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Fasting Versus Non-Fasting in Assessing Lipid Profile and Complete Blood Picture

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Abstract

Coronary Heart Disease (CHD) is the world's leading cause of death and represents a serious global health problem. The general recommendations to operators in the prevention of CHD should include complete lipid profile testing, that is Total Cholesterol(TC), Total Triglycerides(TG), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and Very Low Density Lipoprotein (VLDL). Recent recommendations have supported non-fasting lipid assessment. On the other hand, classification of dyslipidemias was derived in fasting samples, and cohort studies and clinical trials have performed fasting assessments.

The aim of this study was to evaluate fasting versus non-fasting in measuring lipid profile & complete blood picture.

A total of 80 female were divided into four groups of 20 female each. The 1st three groups were fasting for 4, 6,14 hours respectively and the 4th group was non-fasting. Blood samples were taken from these females for biochemical & hematological investigations.

The lipid profile parameters were measured using Synchron CX4 clinical system Beckman Coulter Inc., Brea, CA. Complete Blood Picture was measured by using automated hematological analyzers BC-3000 plus (Hamburg, Germany). Statistical analysis was carried out using SPSS(Statistical Package for Social Sciences) number 22.

Biochemically, for TC,TG & VLDL, it was found that fasting 6 , 14 hours gave significant differences ($P< 0.05$) when compared with non-fasting group while there were non-significant results for the mean level of HDL & LDL between groups . Regarding hematological assessment, there were non-significant differences between groups in measuring Hemoglobin, Red blood cells, White blood cells, Platelet counts.

Since non-fasting may weaken the accuracy in diagnosing some forms of hyperlipidemia, we proposed that laboratories & organizations should also offer measurement of fasting triglycerides according to clinical situations , as in the case of very high non-fasting triglyceride concentration.

Keywords: *Lipid profile, Complete blood picture, Fasting, Non- fasting.*

Introduction

Coronary heart disease (CHD) is a leading cause of morbidity and mortality in many countries world-wide and is estimated that it will be the single largest cause of disease burden [(1)]. A number of factors are thought to increase the likelihood of developing CHD. It can be divided into two, which are controllable and uncontrollable risk factors and hypercholesterolemia is one of controllable risk factors[(2]. Recent recommendations have favored non-fasting lipid assessment [(3)]. Practical advantages to using non-fasting measurements include increasing patient convenience avoiding separate return visits for laboratory draws and improving hospital and clinic efficiency. Moreover, non-fasting triglycerides may improve cardiovascular risk prediction [(4)] .On the other hand, classification of dyslipidemias was historically derived in fasting samples, and cohort studies and clinical trials have traditionally performed fasting assessments [(5,6)].

Because of this controversy, the aim of our study was to evaluate fasting versus non-fasting in measuring lipid profile.

Material and Method

A total of 80 healthy volunteer females , ranging in age between 22-30 years, were divided into four groups of 20 female each . The first three groups are fasting groups that had not taken any diet for last 4, 6, 14 hours respectively while in the non-fating group, blood samples were collected after 2 hours of meal. The health status of our volunteer female was confirmed by clinical examination.

For biochemical & hematological investigations, venous blood samples were taken from these females from January 2018 to June 2018. The biochemical investigation includes Total Cholesterol(TC), Total Triglycerides(TG), High Density Lipoprotein (HDL), Low Density Lipoprotein (LDL) and Very Low Density Lipoprotein (VLDL) . They were measured using Synchron CX4 clinical system Beckman Coulter Inc., Brea, CA(standard clinical laboratory methods).The hematological investigation includes White Blood Cell (WBC), Red Blood Cell (RBC), Hemoglobin (HB) and Platelet Count (PLT), the whole blood was determined by using automated hematological analyzers BC-3000 plus (from Hamburg, Germany).

Statistical analysis was carried out using SPSS (Statistical Package for Social Sciences) number 22 with regard to numerical features. It was described using the mean and standard deviation of the mean and was compared between the averages for the calculation of the samples under study at the level of 0.05. [7]

Results

Table 1 & Fig. 1 demonstrated that there were significant($p < 0.05$) results for the mean level of TC , TG & VLDL when fasted for 6 & 14 hours while there were non-significant results between groups for the mean level of HDL & LDL.

The mean level of TC was 159.25 mg/dl, 142.25 mg/dl, 150.25 mg/dl, 172.50 mg/dl for fasting periods of 4 hours, 6 hours and 14 hours and the non-fasting respectively and mean level of TG was 72.75mg/dl, 59.0 mg/dl, 62.50mg/dl, 97.00 mg/dl for fasting hours of 4hours, 6 hours ,14 hours and the non- fasting respectively . Regarding VLDL, its mean level was 16mg/dl,14.25mg/dl,12.25mg/dl and 20.75 mg/dl for fasting periods of 4 hours, 6 hours and 14 hours and non-fasting respectively. From the above measurements, we concluded that fasting at least 6 hours gave significant differences ($P< 0.05$) in assessing TC,TG & VLDL.

