.3)	8	(12.3)		
None	0	(0.0)	0	(0.0)		
Fish						
Daily	0	(0.0)	0	(0.0)	F= 4.415	0.038
Twice \	53	(81.5)	32	(49.2)		
Once \ week	12	(18.5)	33	(50.8)		
None	0	(0.0)	0	(0.0)		

P<0.05: significant.

Distribution of the study population (n=130) by family history of CVD: Table 5, shows that, about 50.8% cases from the CHF (case) group (n=65) had a family history of CVD, unlike the control group. There was niether diabetes mellitus (DM) nor hypertension (HT), found among control group,

while 55.4% of the other group suffering from DM and the same ratio of the same group suffered from HT.

Table 5: Distribution of the study population (n=130) by family history of CVD

Family history of CVD		Control group		Case group	
		N	(%)	N	(%)
Yes		0	(0.0)	33	(50.8)
No		65	(100.0)	32	(49.2)
Other chronic disease					
DM	Yes	0	(0.0)	36	(55.4)
	No	65	(100.0)	29	(44.6)
HT	Yes	0	(0.0)	36	(55.4)
	No	65	(100.0)	29	(44.6)

Biochemical parameters among the study population (n=130)

The mean of serum glucose concentration was higher among CHF group. In regarding to levels of total cholesterol, triglyceride and LDL-c were higher among CHF group in compared to the control group, with significant difference between the two groups.

On the other hand, the cases had the higher means of AST, CPK, CK-MB, and LDH, with significant difference between the two groups on AST, CK-MB, and LDH only. Further more in corresponding to serum leptin hormone the case group (CHF) had a mean of (17.10±7.27 ng/ml), which was higher than the control group (8.618±3.321 ng/ml), with significant difference between the two groups (P=0.000). (Table 6).

Table 6: Biochemical parameters results of the study population

Test Item	Control group (n=65) Mean ± SD (min-max)	Case group (n=65) Mean ± SD (min-max)	T-test X^2=	P-value
Serum glucose concentration (mg/dL)				
Glucose	90.430 ± 5.905	166.307 ± 92.704	6.585	0.000
	80-100	72-353		
lipid profile (mg/dl)				
Cholesterol	173.246 ± 14.55	186.461 ± 44.217	6.585	0.000
	(149 - 197)	(106 - 264)		
HDL-c	59.846 ± 7.884	46.815 ± 10.405	-8.047	0.000

	(42 - 70)	(28 - 63)		
LDL-c	81.276 ± 18.190	95.153 ± 45.903	2.266	0.025
	(58 - 109)	(27 – 191)		
Triglyceride	135.230 ± 15.089	203.784 ± 95.615	5.710	0.000
	(95-155)	(74 – 465)		
Cardiac biomarkers (IU/L)				
AST	15.369 ± 3.110	25.800 ± 21.538	6.585	0.000
	(12-22)	(11-101)		
CPK	40.815 ± 12.829	46.446 ± 20.676	1.866	0.064
	(22-68)	(18-92)		
CK-MB	15.492 ± 2.332	17.723 ± 4.414	3.602	0.000
	(12-20)	(10-28)		
LDH	259.615 ± 23.475	338.276 ± 40.440	13.563	0.000
	(236-303)	(263-403)		
Serum leptin hormone (ng/ml)				
Leptin	8.618 ± 3.321	17.109 ± 7.271	8.563	0.000
	(3.60-14.20)	(5.30-30.20)		

P<0.05: significant.

Serum leptin hormone, gender and marital status:

Data in Table 7, shows that serum leptin hormone was higher in concentration among females than males (P=0.037). Statistical analysis of marital status indicated that individuals with widow status had a greater level of leptin in compared to married status (P=0.000).

Table 7: Leptin, gender and marital status:

Gender	Sample size	Mean leptin	SD	T-test	P-value
Male	78	11.8103	6.6495	2.371	0.037
Female	52	14.4442	7.8856		
Married	124	12.3879	6.73516	0.071	0.000
Widow	6	22.7000	7.00000		

P<0.05: significant.

Serum Leptin hormone level and cigarettes smoking:

As shown in table 8, serum leptin hormone level was found to be significantly higher among smokers (16.63±6.73 Vs, 11.58±6.73, P= 0.000)

Table 8: Leptin and cigarettes smoking

Cigarettes smoking	Sample size	Mean leptin	SD	T-test	P-value
Yes	33	16.6333	6.73418	0.470	0.000
No	97	11.5814	6.73422		

P<0.05: significant.

