Prevalence of dyslipidemia in the Iraqi adult population

Waad-Allah S. Mula-Abed, MSc, FRCPath, *Saba K. Chilmeran,* BVM, MSc.

ABSTRACT

Objectives: To establish the prevalence of dyslipidemia in the Iraqi adult population in Mosul, Iraq, according to the different recommended criteria.

Methods: The study was carried out from October 2003 to April 2004, with 871 apparently healthy volunteers (413 males, 458 females) aged 20-70 year ([mean±SD] 41.2±13.8 year). Fasting blood specimens were collected from all subjects for measurement of serum lipid profile including triglycerides (TG), total cholesterol (TC), high density lipoprotein-cholesterol (HDL-C), low density lipoprotein-cholesterol (LDL-C), and ratios of cholesterol such as TC:HDL-C, LDL-C:HDL-C, and TG:HDL-C. Classification was carried out according to the different cut-off levels as recommended by the 2001 American National Cholesterol Education Program (NCEP) III using thresholds of TG≥150 mg/dl (2.0 mmol/L), LDL-C≥100 mg/dl (2.6 mmol/L), HDL-C<40 mg/dl (1.04 mmol/L), and non-HDL-C≥130 mg/dl (3.37 mmol/L). The criteria of the 1998 British Hyperlipidemia Association (BHA) were also followed using thresholds of TG≥180 mg/dl (2.4 mmol/L), TC≥194 mg/dl (5.0 mmol/L), LDL-C≥116 mg/dl (3.0 mmol/L), HDL-C≤45mg/dl(1.15mmol/L),TC:HDL-C≥5.0,HDL-C:DL-C≥2.5, and TG:HDL-C≥3.0.

Results: Based on the American NCEP III criteria, the dyslipidemic states were noted with high TG (41.6%), high LDL-C (57.8%), low HDL-C (49.9%), and high non-HDL-C (56.8%) from the subjects. Based on the BHA criteria, high TG (24.5%), high TC (32.7%), high LDL-C (37.8%), high TC:HDL-C (30.9%), high LDL-C HDL-C (55.7%), and high TG:HDL-C (58.3%) were noted.

Conclusion: Dyslipidemia is common in the Iraqi population, and this was identified at different recommendation criteria.

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From the Department of Chemical Pathology (Mula-Abed), Royal Hospital, Muscat, Sultanate of Oman, and the Department of Biochemistry (Chilmeran), College of Medicine, University of Mosul, Mosul, Iraq.

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Address correspondence and reprint request to: Prof. Waad-Allah S. Mula-Abed, Senior Consultant and Head, Department of Chemical Pathology, Royal Hospital, PO Box 1331, Seeb 111, Muscat, Sultanate of Oman. Tel. +968 24599735. Fax. +968 24590298. E-mail: drsharef@hotmail.com

Coronary heart disease (CHD) constitutes one of the main health problems, representing the leading most common disease and hospital-based mortality.[1] Several risk factors contribute to its development, some are modifiable while others are not. These include dyslipidemia,[2] hypertension,[3] family history,[4] age and gender,[5] diabetes mellitus (DM) and insulin resistance,[6] obesity,[7] lack of physical exercise,[8] and cigarette smoking.[9] Extensive medical research has identified hyperlipidemia or dyslipidemia as a major risk factor for CHD. This includes elevated serum cholesterol, particularly low-density lipoprotein-cholesterol (LDL-C) and low high-density lipoprotein-cholesterol (HDL-C).[10] There is also a growing interest in the contribution of triglycerides (TG) in the risk of CHD.[11] The association between a cluster and multiplex of metabolic risk factors was labelled as syndrome X or insulin resistance syndrome, and as metabolic syndrome.[12,13] This syndrome is common, and its diagnosis varies according to the criteria of the World Health Organization, American Association of Clinical Endocrinologists, or European Group for the Study of Insulin Resistance.[14] There is also a growing interest in evaluating the cut-off limits for the desirable thresholds of serum cholesterol (total, LDL, and HDL) and TG according to different population studies and clinical trials.[15] In the USA, different studies were started in 1970s from the Framingham Study, Coronary Drug Project, and Helsinki Heart Project; in 1988 from Angiographic Trials, Meta Analysis and National Cholesterol Education Program I (NCEP I); in 1993 from NCEP II; and in 2001 from NCEP III trials.[16-18] The trend is always towards lowering the target thresholds for goal treatment (particularly, following the important statin trials). In