There were non-significant differences between fasting & non-fasting in measuring HB , RBC, WBC and PCT as demonstrated in table 2 & Fig.2

Table 1: demonstrating Mean ± Standard deviation (mg/dl) of different fasting hours versus non fasting in Lipid profile assessment

			Mean	SD	SE	Sig.
TC	fasting	4	159.25 b	4.35	2.17	0.009**
		6	150.25 c	4.50	7.82	
		14	142.25 c	15.65	2.25	
	Non fasting		172.50 a	12.29	6.14	
TG	fasting	4	72.75 b	12.66	6.33	0.008**
		6	62.50 c	9.00	7.82	
		14	59.00 c	15.64	4.50	
	Non fasting		97.00 a	16.21	8.10	

Cont... **Table 1: demonstrating Mean ± Standard deviation (mg/dl) of different fasting hours versus non fasting in Lipid profile assessment**

HDL	fasting	4	54.25	2.50	1.25	0.32NS
		6	47.00	8.52	4.97	
		14	49.25	9.95	4.26	
	Non fasting		55.25	2.75	1.38	
LDL	fasting	4	96.75	8.42	4.21	0.47 NS
		6	93.00	12.03	6.01	
		14	91.25	4.72	2.36	
	Non fasting		100.00	6.38	3.19	
VLDL	fasting	4	16.00 B	1.41	0.71	0.01**
		6	14.25 C	1.71	0.85	
		14	12.25 C	2.06	1.03	
	Non fasting		20.75 A	5.74	2.87	

SD Standard Deviation ; SE Standard Error ; P< 0.05

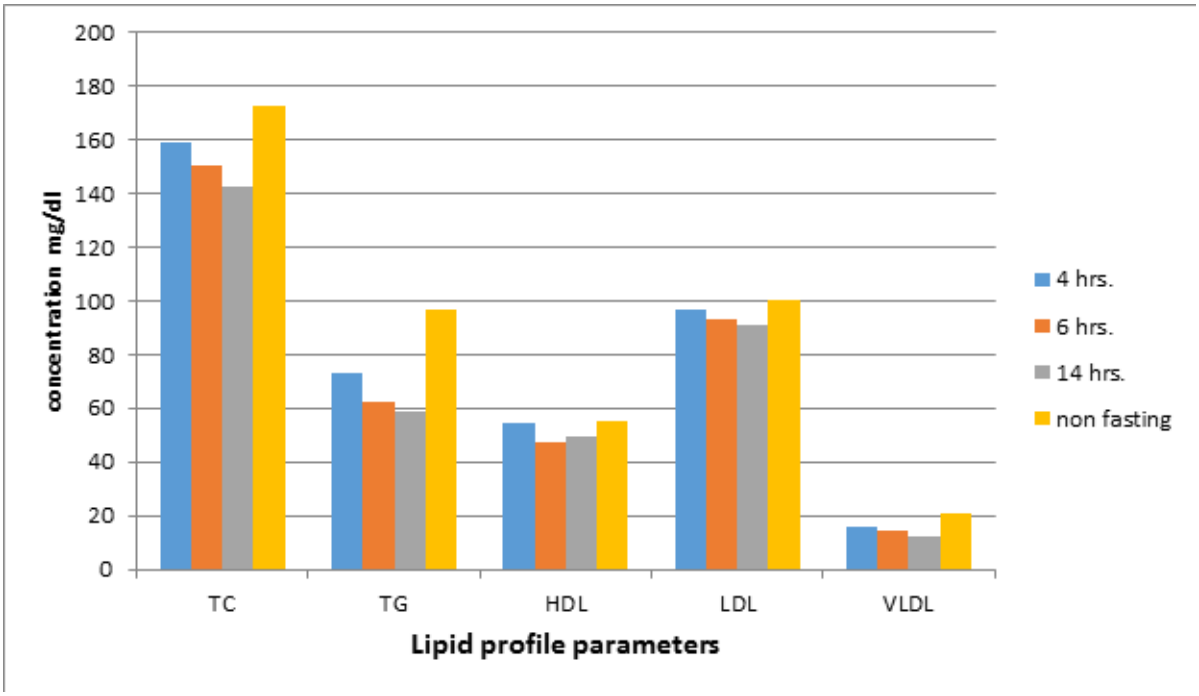

Figure 1: Lipid profile parameters under different fasting hours and non-fasting in healthy female

Table (2) demonstrating mean level of Complete Blood Picture in fasting and non-fasting groups

		HB	RBC	WBC	PLT
Fasting hrs.	4hrs.	11.98 g/dl	4.87 x10^12/L	7.27 x10^9/L	295 x10^9/L
	6hrs.	12.20 g/dl	4.87 x10^12/L	6.95 x10^9/L	299 x10^9/L
	14hrs	12.25 g/dl	4.78 x10^12/L	7.33 x10^9/L	301 x10^9/L
Non fasting		11.25 g/dl	4.90 x10^12/L	7.48 x10^9/L	295 x10^9/L