Serum Leptin hormone level in the relation to socioeconomic characters of the study population:

Results in table 9 showed an inverse relation between education level and leptin concentration, (P=0.000). On the other hand leptin level in unemployed persons was significantly higher than employed ones (P= 0.000). In addition, individuals with low income status had higher levels of leptin hormone than those with high income (P= 0.001).

Table 9: Leptin hormone with education level, occupation and income status (n=130)

Character		Sample size (n=130)	Mean leptin (ng\ml)	SD	Test	P-value
Education level	**University**	19	5.9421	1.68038	F= 22.177	0.000
	Secondary	47	11.9447	7.02984		
	Preparatory	18	9.9556	1.69332		
	Illiterate	46	17.8000	6.38968		
Occupation	**Employed**	70	10.8386	6.96166	t = 0.002	0.000
	Unemployed	60	15.2267	6.46634		
Income status	**≤1000NIS**	51	15.5471	7.02807	F= 7.456	0.001
	1000-2000NIS	58	11.7052	6.91387		
	≥2000NIS	21	9.5476	5.30468		

P, less than 0.05: significant.

Post hoc and Scheffe test analysis results (Table 10) showed a significant difference between education level and leptin hormone concentration (P-value <0.05, Table 10).

Leptin Hormone and Some Cardiac Biomarkers

Table 10: The relation between leptin hormone with education level, among study population (n=130)

Character		Sample size (n)	Mean leptin	SD	Test	P-value
Education	**University**	19	5.9421*	1.68038	F= 22.177	0.000
	Secondary	47	9.9556*	7.02984		
	Preparatory	18	11.9447*#	1.69332		
	Illiterate	46	17.8000	6.38968		

(P<0.05: significant.**)*Compare Illiterate versus UV, secondary and preparatory. #compares UV versus secondary and preparatory.**

Post hoc and Scheffe test analysis showed a significant difference between income status and leptin hormone concentration (P-value <0.05, Table 11).

Table 11: Leptin hormone and education level, among study population (n=130)

Character		Sample size (n)	Mean leptin	SD	Test	P-value
Income	**<1000NIS**	51	15.5471	7.02807	t= 7.456	0.001
	1000-	58	11.7052*	6.91387		
	>2000NIS	21	9.5476*	5.30468		

(P<0.05: significant.**)*Compare <1000NIS versus 1000-2000NIS, >2000NIS.**

Serum Leptin hormone, family history of CVD and other chronic disease (DM and HT):

As shown in table 12, cases with family history of CVD had higher leptin levels than those without (15.77±7.15, P = 0.007). In addition patients from case group with DM or HT had higher levels of leptin hormone (19.60±7.62, P = 0.001 and 17.50±7.79, P= 0.633, respectively).

Table 12: Leptin hormone with family history of CVD (n=130), then DM or HT (n=65)

Family history		Sample size (n)	Mean leptin (ng\ml)	SD	T-test	P-value
CVD	Yes	32	15.7750	7.15519	0.913	0.007
	No	98	11.9133	6.80078		
DM	Yes	29	19.6000	7.62012	1.834	0.002
	No	36	14.0172	5.51414		
HT	Yes	29	17.5000	7.79685	0.832	0.633
	No	36	16.6241	6.67		

P<0.05: significant.

Leptin hormone and BMI:

BMI mean of then control group (27.16±1.25) and the case group (30.68±4.66), showed positive significant correlation with (P = 0.000).

Table 13: The correlation between leptin hormone and BMI among study population (n=130)

Parameter (Kg/m2)	Leptin Hormone (ng\ml)	
	Pearson correlation (r)	P-value
BMI	0.714	0.000

P<0.05: significant.

Leptin level correlated with glucose concentration:

Pearson correlation test in table 14, showed positive significant correlation between serum leptin hormone and serum glucose concentration (P=0.000).

Table 14: Leptin hormone and serum glucose concentration (n=130):

Parameter mg/dl	Leptin Hormone (ng\ml)	
	Pearson correlation (r)	P-value
Glucose	0.621	0.000

P<0.05: significant.