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the UK, the British Hyperlipidemia Association (BHA), British Cardiac Society, British Hypertension Society, and Diabetes UK have also contributed in this field by publishing the British Recommendations on Prevention of Coronary Heart Disease in Clinical Practice.[19]

The objectives of the current study were to screen for dyslipidemia in the Iraqi adult population using serum lipid profile, which includes TG, total cholesterol (TC), HDL-C, LDL-C, and ratios of cholesterol: HDL-C, LDL-C:HDL-C, and TG:HDL-C, and to establish the prevalence of dyslipidemia, according to the defined cut-off levels, using the recommendations of the American NCEP III,[18] and the BHA.[19]

Methods. A cross-sectional survey for dyslipidemia using serum lipid profiles in an apparently healthy adult population in Mosul city, northern Iraq. The study was carried out during October 2003 - April 2004. The subjects included 871 individuals (413 males and 458 females), 20-70 years, ([mean±SD] 41.2±13.8 year, 40 year median). These subjects were apparently healthy volunteers who were divided into 3 samples. The first sample was composed of 300 individuals (165 males and 135 females), 21-70 years, (38.2±13.9, 40 year median). They were from the staff of the Mosul College of Medicine, Mosul, Iraq, and from the author's relatives and friends. The second sample was composed of 471 individuals (150 males and 321 females), 22-68 years (44.2±13, 43 year median). These individuals were accompanying the inpatients in the surgical wards of Al-Zahrawi Hospital, Mosul, Iraq. The third sample was composed of 100 individuals (98 males and 2 females), 20-40 years (34.0±14.5 year, 32 year median). They were blood donors who were attending the Blood Bank of Al-Zahrawi Hospital. All subjects were asked to answer a questionnaire, and assessed for the presence or absence of personal or family history of CHD, DM, hypertension, renal diseases, and features of hyperlipidemia such as lipemia retinalis, tendon xanthoma, or xanthelasma. Their weight and height were recorded. The subjects were classified, according to their age depending on decades, into 5 subgroups (20-29, 30-39, 40-49, 50-59, and 60-70 years). The ethical approval was obtained subjects' consent according to the recommendations of the scientific committee of Mosul Medical College and Nineveh Province Health Sector, Ministry of Health, Iraq.

Classification of dyslipidemia according to the cut-off values of different components of serum lipid profile. The prevalence of dyslipidemia, involving one or more of the components of serum lipid profile was calculated. In the first classification, the individual lipid parameter was considered to be abnormal or indicative of dyslipidemic state, according to the recommendations by the NCEP III, at the following cut-off levels: **a.** TG≥150 mg/dl (2.0 mmol/L), **b.** LDL-C≥100 mg/dl (2.6 mmol/L), **c.** HDL-C <40 mg/dl (1.04 mmol/L), and **d.** non-HDL-C ≥130 mg/dl (3.37 mmol/L). A second classification was made, according to the recommendations by the BHA, and lipoprotein ratios or indices according to the recommendations of the Joint British Society[19,20] in terms of risk assessment at the following cut-off levels: **a.** TG ≥180 mg/dl (2.4 mmol/L), **b.** TC ≥194 mg/dl (5.0 mmol/L), **c.** LDL-C ≥116 mg/dl (3.0 mmol/L), **d.** HDL-C ≤45 mg/dl (1.15 mmol/L), **e.** TC:HDL-C ≥5.0, **f.** LDL-C:HDL-C ≥2.5, and **g.** TG:HDL-C ≥3.0.

A venous blood specimen was collected from every subject from 8-10 in the morning, following an overnight fast for not less than 10-12 hours. Measurements of serum lipid components were made and in addition, a number of indices for certain lipid parameters were calculated or derived from the measured values.[18-20] The overall components include the measured parameters (TG, TC, and HDL-C), and the derived parameters (LDL-C, non-HDL-C, TC:HDL-C, LDL-C:HDL-C, and TG:HDL-C). Serum TG and TC were measured by enzymatic methods[21,22] using kits from bioMérieux (France). Serum HDL-C was measured following the precipitation of the apoprotein-B containing chylomicrons and lipoproteins of very low-density lipoprotein and LDL, by phosphotungstic acid in the presence of magnesium ions.[23] The supernatant obtained after centrifugation that contains HDL was determined using the cholesterol enzymatic reagents from bioMérieux (France). Serum LDL-C is calculated by the Friedewald formula,[24] using TC, HDL-C, and TG values as

LDL-C (mg/dl) = TC-HDL-C (TGx0.2) or
LDL-C (mmol/L) = TC-HDL-C (TGx0.455)

Serum non HDL-C is calculated by subtracting HDL-C value from TC value as recommended by the NCEP III.[18] Certain indictors or ratios of lipid profile parameters are calculated by dividing the corresponding value of lipid components. This includes TC:HDL-C (atherogenic index), LDL-C:HDL-C, and TG: HDL-C. All these biochemical analyses were performed in the Clinical Chemistry Laboratory, Department of Biochemistry, College of Medicine, University of Mosul, Iraq.

