Coll. Antropol. **32** (2008) 4: 1087–1092
Original scientific paper

Prevalence of Unrecognized Dyslipidaemia in Dubai and Northern Emirates: A Cross-Sectional Hospital Based Study

Barbara Karin Vela[1], Alaaeldin Y. Alhessi[2], Marko Popović[3] and Maryam A. Al-Shaqra[4]

[1] Dubai London Clinic, Dubai, UAE
[2] Emirates Hospital, Dubai, UAE
[3] Vipnet, Zagreb, Croatia
[4] College of Pharmacy, University of Sharjah, Sharjah, UAE

A B S T R A C T

The aim of this study is to determine the prevalence of unrecognized dyslipidaemia and a specific correlation between lipid values and age, gender or ethnic origin in the study population. This retrospective cross-sectional study included 311 subjects who had their lipid profiles checked for the first time in a private hospital in Dubai in a six month – period. The analysis shows an increased prevalence of Low Density Lipoprotein (LDL) hypercholesterolemia with relatively higher Low Density Lipoprotein Cholesterol (LDL-c) values in male subjects ($p<0.016$) as well as with the Middle East ethnic origin group ($p<0.025$), while desirable High Density Lipoprotein (HDL-c) was found among female subjects ($p=0$). The discordance between the percentages of elevated LDL-c and Total cholesterol (T-c) signifies the role of the LDL-c/non-HDL-c as the main surrogate for dyslipidaemia as a risk for atherosclerosis, and as a primary target of therapy.

Key words: *dyslipidaemia, LDL cholesterol, HDL cholesterol, prevalence, United Arab Emirates*

Introduction

Dyslipidaemia is recognized as a major modifiable risk factor for cardiovascular diseases[1], the leading and growing cause of mortality in the United Arab Emirates (UAE)[2,3]. Elevated levels of Low Density Lipoprotein cholesterol (LDL-c), Total cholesterol (T-c) and low levels of High Density Lipoprotein cholesterol (HDL-c) are all risk factors for developing cardiovascular disease[4]. Lowering of LDL-c is regarded as the primary target for the prevention of cardiovascular diseases in the dyslipidaemic patients[4].

According to our knowledge there has been no study to measure the prevalence of dyslipidaemias in the UAE. We propose that dyslipidaemia along with other major risk factors is related to the increasing number of cardiovascular diseases and mortality rate in the UAE.

Materials and Methods

The population in the retrospective cross-sectional analysis consists of 516 subjects, aged between 18 and 75, who had their lipid profiles checked in a private hospital in Dubai during a six month – period from 01.12.2006 to 31.05.2007.

T-c, LDL-c and HDL-c values were directly measured (fully automated chemistry analyzer ACE Alera, Alfa Wassermann). The measurement was in mass units (mg/dL) and was converted to SI units (mmol/L) by authors using conversion factor 0.026[5].

Laboratory investigations were carried out in the private hospital and ordered by general practitioners and specialist physicians for various health checks (screening either initiated by physicians due to presenting symptoms or requested by patients). Laboratory data were extracted from hospital's computer system PulseMedPlus (Version 4.0, Build version 1.0.0.) and filtered by authors. All patient files were reviewed by authors and all subjects presenting with an acute cardiac event, morbid obesity, subjects with secondary causes of dyslipidaemia, isolated hypertriglyceredemia, or established hypercholesterolemia were excluded. Secondary dyslipidaemia taken

Received for publication February 26, 2008

into account included uncontrolled diabetes mellitus with HbA1c level above 8.0 %, hypothyroidism, pregnancy, secondary dyslipidaemia due to estrogen, progestin or isotretinoin therapy, nephritic syndrome, and chronic renal failure.

After their files had been reviewed and the subjects with established or secondary dyslipidaemia had been deducted, 311 subjects were checked for the first time during the study period. The diagnosis of dyslipidaemia was made according to the criteria of Adult Treatment Panel III (ATP III) of the National Cholesterol Education Program[4]. Normal LDL-c was up to 2.6 mmol/l (100 mg/dl), borderline 2.63 mmol/L – 3.38 mmol/L (101 mg/mL – 130 mg/dL) and high from 3.04 mmol/L (131 mg/dL). Subjects with cardiovascular disease or cardiovascular disease equivalent, including coronary artery disease, cerebrovascular disease, peripheral vascular disease and diabetes mellitus had a different LDL-c target of 1.82 mmol/L (70 mg/dL), borderline 1.85 mmol/L – 2.6 mmol/L (71 mg/dL – 100 mg/dL) and high 2.63 mmol/L (101 mg/dL) and up. Desirable HDL-c was >1.56 mmol/L (60 mg/dL) and low HDL-c was <1.04 mmol/L (40 mg/mL) for all subjects. Total cholesterol (T-c) levels were divided into three categories: normal up to 5.17 mmol/L (199 mg/dL) borderline from 5.2 mmol/L (200 mg/dL) and high 6.24 mmol/L (240 mg/dL) and up[6] for all subjects.