Serum Leptin hormone level in the relation to serum lipid profile:

Regarding to table 6, Pearson correlation test revealed positive significant correlations between leptin hormone level and cholesterol, or triglyceride (P=0.000, and P = 0.000, respectively) table 15, figure 1&2. On the other

hand, there was a negative significant correlation between leptin and HDL-c levels (P=0.000), figure 3.

Table 15: Leptin hormone and lipid profile among study population (n=130):

Parameter mg/dl	Leptin Hormone (ng\ml)	
	Pearson correlation (r)	P-value
Cholesterol	0.621	0.000
HDL-C	-0.428	0.000
LDL-C	0.016	0.860
Triglyceride	0.593	0.000

P<0.05: significant.

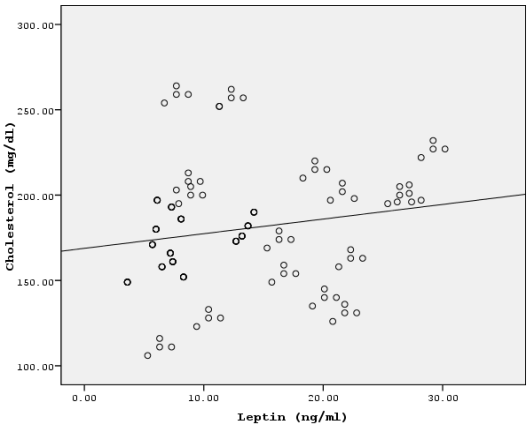

Figure 1: Relation between leptin (ng/ml) and Cholesterol (mg/dl)

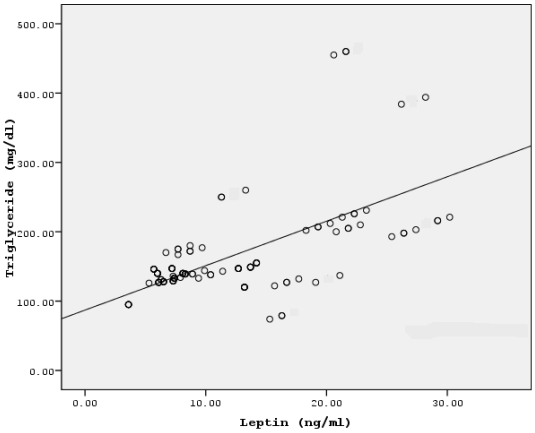

Figure 2: Relation between leptin (ng/ml) and triglyceride (mg/dl)

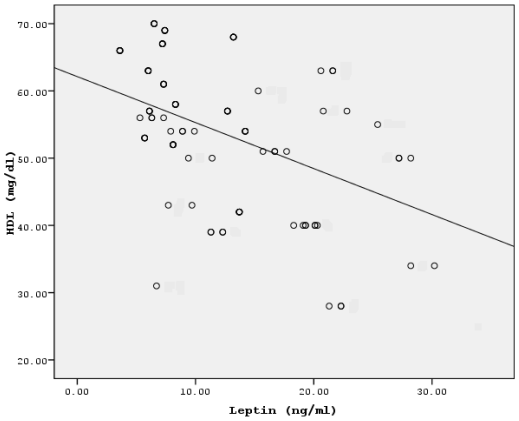

Figure 3: Relation between leptin hormone (ng/ml) and HDL-c (mg/dl)

Serum Leptin and serum cardiac biomarkers (IU/L):

The results of cardiac biomarkers (table 16), were correlated with serum leptin hormone. It was found a positive significant correlations between leptin hormone level with CK-MB and LDH levels (P=0.002 and P=0.000, respectively) figure 4&5.

Table 16: Leptin hormone and cardiac biomarkers among study population (n=130)

Parameter U/L	**Leptin Hormone (ng\ml)**	
	Pearson correlation (r)	**P-value**
CPK	0.162	0.065
CK-MB	0.268	0.002
AST	-0.020	0.820
LDH	0.624	0.000

P<0.05: significant.