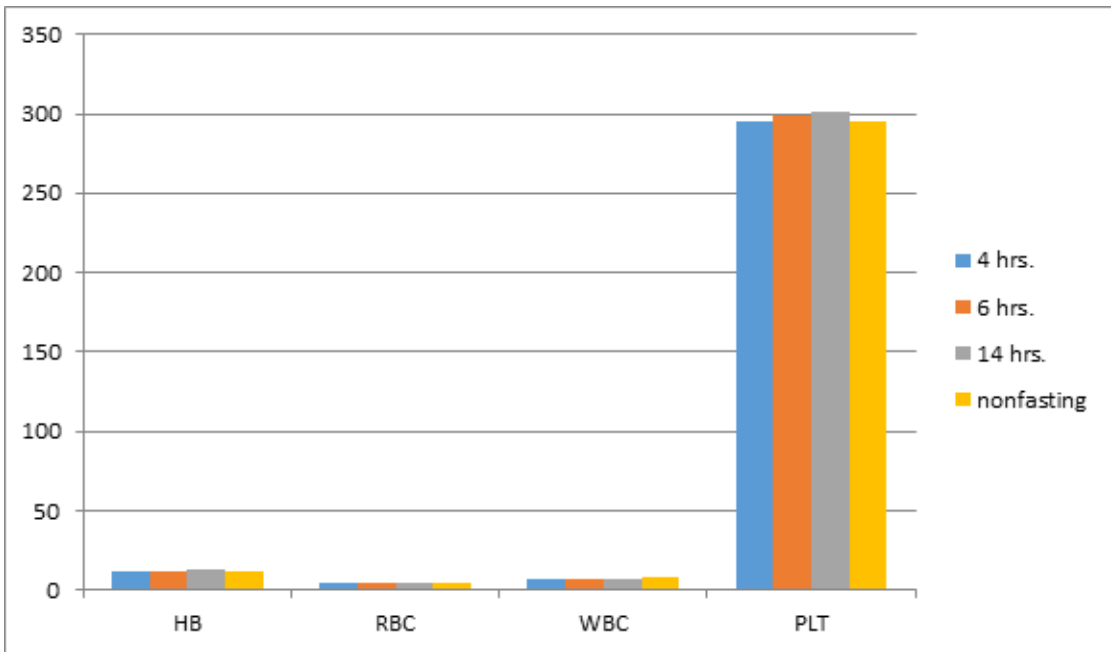

Figure 2 : Blood parameters under different fasting hours and non-fasting in healthy female

Discussion

Venipuncture is implicated in testing the lipid profile in order to predict cardiovascular risk and/or monitor responses to lipid-lowering therapy. Some guidelines continue to promulgate the conventional practice of measuring the lipid profile in the fasting state [8] . Although other societies & laboratories adapted non-fasting lipid profiles. Since 2009, non-fasting lipid testing has become the clinical standard in Denmark, based on recommendations from the Danish Society for Clinical Biochemistry that all laboratories in Denmark use random non-fasting lipid profiles as the standard, while offering clinicians the option of re-measuring triglyceride concentrations in the fasting state if non-fasting values are 4 mmol/L (350 mg/dL) [9,10] . Furthermore, the UK NICE guidelines have allowed non-fasting lipid testing in the primary prevention setting since 2014 [11].

For cardiovascular risk assessment, evidence is lacking that fasting is superior to non-fasting when evaluating the lipid profile. However, there are advantages to using non-fasting samples over fasting ones for measuring the lipid profile [12,13] .

Comparing our biochemical and hematological results, fasting is not needed for assessing complete blood picture as there were no significant differences bet fasting & non-fasting in measuring Hb, RBC,WBC,PLC. For lipid profile assessment, fasting at least 6 hours was recommended for measuring TC,TG & VLDL while it was not necessary for assessing HDL & LDL. It was concluded by Cohn et al. [14] & Mihas et al. [15] the reason that preferred fasting lipid profiles is the increase in triglyceride concentration seen during a fat tolerance test. On the other hand, LDL cholesterol is often calculated by the Friedewald equation, which has been thought to be affected substantially by food intake .So if this equation is employed, there may be some underestimation of LDL cholesterol when chylomicrons are present [16] . In addition to that non-fasting condition may marginally lower plasma LDL cholesterol concentrations due to liberal intake of fluids, and therefore lead to minor misclassification of cardiovascular risk, as well as to error in initiating or altering lipid-lowering medication especially to diabetic subjects [17,18,19].

Since non-fasting may weaken the accuracy in diagnosing some forms of hyperlipidaemia, we suggested that laboratories & organizations should also offer measurement of fasting triglycerides according to clinical situations , as in the case of very high non-fasting triglyceride concentration.

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Conflict of Interest: None to declare.

Ethical Clearance: All experimental protocols were approved under Medical Laboratory Technologies Department/ Bilad Alrafidain University College/ Baqubah/Iraq and all experiments were carried out in accordance with approved guidelines.

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