The statistical methods used included the standard statistical methods of the mean, medium, SD, and range (minimum-maximum). Unpaired Z test was used for comparisons with a statistically significant difference considered to be present at $p<0.05$. All values are quoted as the mean±SD. The point prevalence rate of dyslipidemia, involving each of the components of the lipid profile, was calculated according to the following equation:[25]

Prevalence rate (%) = n (with abnormal lipid)/
population (sample) size x 100

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Results. The results of serum lipid profile are presented in conventional units of mg/dl, and are followed when necessary, by mmol/L, consistent with the convention followed by the NCEP III.[18] The age and gender distribution of serum lipid profile in the study population is shown in **Table 1**. Using Z test, a significant gender difference between males and females was noted for TG, HDL-C, and TG/DL-C; however, no significant difference was noted for TC, LDL-C, TC:HDL-C, and LDL-C:HDL-C.

Dyslipidemia is considered to be present when an analyte exceeds the cut-off point, which is regarded to be abnormally high or low. According to the criteria of NCEP III,[18] a dyslipidemic state was noted with high TG in 41.6% (190 males, 176 females), high LDL-C in 57.8% (237 males, 268 females), low HDL-C in 49.9% (225 males, 196 females), and high non-HDL-C in 56.3% (230 males and 261 females), (**Table 2**). Abnormally high proportion of high TG and low HDL-C was noted in males than females. However, no gender difference in the proportion of high LDL-C and high non-HDL-C was noted.

Classification of dyslipidemia was also carried out based on the criteria of the BHA.[19,20] An elevated serum TG was noted in 24.5% (115 males, 99 females), elevated TC in 32.7% (124 males, 171 females), elevated LDL-C in 37.8% (142 males, 191 females), elevated TC:HDL-C in 30.9% (125 males, 138 females), elevated LDL-C:HDL-C in 55.7% (225 males, 258 females), and elevated TG:HDL-C in 58.3% (260 males, 242 females) at different age groups (**Table 3**). High proportions of subjects with high levels of TC, LDL-C, TC:HDL-C, and LDL-C:HDL-C were noted in females, while high values of TG and TG:HDL-C were noted in males.

Discussion. When the recommendations of the NCEP III[18] was considered, 42% of the study population had TG>150 mg/dl (2.0 mmol/L), 58% had LDL-C>100 mg/dl (2.6 mmol/L), and 50% had HDL-C<40 mg/dl (1.04 mmol/l) while 56% had non HDL-C>130 mg/dl (3.37 mmol/l). When using the cut-off limits recommended by the BHA,[19] 25% of the study population had TG>180 mg/dl (2.4 mmol/L),

Table 1 - Age and gender distribution of serum lipid profile in the study population. Data are presented as mean ± SD.