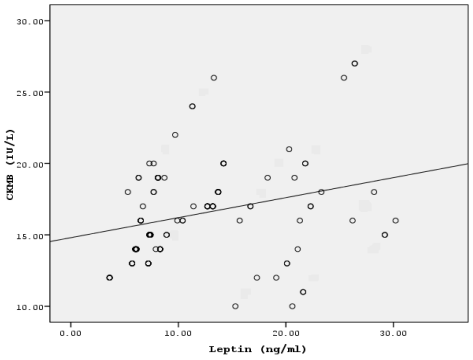

Figure 4: 10 Relation between leptin hormone (ng/ml) and CK-MB (IU/L)

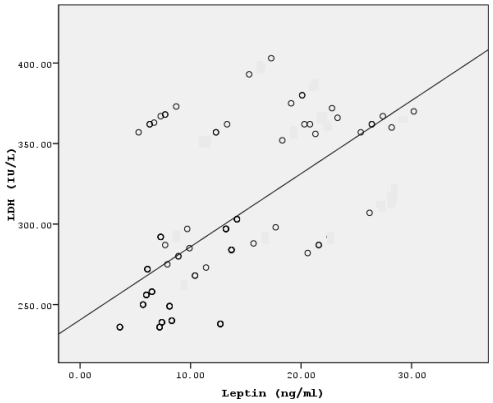

Figure 5: Relation between leptin hormone (ng/ml) and LDH (IU/L)

Discussion:

By 2001, CVD had become the leading cause of death in the developing world, as it has been in the developed world since the mid 1900s (**Mathers et al., 2001**). CVD are increasing progressively in Palestine, particularly hypertension and ischemic heart diseases, at a rate which is almost the same as that reported in neighboring countries (**MOH, 2004**). In 2010, heart diseases were the first leading cause of death among Palestinians (**MOH, 2011**). Although there are many studies have been recently assessed an early markers of CHF disease in all over the world (**Alghorra et.al. 2009**), there are no previous studies assess leptin hormone level among CVD patients or CHF carried out to Gaza governorate, Palestine.

Socio-demographic data of the study population:

The present study showed a significant association between the CHF disease with age, and sex which was in agreement with many studies, **Hunt, et al., (2001)** which reported that CHF incidence is approaches 10 per 1,000 populations after 65 years of age. While **MOH, (2011)** reported mortality of CVD 54.3% in males Vs 45.7% in females.

Analysis of the educational level of the study population showed that the development of CHF is significantly increase with decreasing educational level among case groups 55.4%, 20.0%, and 24.6% for Illiterate, Preparatory, and Secondary school respectively. This finding is in agreement with **Mayer, et al., (2004) and Gupta, (2006)** who speculated that CVD risk factor is associated with lower level of education and income status in developing countries. Also the rate of HF incidence is more common among unemployed cases with rate reaches 69.2%, and 63.1% for peoples with income status less than 1000 NIS, which mean that its

prevalence was generally higher among those of lower socioeconomic status (SES) as reported with **Cunningham (2010**) and **Gersh et al., (2010**). While 50.8% of our cases was cigarettes smoking which may indicate that smoking is a risk factor for developing HF or CVD as mentioned by **Hossain et al., (2007)**, **Glick, (2002), Akbartabartoori et al., (2006)**, and **Mannan et al., (2011).**

Our study showed a significant relation between physical inactivity and CHF (P-value= 0.000). This is in agreement with **Pate, 1995**, **Wannamethee and Shaper, (1997)** , **Wannamethee et. al., (2000)**, **Bassuk and Manson (2005)**, **Fransson et al. (2006)** , and **Weinstein et al, (2008)**, all of them indicate that physical inactivity is considered as a risk factor for CVD, while **Lightfoot et al., (2010),** recorded that, physical activity interventions increase lifespan and improve the quality of life of heart disease patients.

BMI was significantly increased in our cases compared to our control with means of 30.68 ± 4.66 and 27.16 ± 1.25 (Kg/m2), which indicated that incidence of CHF is more common in peoples with high BMI as reported by **Rimm et al., (1995), Wilson et al., (2002), Shiraishi et al., (2006)** , **Yao et al., (2007)**, and **CDC, (2009)**.