The subjects were subdivided according to gender, age and ethnic origin. There are five age groups (up to 30y, 31 to 40y, 41 to 50y, 51 to 60y, and 61 and up) and four Ethnic origin groups: Europe/North America/ Australia/New Zealand (E/NA/A/NZ), Middle East (ME), India/Pakistan (I/P) and other ethnic origins (Ot.). Within Middle East group we divided the subjects into two categories: the United Arab Emirates citizenship and non-UAE citizenship. Descriptive statistics and chi-square test and chi-square test in pairs have been carried out between different groups to test for significance using software SPSS 13.0 for Windows.

Results

Group descriptions

Out of 311 subjects included in this study, 195 (63%) are males and 116 (37%) are females. 63% of all the subjects are of the ME ethnic origin (12% of UAE nationals and 51% of non UAE nationals), 22% from the E/NA/A/NZ ethnic origin group, 9% of the I/P origin and 6% of the Other ethnic origin groups. Distribution per gender and ethnic origin is shown in Figure 1.

Within ethnic origin groups, there is significant difference according to gender in group Ot. that has more female subjects ($p<0.006$) (73.7%) than other ethnic groups which have more males than females (70.6% in E/NA/A/NZ, 64.3% in I/P and 63.3% in ME).

According to the age distribution, patients are divided into five groups (up to 30y, 31 to 40y, 41 to 50y, 51 to 60y, and 61 and up). Out of 311 patients 15% are under 30 years of age, 33.6% are from 31 to 40 years, 31.3% are from 41 to 50 years, 15.3% are from 51 to 60 years and 4.9% are older than 61. Gender distribution shows that the percentage of males in the group from 41 to 50 yrs (57.3%) is lower than in overall subject group (62.7%) while it is significantly higher in the group of 51 to 60 years old subjects (76.6%). In other age groups gender distribution is close to overall distribution values. Ethnic origin distribution in age groups also differs from the overall age group distribution. This distribution is shown in Figure 2.

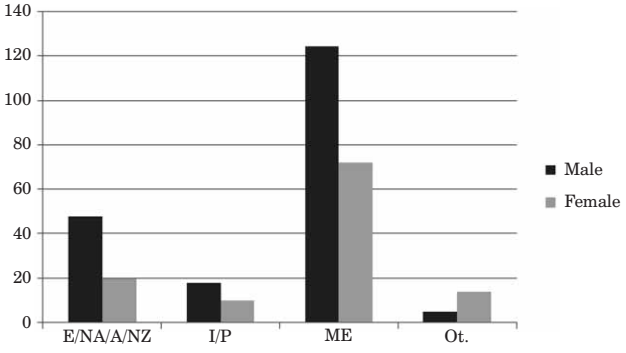

Fig. 1. Distribution of gender per ethnic origin (E/NA/A/NZ – Europe/North America/ Australia/New Zealand, ME-Middle East, I/P-India/Pakistan, Ot.-Other ethnic origins).

The influence of specific group differences on cholesterol levels

The average value of LDL-c for the whole group is 3.83 mmol/L (SD=1.1). However, the analysis shows discrepancies from the average value depending on gender, ethnic origin and age.

The ratio of men to women in the overall subject group is 1.68:1. It has been tested whether a similar ratio will be kept in different groups of measured LDL-c. In