Age (year)	Gender (n)	TG mg/dl	TC mg/dl	HDL-C mg/dl	LDL-C mg/dl	TC/HDLC	LDL-C/ HDLC	TG/HDLC
20-29	M (105)	143.77±52.66	168.0±32.34	41.55±9.39	97.7±29.74	4.2±1.05	2.46±0.92	3.67±1.65
	F (89)	129.0 ±49.11	171.50±30.12	44.80±8.85	100.89±27.61	3.96±0. 97	2.35±0.81	3.04±1.45
	Both (294)	137±51.46	169.61±31.31	43.04±9.26	99.17±28.75	4.09±1.02	2.41±0.87	3.38±1.59
30-39	M (77)	153.32±60.08	180.87±41.93	39.50±9.15	110.69±39.53	4.72±1.23	2.88±1.11	4.18±2.29
	F (104)	139.8±69.64	180.89±30.7	41.52±8.86	111.4±28.76	4.48±1.08	2.8±0.92	3.55±1.97
	Both (181)	145.55±65.91	180.88±35.8	40.66±9.0	111.1±33.66	4.58±1.15	2.84±1.0	3.82±2.13
40-49	M (90)	144.71±53.0	182.05±34.39	39.5±7.83	113.6±31.12	4.75±1.16	2.99±1.0	3.83±1.68
	F (106)	135.64±53.87	180.12±35.82	42.16±10.82	110.83±30.08	4.51±1.32	2.81±1.05	3.51±1.95
	Both (196)	139.80±53.53	181.01±35.0	40.93±9.64	112.11±30.57	4.62±1.25	2.89±1.04	3.66±1.83
50-59	M (79)	157.17±60.1	187.06±33.92	41.39±8.58	114.23±32.49	4.66±1.09	2.87±0.97	3.98±1.83
	F (116)	153.12±59.57	185.73±35.29	42.73±9.95	112.37±33.9	4.52±1.11	2.76±1.03	3.79±1.69
	Both (195)	154.76±59.67	186.27±34.66	42.18±9.42	113.12±33.26	4.58±1.1	2.85±1.17	3.87±1.75
60-70	M (62)	148.8±50.71	170.38±32.09	39.35±8.28	101.27±30.38	4.48±1.13	2.70±1.01	3.91±1.42
	F (43)	139.18±63.95	178.46±47.28	38.62±9.02	112.0±46.02	4.82±1.44	3.07±1.35	3.75±1.75
	Both (105)	144.86±56.41	173.69±39.02	39.05±8.56	105.66±37.75	4.62±1.27	2.75±1.02	3.84±1.56
All	M	149.1±55.36	177.47±35.6	40.36±8.72	107.3±33.26	4.55±1.15	2.77±1.02	3.89±1.8
	F	140.1±59.1	179.9±34.98	42.34±9.74	109.53±32.3	4.43±1.19	2.73±1.02	3.52±1.8
	Both	144.33±57.8	178.74±35.3	41.4±9.31	108.5±32.77	4.49±1.17	2.75±1.02	3.7±1.81
Z		2.9	1.2	3.12	1.17	1.64	0.57	3.6
P-value		0.004	0.23	0.002	0.24	0.10	0.58	0.0001

SD - standard deviation, M - male, F - female, TG - triglycerides, TC - total cholesterol, HDL-C - high density lipoprotein-cholesterol, LDL-C - low density lipoprotein-cholesterol, TC/HDLC - total cholesterol/high density lipoprotein-cholesterol, LDL-C/HDLC - low density lipoprotein-cholesterol/ high density lipoprotein-cholesterol, TG/HDL-C - trygliceride/high density lipoprotein-cholesterol, Z - Z-test. All values are presented as number (%)

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Table 2 - Prevalence of dyslipidemia in the study population according to the recommendations of the American National Cholesterol Education Program III.[18] Results are expressed as numbers of subjects (with age and gender-specific crude prevalence in parenthesis).

Age (year)	Gender	TG≥150 mg/dl	LDL-C≥100 mg/dl	HDL-C<40 mg/dl	Non HDL-C≥130 mg/dl
	M	44 (41.9)	45 (42.9)	54 (51.4)	40 (38.1)
20-29	F	29 (32.6)	43 (48.3)	27 (30.3)	40 (44.9)
	Both	73 (37.2)	88 (45.6)	81 (40.8)	80 (41.5)
	M	38 (49.4)	50 (64.9)	46 (59.7)	51 (66.2)
30-39	F	37 (35.6)	63 (60.6)	47 (45.2)	61 (58.7)
	Both	75 (42.5)	113 (62.7)	93 (52.4)	112 (62.4)
	M	39 (43.3)	58 (64.4)	50 (55.6)	55 (61.1)
40-49	F	42 (39.6)	59 (55.7)	48 (45.3)	62 (58.5)
	Both	81 (41.4)	117 (60)	98 (50.4)	117 (59.8)
	M	40 (50.6)	53 (67.1)	39 (49.4)	51 (64.6)
50-59	F	56 (48.3)	78 (67.2)	46 (39.7)	75 (64.7)
	Both	96 (49.4)	131 (67.1)	85 (44.5)	126 (64.6)
	M	29 (46.8)	31 (50.0)	36 (58.1)	33(53.2)
60-70	F	12 (27.9)	25 (58.1)	28 (65.1)	23 (53.5)
	Both	41 (37.3)	56 (54)	64 (61.6)	56 (53.3)
	M	190 (46.4)	237 (57.8)	225 (54.8)	230 (56.6)
All	F	176 (36.8)	268 (57.9)	196 (45.1)	26 (56.0)
	Both	366 (41.6)	505 (57.8)	421 (49.9)	491 (56.3)

M - male, F - female, TG - triglycerides, LDL-C - low density lipoprotein-cholesterol, HDL-C - high density lipoprotein-cholesterol, Non HDLC - non high density lipoprotein-cholesterol. All values are presented as number (%)

33% had TC>193 mg/dl (5.0 mmol/l), and 38% had LDL-C>116 mg/dl (3.0 mmol/L).