CHF was more observed in patients with a family history of CVD which indicate an association between family history of CVD and the presence of HF as mentioned by **Sesso et al., (2001), Nasir et al., (2004)**, **Brækkan et al., (2008),** and **Sivapalaratnam et al., (2010).** In addition 55.4% of cases had DM with mean of serum glucose 166.3 ± 92.7 (mg/dL), which is higher than the mean of the control mean 90.4 ± 5.9 (mg/dL), which indicated that DM is considered as a common risk factor for CVD, as mentioned by **Lehto , 1997.** While **(Esteghamati et al., 2006),** investigated that DM and HT are risk factors directly or indirectly interfere and predict more serious complications. Our investigation is in agreement with **Demosthenes et al., (2005), Oba et al., (2008), Dorjgochoo et al. (2009)**, **Kathryn et al., 2010, Borg et al., (2011)**, and **CDC (2011).**

Lipid abnormalities, dyslipidemia and glucose:

The results of this study showed a progressive significant increase of lipid profile markers and glucose levels in the CHF group patients in respect to control group. In general, there was gradual significant increase in the mean level of cholesterol, triglyceride and LDL-c, whereas the mean level of HDL-c was decreased significantly in the case group towards the development of CHF. These results are in accordance with that reported by

other authors (**Schwartzkopff et al., 1990, Welin, 1992, Kugiyama et al., 1999**, **Washio et al., 2001**, and **Nakamura et al., 2011).**

Analysis of the relation between leptin hormone and the lipid profile of the results indicated that, there was a positive correlation between leptin hormone and cholesterol (T-Chol.), triglyceride (TG), and LDL-C with significant relation between leptin and T-CHOL and TG with p-value (0.039), (0.000) respectively (Figure 1&2). While there is no significant association with LDL-C., according to the results of glucose concentration, we detect a significant association to leptin hormone with p-value (0.000)

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On the other hand HDL-C indicated a strong negative correlation with leptin hormone with p-value reaches (0.000). Such findings are in line with previous studies conducted by **Tamer et al., (2002),** and support the hypothesis that leptin hormone had numerous effect suggesting its role in both lipid and glucose metabolism , angiogenesis and blood pressure regulation (**Housa et al., 2006**) and play a pathophysiological role in the development of CVD especially CHF. (Figure 3)

Serum cardiac biomarkers of the study population:

Our CHF group at this study have increased means of AST, CPK, CK-MB, and LDH than control group means of the same parameters even if they are within normal range, our results is in agreement with the **American College of Cardiology and the American Heart Association (ACC/AHA) guidelines** , **Costa et al, 2001 and Alpert et al., 2000**. Analysis of the relation between leptin hormone and the cardiac biomarkers of our results indicated that, there is a positive correlation and significant relation between leptin hormone with CK-MB and LDH with P-value (0.002) and (0.000) respectively, (Figure 4 & 5). While a weak association between leptin hormone with CPK and AST was found as evidence by P-value (0.065) and (0.860).

Mutual increment of leptin hormone level with increase in CK-MB and LDH could introduce further evidence in the involvement of hyperleptinemia in the pathophysiology of CHF.

Serum leptin hormone level of the study population:

The result of this study showed a progressive significant increase leptin hormone levels in the CHF group patients with mean (17.10±7.27 ng/ml), in respect to control group. Such finding is in line with previous studies, **Leyva F, et al., 1998, Söderberg et al. 1999**, **Singhal A et al., 2002, Schulze PC, et al., 2003**, **Selvakumar et al., 2005 ,** and **Piestrzeniewicz et al. , 2007** and support the hypothesis that leptin hormone may play a pathophysiological role in the development of CVD. In addition leptin

hormone is found to be higher in females more than males accordion to our result on all population it may be due to the other sources of leptin hormone on females including the placenta, ovaries, and mammary **(Margetic *et al.*, 2002 and Kiess *et al.*, 2008)** in part due to differences in sex hormones, fat mass, and body fat distribution**.**

All these data of increased leptin level among CHF may suggest a possible role for leptin in the development of atherosclerotic heart disease and its prognostic mechanism as **(Tamer et al., 2002) mentioned.**

In conclusion, the present study supports the importance of socioeconomic and demographic factors, associated factors of CVD and CHF and indicates a needed for more effective prevention programs for diagnosis and controlling of CVD in Palestine, and decreasing the incidence of CHF.

Conclusion: The current study supports the importance of socioeconomic and demographic factors as a risk for CHF in Gaza strip, and supports the hypothesis that leptin hormone may play a pathophysiologcal role in the development of CVD patients especially CHF group. Also a health education program should be started at primary and secondary levels to control risk factors of CHF.

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