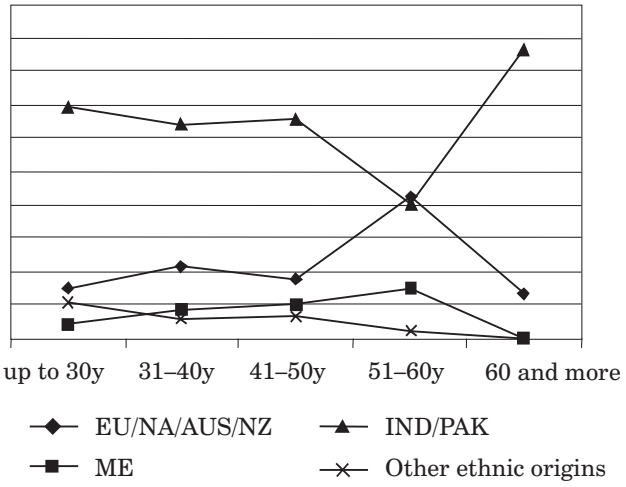

Fig. 2. Distribution of ethnic origin groups per age (EU/NA/AUS/ ZN-Europe/North America/ Australia/New Zealand, ME-Middle East, IND/PAK-India/Pakistan).

the group of subjects with the normal LDL-c, which makes 30 out of 311 subjects (9.6%) the representation of males and females is equal. The same trend is in the group of subjects with the borderline LDL-c, where the ratio is 1.15:1, also lower than the overall gender ratio. This means that only 31.3% of male subjects have a normal or borderline LDL-c, while with females this percentage is 47.4%. In the group with high LDL-c the ratio between males and females is 2.19:1, much higher than the overall gender ratio. This shows that out of 195 male subjects 134 (68.7%) have high LDL-c, while this percentage is lower with female subjects (52.6%). As a result, the analysis shows that gender has significant impact on the LDL-c level ($p<0.016$).

A similar analysis can be done according to the distribution by the ethnic origin. It has been tested whether overall distribution by the ethnic origin will be kept in different groups of the measured LDL-c. In the group of subjects with normal and borderline LDL-c which makes 116 out of 311 subjects, 30 subjects come from E/NA/A/NZ. This means that subjects within this ethnic origin make 25.9% of non-hypercholesterolaemic patients, while in the overall distribution they represent only 21.9%. In the ethnic origin groups I/P and Ot. 11 subjects per group have low or borderline LDL-c, which is 9.5%, whereas the subjects descending from these ethnic origin groups are represented in the overall subject distribution with 9% and 6.1% respectively. Finally, in the ME ethnic origin group 64 subjects have normal or borderline LDL-c, which is 55.2%, while the subjects from these ethnic origin groups are represented in the overall subject groups with a distribution of 63%. This distribution shows that the subjects from ME are under-represented in the group of subjects that have normal or borderline LDL-c. As shown before, male subjects have higher levels of LDL-c, and the subjects from ME have more male population than the overall gender distribution. However, this over--representation of male subjects in the ME ethnic origin is just 2.4% and it cannot justify the under-representation of the subjects of the ME ethnic origin in the group with normal or borderline LDL-c. Moreover, the subjects from ME are 63% of overall subjects, but 67.7% of the subjects with high LDL-c, while all other ethnic origin groups have lower representation in high LDL-c than in overall ethnic origin distribution ($p<0.025$).

Analysis has also been done according to the age distribution. It has been tested whether overall age distribution will be kept in different groups with the measured LDL-c. These data are shown in Table 1. It is evident that the ratio between the age group participation in overall subjects and the age group participation in the level of LDL-c changes the trend on the 40 years of age borderline as well as the level of LDL-c increases with age.

Discrepancy between total cholesterol and LDL-c levels

It has been tested whether there is a linear correlation between T-c level and LDL-c, as T-c may be impacted on with its other component, HDL-c, the elevation of which is desirable to lower a cardiovascular risk. 97.4% of male subjects have low or normal and only 2.6% have high level of HDL-c while 78.2% of female subjects have low or normal and 21.7% have high HDL-c. Out of 308 subjects only 30 have high level of HDL-c and 83.3% of them are females.

Taking into consideration that LDL-c and HDL-c have different impact on cardiovascular risk and a proportional impact on T-c level, a comparison between LDL-c and T-c has been done (Table 2). Average values of T-c, LDL-c and HDL-c per gender and ethnic origin distributions are shown in Tables 3 and 4.

Discussion

Human atherogenesis starts early in life, and once initiated, different risk factors influence its progression and may act synergistically. The long lag between onset and clinical manifestations of atherosclerosis provides an opportunity to implement early detection, prevention and intervention strategies[7]. More than a century ago, a Russian pathologist, Antischkow, induced atherosclerosis in rabbits by feeding them cholesterol. Since then the evidence proving that hypercholesterolaemia is strongly linked to atherosclerosis[8] increased. The final link proving the correlation between hypercholesterolaemia and atherosclerosis came from the prospective Framingham study[1] and furthermore established by the marked reduction of the atherosclerosis related clinical events by cholesterol lowering intervention[9–11]. Cardiovascular diseases (coronary and cerebral) represent the leading cause of mortality in the UAE with 30.37% deaths in 2006, with a steady growth in the last 10 years[2,3], although it has been regressing steadily in the industrialized world[12–15].