An abnormal ratio of certain lipoprotein components, which has been recommended to be used for risk assessment, was also noticed in the study population.[20] Accordingly, 31% of the study population had TC HDL-C>5.0, 56% had LDL-C HDL-C>2.5, and 58% had TG:HDL-C>3.0. These ratios will further reflect the status of HDL-C, which is an independent risk factor for CHD.[10] There is an increasing interest in the use of TG:HDL-C as a reflector of the metabolic syndrome.[14] This ratio correlates inversely with LDL size and positively with LDL-C.[26] The small LDL particle predominance (phenotype B) is associated with much higher atherogenic index.[27] It has been reported that for predicting phenotype B, a TG:HDL-C≥3.8 has a sensitivity of 76%, specificity of 93%, positive predictive value of 83% and negative predictive value of 89%.[28] The NCEP III recommends the use of an additional secondary target for therapy, the non HDL-C, which combines all apoprotein B containing lipoproteins in LDL and VLDL, most of which are atherogenic.[18] This should be monitored as a secondary target when the primary goal for LDL-C has been achieved, however, TG remain high (>200 mg/dl, 2.7 mmol/L). The NCEP III recommends the cut-point for non-HDL-C as that for LDL-C+30 mg/dl (0.78 mmol/L), which is equivalent to VLDL-C at lower TG cut-point of 150 mg/dl (1.7 mmol/L). In addition, it has been reported that non-HDLC correlates significantly with apoprotein B in discriminating and predicting CHD risk based on angiographic study.[29] When data available from different publications are reviewed, comparable and non-comparable results are revealed. Different means and ranges for the prevalence rates of the components of serum lipid profile were obtained in the different age and gender groups. Genetic, dietary, lifestyle, and other factors may contribute to these differences. The prevalence is also changing with time, as there is continuous change in the international guidelines data for lipid profile according to available clinical trials. For example, the cut-off threshold for LDL-C has dropped from 130-160 mg/dl (3.37-4.15 mmol/L) by NCEP I in 1988,[16] to 100-130 mg/dl (2.6-3.37 mmol/L) by NCEP II in 1993,[17] and to 100 mg/dl (2.6 mmol/L) by NCEP III in 2001,[18] with the inclusion of other risk

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Table 3 - Prevalence of dyslipidemia in the study population according to the recommendations of the British Hyperlipidemia Association.[19] Results are expressed as numbers of subjects (with age and gender-specific crude prevalence in parenthesis).

Age (year)	Gender	TG ≥180 mg/dl	TC ≥194 mg/dl	LDL.C ≥116 mg/dl	TC/HDLC ≥5	LDLC/HDLC ≥2.5	TG/HDLC ≥3
	M	25 (23.8)	18 (17.1)	22 (21)	21 (20)	42 (40)	63 (60)
20-29	F	17 (19.1)	27 (30.3)	27 (30.3)	16 (18)	38 (42.7)	36 (40.4)
	Both	42 (21.4)	45 (23.7)	49 (25.6)	37 (19)	80 (41.3)	99 (50.2)
	M	24 (31.2)	32 (41.6)	35 (45.5)	26 (33.8)	43 (55.8)	50 (64.9)
30-39	F	22 (21.2)	37 (35.6)	42 (40.4)	30 (28.8)	61 (58.7)	56 (53.8)
	Both	46 (26.2)	69 (38.6)	77 (42.9)	56 (31.3)	104 (57.2)	106 (59.3)
	M	23 (25.6)	27 (30)	39 (43.3)	32 (35.6)	58 (64.4)	56 (62.2)
40-49	F	23 (21.7)	44 (41.5)	48 (45.3)	34 (32.1)	64 (60.4)	50 (47.2)
	Both	46 (23.6)	71 (35.7)	87 (44.3)	66 (33.8)	122 (62.4)	106 (54.7)
	M	29 (36.7)	33 (41.8)	30 (38)	30 (38)	47 (59.5)	50 (63.3)
50-59	F	29 (25)	54 (46.4)	55 (47.4)	39 (33.6)	69 (59.5)	73 (62.9)
	Both	58 (30.8)	87 (44.1)	85 (42.7)	69 (35.8)	116 (59.5)	123 (63.1)
	M	14 (22.6)	14 (22.6)	16 (25.8)	16 (25.8)	35 (56.5)	41 (66.1)
60-70	F	8 (18.6)	9 (20.9)	19 (44.2)	19 (44.2)	26 (60.5)	27 (62.8)
	Both	22 (20.6)	23 (21.7)	35 (35)	35 (35)	61 (58.5)	68 (64.4)
	M	115 (27.9)	124 (30.6)	142 (34.7)	125 (30.6)	225 (55.2)	260 (63.3)
All	F	99 (21.1)	171 (34.9)	191 (41)	138 (31.3)	258 (56.3)	242 (53.4)
	Both	214 (24.5)	295 (32.7)	333 (37.8)	263 (30.9)	483 (55.7)	502 (58.3)

M - male, F - female, TG - triglycerides, TC - total cholesterol, LDL-C - low density lipoprotein-cholesterol, TC/HDL-C - total cholesterol/high density lipoprotein-cholesterol, LDLC/HDLC - low density lipoprotein-cholesterol/high density lipoprotein-cholesterol, TG/HDLC - trygliceride/high density lipoprotein-cholesterol. All values are presented as number (%)

factors as well as lowering the threshold for TG to 150 mg/dl (2.0 mmol/L), HDL-C to 40 mg/dl (1.04 mmol/L) and adding of non HDL-C to lipid reporting. The NCEP itself was organized in 1985 in USA to develop practice guidelines, and educate both the general public and medical community on the indications and recommendations to identify and treat people with abnormal lipids to reduce CHD risk.[30] This modification in NCEP III made a major change in the demand for management whereby the American people undergoing dietary manipulation for lowering cholesterol increased from 52 - 65 millions, and those taking cholesterol lowering drugs increased from 13 - 36 millions.[18] This change in management strategy was based on reducing LDL-C. In addition, the implication of 4 widely used cholesterol-screening guidelines on the British population was also assessed in 322 males and 319 females aged 25-64 years. Treatment was recommended for 5.3% of males and 3.3% of females based on the British Drugs and Therapeutics Bulletin Guidelines, compared with 4.6% and 2.8% based on the BHA, 23% and 10.6% for European Atherosclerosis Society, and 37.2% and 22.2% for NCEP II.[31] The guidelines now recommend achieving more aggressive target level for LDL-C<70 mg/dl (1.8 mmol/L) in certain very high-risk secondary prevention patients.[32] The new guidelines of the Joint British Societies (European Society of Cardiology, BHA, British Hypertension Society) have also recently updated the optimal target for total cholesterol <155 mg/dl (4.0 mmol/L) and for LDL-C<78 mg/dl (2.0 mmol/L).[33]

Different proportions of different populations have reported variable prevalence rates of dyslipidemia or hyperlipidemia states. In Saudi Arabia, hypercholesterolemia was noticed in 10.1% of Saudis, which was significantly related to age (>40 years).[34] A recent study among 1390 boys and girls aged 9-12 years in Riyadh city revealed high rates even in children. High-risk levels of total cholesterol of the students were found to be >200 mg/dl (5.2 mmol/L) (32.7%), LDL-C>130 mg/dl (3.4 mmol/L) (33.1%), TG>85 mg/dl (1.13 mmol/L) (34.1%), and TC:HDL-C>4.5 (for boys) and >4.0 (for girls) (22%).[35] In Jordan, the prevalence rate of hypercholesterolemia in adults

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was 23%.[36] In Sri Lanka, the prevalence was 14.9% hypercholesterolemia (>250 mg/dl, 6.5 mmol/L), 8.5% hypertriglyceridemia (>165 mg/dl, 2.2 mmol/L), and 11.2% low HDL-C (<35 mg/dl, 0.9 mmol/L), as reported in 633 subjects aged 30-64 years.[37] An additional estimate from the USA based on data from the Third National Health and Nutrition Examination Survey III suggests that approximately 22% (>50 million) of US adults aged >20 years have hyperlipidemia that warrants treatment.[38]

In conclusion, dyslipidemia is common in Iraqi adults. Variable prevalence rates are reported depending on the cut-off thresholds recommended by the American NCEP III and the BHA. Early diagnosis of this medical problem is advisable to implement the appropriate management to avoid its consequences.

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