In this cross sectional analysis, we evaluated 311 subjects for the prevalence of unrecognized dyslipidaemia,

TABLE 1
LEVEL OF LDL-C PER AGE GROUPS

		<30	31–40	41–50	51–60	>61
Level of LDL-c	Normal	6	12	7	3	1
	Borderline	15	33	20	12	7
	High	26	59	69	34	7

LDL-c – Low Density Lipoprotein Cholesterol

TABLE 2
COMPARISSON BETWEEN LEVEL OF T-C AND LDL-C

		Level of LDL cholesterol		
		Normal	Borderline	High
Level of total cholesterol	Low	29	61	28
	Borderline	1	24	87
	High	0	1	79

T-C – Total Cholesterol, LDL-C – Low Density Lipoprotein Cholesterol

TABLE 3
AVERAGE VALUES OF T-C, LDL-C AND HDL-C PER GENDER

	T-c			LDL-c			HDL-c		
	All	Male	Female	All	Male	Female	All	Male	Female
Mean	5.64	5.76	5.45	3.83	4	3.54	1.14	1.06	1.29
SD	1.17	1.28	0.92	1.1	1.12	1	0.29	0.22	0.33

T-c – Total Cholesterol, LDL-c – Low Density Lipoprotein Cholesterol, HDL-c – High Density Lipoprotein Cholesterol, SD – Standard Deviation, Mean in mmol/L,

TABLE 4
AVERAGE VALUES OF T-C, LDL-C AND HDL-c PER ETHNIC ORIGIN

		Total	E/NA/A/NZ	I/P	ME	Ot.
T-c	Mean	5.64	5.68	5.39	5.67	5.59
	SD	1.17	1.19	0.91	1.22	0.89
LDL-c	Mean	3.83	3.72	3.64	3.93	3.48
	SD	1.1	1.13	1.13	1.09	0.82
HDL-c	Mean	1.14	1.19	1.1	1.11	1.33
	SD	0.29	0.29	0.3	0.27	0.35

T-c – Total Cholesterol, LDL-c – Low Density Lipoprotein Cholesterol, HDL-c – High Density Lipoprotein Cholesterol, SD – Standard Deviation, E/NA/A/NZ – Europe/North America/ Australia/New Zealand, ME – Middle East, I/P – India/Pakistan, Ot. – Other ethnic origins, Mean in mmol/L

its relation to different epidemiologic factors (age, gender and ethnic origin) and whether concordance exists between hypercholesterolaemia and LDL-hypercholesterolaemia. The results of this study demonstrated that the average level of total and LDL cholesterol are significantly higher than the levels required for the prevention of cardiovascular diseases. Hypercholesterolemia is a worldwide phenomenon, with higher prevalence in the industrialized world[12,13,16,17]. This can be attributed to physical inactivity and unhealthy diet, along with the growing pandemic of obesity and diabetes mellitus. The discordance between the percentages of elevated LDL-c and T-c signifies the role of LDL-C/non-HDL-c as the main surrogate for dyslipidemia as a risk for atherosclerosis, and as a primary target of therapy[4]. Results of this study show that the overall average level of T-c is 5.64 mmol/L (SD=1.17), LDL-c of 3.83 mmol/L (SD 1.1) only. This shows prevalence of LDL hypercholesterolaemia of 62.7% and T-c hypercholesterolaemia of 25.8%.

The increasing prevalence of cardiovascular mortality in the UAE, although decreasing in industrialized countries worldwide, cannot be explained solely by the higher prevalence of diabetes mellitus, the prevalence charts of which show worldwide increase[18,19]. Hypercholesterolaemia, on the other hand, may explain this. More investigations are needed to estimate the prevalence of hypercholesterolaemia, the trends in the last decade and the correlations with the cardiovascular mortality trends. Prevalence of hypercholesterolaemia tends to be higher in male population and increases with the age, correlates with the findings from other major prevalence studies worldwide. The high prevalence can be explained partly by the selection bias having more of the male gender and older population, though, the average age and gender matching T-c and LDL-c values are still among the highest investigated. In the Emirate of Dubai there is higher prevalence of males (76.13%) than females (23.8%)[20] while in our study population there are 63% of males and 37 % of females. If our study population had the same gender distribution as the Emirate of Dubai, we would expect higher average levels of T-c, LDL-c and lower average levels of HDL-c. The age distribution of our study group

differs from the age distribution of the Emirate of Dubai (30% up to 30 years, 35% 31 to 40 years, 15% 41–50 years, 5% 51 to 60 years and 1% older than 61 years), which means that our study population is older than the real population of the Emirate of Dubai. According to the survey of the City of Dubai from 1997/1998, the UAE-nationals were represented with 17%, Asians with 71%, Westerns and Arabs with 12% of the total population[21]. If we assume that the distribution according to the ethnic origin did not change in the past decade, then we can see that our study group does not represent the real ethnic distribution of the Emirate of Dubai. We think the reason behind the discrepancy in the ethnic origin distribution between our study group and the real population of Dubai and Northern Emirates is in the access to the private healthcare, hence higher percentage of the ME and E/NA/A/NZ ethnic origin groups.

Although T-c has been strongly correlated with the cardiovascular morbidity and mortality[1], the LDL-c is the primary cause of cardiovascular risk and primary target of the therapy[4]. The analysis of the correlation between T-c and LDL-c shows that out of 230 subjects who had low or borderline T-c 194 subjects (62.9%) had high LDL-c, which is a statistically significant discordance that can be explained by the fact that T-c is dependent on different lipids (HDL and non-HDL cholesterol) having different impacts on cardiovascular health. The fact that the average LDL-c is lower in »Other ethnic group« can be attributed to a female predominance in this group other than the true ethnic disparity.

Low levels of HDL-c are an independent powerful prediction of the increased CVD risk. The increasing of the HDL-c is associated with a decrease of the future risk of coronary heart disease regardless of the LDL-c level[4,22]. In our study 97.4% male subjects and 78.25% female subjects did not have the HDL-c high enough to decrease the cardiovascular risk.

The causes of the bias in our study may be the fact that the hospital population may not be truly representative of the overall population trends, the age and gender distribution affecting the results (more males in most groups) which might have lead to higher average values from those representative of the community and that fasting was not the prerequisite for the lipid profile measurements. However, LDL-c and HDL-c are not depended on the fasting as prerequisite, but T-c values can be influenced by triglyceride levels.

Conclusion

Dyslipidaemia (high LDL-c, low HDL-c) prevalence in Dubai and Northern Emirates appears to be very high. However, we need a larger scale population based screening program for the adequate estimation of the burden of the problem, hence implementing measures to control it. The increasing cardiovascular mortality may be secondary to the increasing dyslipidaemia. Total cholesterol is not a good surrogate marker of the cardiovascular risk. The HDL-c and the non-HDL-c (LDL-c and triglycerides) are better surrogate markers.

Acknowledgement

We would like to thank to RN Fariha Khan, Mr. John D'Souza and the staff of the Emirates Hospital from Dubai for providing data used in this paper.

REFERENCES

1. KANNEL WB, DAWBER TR, KAGAN A, REVOTSKIE N, STOKES JI, Ann intern Med, 55 (1961) 33. — 2. HASAB AAH, Situational analysis and future prospects, DOHMS, Dubai, UAE accessed 10.02.2007. Available from: http://www.dohms.gov.ae/NR/rdonlyres/4B82DDEB-AAED-47FC-97FF-F6FA53106D3E/381/HealthinDubai_3_.pdf — 3. MOH Statistics accessed 10.02.2007. Available from: http:// www.moh.gov.ae/moh_site/stat_plan/StatRep2004/index.htm — 4. EXECUTIVE SUMMARY OF THE THIRD REPORT OF THE NATIONAL EDUCATION PROGRAM (NCEP) EXPERT PANEL ON DETECTION, EVALUATION, AND TREATMENT OF HIGH BLOOD CHOLESTEROL IN ADULTS (ADULT TREATMENT PANEL III), JAMA, 285 (2001) 2486. — 5. WALLACH J, The Interpretation of Laboratory Tests (Lippincott Williams & Wilkins, Philadelphia, 2000) — 6. GRUNDY SM, CLEEMAN JI, MERZ CN, BREWER HB Jr, HUNNINGHAKE DB, PASTERNAK RC, SMITH SC Jr, STONE NJ, J Am Coll Cardiol, 44 (2004) 720. — 7. NAPOLI C, LERMAN LO, DE NIGRIS F, GOSSL M, BALESTRIERI ML, LERMAN A, Circulation, 114 (2006) 2517. — 8. CARLSON LA, Development of the link between dyslipidaemia and clinical atherosclerosis. In: CARLSON LA (Eds): Part 5 Secondary Prevention of Clinical Atherosclerosis (Science Press Ltd, London, 2003) — 9. THE SCANDINAVIAN SIMVASTATIN SURVIVAL STUDY GROUP (4S), Lancet, 344 (1994) 1383. — 10. SEVER PS, DAHLOF B, PUOLTER NR, WEDEL H, BEEVERS G, COLLINS R, KJELDESEN SE, KRISTINSSON A, McINNES GT, MEHLSEN J, NIEMIEN M, O'BRIEN E, OSTERGREN J, Lancet, 361 (2003) 1149. — 11. DOWNS JR, CLEARFIELD M, WEIS S, WHITNEY E, SHAPIRO DR, BEERE PA, LANGENDORFER A, STEIN EA, KRUYER W, GOTTO AM Jr, JAMA, 279 (1998) 1615. — 12. TOLONEN H, KEIL U, FERRARIO M, EVANS A, Int J Epidemiol, 34 (2005) 181. — 13. KUULASMAA K, TUNSTALL-PEDOE H, DOBSON A, FORTMANN S, SANS S, TOLONEN H, EVANS A, FERRARIO M, TOUMILEHTO J, Lancet, 355 (2000) 675. — 14. McGOVERN PG, PANKOW JS, SHAHAR E, DOLISZNY KM, FOLSOM AR, BLACKBURN H, LUEPKER RV, N Engl J Med, 334 (1996) 884. — 15. LEVI F, LUCCHINI F, NEGRI E, LA VECCHIA C, Heart, 88 (2002) 88. — 16. LINDENSTROM E, BOYSEN G, NYBOE J, BMJ, 309 (1994) 11. — 17. PONGCHAIYAKUL C, PONGCHAIYAKUL C, PRATIPANAWATR T, J Med Assoc Thai, 88 (2005) 1092. — 18. MOKDAD AH, FORD ES, BOWMAN BA, DIETZ WH, VINICOR F, BALES VS, MARKS JS, JAMA, 289 (2003) 76. — 19. KING H, AUBERT RE, HERMAN WH, Diabetes Care, 21 (1998) 1414. — 20. Population bulletin 2007 accessed 19.10.2008. Available from: http://www.dsc.gov.ae/DSC/uploads/populationbulleting2007.pdf — 21. The changing demographics of the UAE accessed 19.10.2008. Available from: http://www.econresearch.net/admin/articles/ 1.pdf — 22. GORDON DJ, PROBSTFIELD JL, GARRISON RJ, NEATON JD, CASTELLI WP, KNOKE JD, JACOBS DR Jr, BANGDIWALA S, TYROLER HA, Circulation, 79 (1989) 8.

B. Karin Vela

Dubai London Clinic, PO Box 74830 Dubai, UAE
e-mail: bkarin@inet.hr

PREVALENCIJA NEPREPOZNATE DISLIPIDEMIJE U DUBAIJU I SJEVERNIM EMIRATIMA: PRESJEČNA STUDIJA BAZIRANA NA PODACIMA IZ BOLNICE

S A Ž E T A K

Cilj ovog istraživanja je da se odredi učestalost neotkrivenih dislipidemija i posebna korelacija izmedju vrijednosti lipida i starosne dobi, spola ili parametara etničkog porijekla u populaciji obuhvaćenoj istraživanjem. Ova retrospektivna presječna studija obuhvatila je 311 osoba koje su prvi puta kontrolirale vrijednosti lipida u jednoj privatnoj bolnici u Dubaiju u razdoblju od šest mjeseci. Iz analize se vidi da kod muških pacijenata prevladava Low Density Lipoprotein hiperkolesteremija sa relativno povišenim Low Density Lipoprotein kolesterolom (LDL-c) ($p<0,016$) kao i kod etničke grupe koja potječe s Bliskog istoka ($p<0,025$), dok su s druge strane poželjne vrijednosti nađene kod žena ($p=0$). Nesrazmjer kod postotaka povišenog LDL-c i ukupnog kolesterola ukazuje na važnost uloge LDL-c/ne HDL-c kao glavnog surogata za dislipidemiju koja predstavlja rizik od ateroskleroze, te kao primarni cilj terapije.