Lipid profile of adult Nepalese population

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ABSTRACT

Dyslipidemia is one of the major risk factors of coronary artery disease. Present study was aimed to find out the lipid profile of non-diabetic adult Nepalese population (n = 454; M: 180 and F: 274; Mean age: 42.8±15.5 years). The mean ± SD (mg/dl) level of total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL) and high density lipoprotein (HDL) was 184±50.7, 147.4±79.9, 111.9±42.0 and 45.0±11.7, respectively. All lipid levels except LDL were higher among 41 to 60 years age group while LDL was higher among participants aged >60 years. Desirable TC level (<200 mg/dl) was found in 78.0% of the total population while the normal TG (<150 mg/dl) and LDL (<129 mg/dl) was found in 61.5% and 72.0%, respectively. High TC (≥240 mg/dl) and very high TG (≥500mg/dl) and LDL (≥190 mg/dl) were found in 8.8%, 2.6% and 5.8% of participants, respectively. Higher HDL level (40 mg/dl) was seen in 60.0% of the total population. Higher percentage of women than men (65.3% vs 52.2%) had >40 mg/dl HDL level. Normal lipid profile (TC <200 mg/dl, TG <150 mg/dl, LDL <129 mg/dl, HDL >40 mg/dl) was seen in 26.7% of participants, and was higher in females (32.1%) than in males (18.3%). The overall mean cholesterol level was within normal limit. Mean LDL level showed increasing trend with age and about one fourth of participants had normal lipid profile.

Keywords: Lipid profile, normal lipid levels, adult population, non-diabetic, Nepal.

INTRODUCTION

Adverse lipid profile is one of the major risk factors for coronary artery disease and myocardial infarction.[1] Lipid disorder is a major causal risk factor, which acts independently, for the progression of coronary artery disease.[2] The relationship between cholesterol and saturated fat with coronary artery disease is identified as early as in 1950s.[3] The causal association between plasma lipid level and risk of coronary artery disease is established. Raised serum cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL) level and decreased high density lipoprotein (HDL) are associated major risk factors for cardiovascular disease.[4] Lipid disorder constitutes one of the major causal risk factors of coronary artery disease.

High cholesterol levels are estimated to cause 56 percent of global ischemic heart diseas.[5] Worldwide, there is a wide variation in mean population cholesterol levels. Steady increase of cholesterol levels was noted in Asian countries in the last decades of the 20th century and the trend was increasing faster in urban areas than in rural areas.[6] However, in the region of established market economies, mean population cholesterol levels are gradually falling,[7] the increasing prevalence of dyslipidemia with advancing age and obesity is reported in other regions of the world.[8,9] So due to the increasing number of older population in the regions of developing economy the increasing prevalence of dyslipidemia is becoming an issue of a major concern for the prevention of coronary artery disease.

Few reports on lipid profile in Nepalese population are available.[10-14] A randomized, cross sectional study on the prevalence and distribution of lipid levels in Nepalese population is not documented. Present study, therefore, was aimed to find out the prevalence and distribution of lipid profile in non-diabetic adult Nepalese population. The prevalence of desirable target lipid levels in the study population is also studied in this study.

MATERIALS AND METHODS

For the purpose of this cross sectional study, cluster sampling method was used through different health camps conducted in Kathmandu Valley. Free health camps were organized (with the prior public notices) to attain the maximum participation of the locals. Participants were advised to attend fasting at least for 12 hours prior to the blood sampling. The purpose of the survey was explained and informed consent was taken from each of the participants. Only the adults aged ≥21 years were included in the study. Individuals, already diagnosed as a case of diabetes mellitus or newly diagnosed case of diabetes mellitus (fasting glucose ≥126 mg/dl) were not included. Participants with impaired fasting glucose (fasting glucose level 100 to 126 mg/dl), according to ADA recommendation,[15] were also excluded from the study.

All TC, TG and HDL cholesterol were estimated by using commercially available enzymatic colorimetric test with lipid clearing factor (Cholesterol and Triglyceride Liquicolor reagents) following the protocol and instructions of the manufacturer (Human, Germany) and value were calculated accordingly. HDL was measured as in the case of TC by removing LDL (including VLDL) with phosphotungstic acid and magnesium chloride as described by the reagents manufacturer. The LDL level was calculated by applying following formula:

LDL level = TC value – (TG value / 5 + HDL value)

The mean ± SD of lipids: TC, TG, LDL and HDL were calculated. The study population was stratified in three different age groups; younger age group (21 to 40 years), middle age group (41 to 60 years) and older age group (>60 years) and the mean ± SD of lipids were also separately calculated among three different age groups. Lipids levels were classified according to the classification recommended by National Cholesterol Education Program (NCEP),[16] and Adult Treatment Panel III (ATP III)[17] guidelines. Desirable level of TC was<200 mg/dl, borderline high was between 200-239 mg/dl and high TC was considered when the level was ≥240 mg/dl. Similarly optimal level of LDL was defined when it was <100 mg/dl, near optimal level was between 100-129 mg/dl, borderline high was between 130-159 mg/dl, the level was considered high when it was between 160-189 mg/dl. When LDL level was ≥190 mg/dl then it was defined very high, according to the guideline. Similarly TG level was considered normal when it was <150 mg/dl, borderline high TG was between 150-199 mg/dl, between 200-499 mg/dl was considered high TG and very high TG was defined when it was ≥500 mg/dl. Desirable HDL was considered when it was >40 mg/dl.

Lipid levels of TC, TG, LDL and HDL were classified according to the aforementioned guideline. Percentage distribution of the total study population according to the lipid profile classification was calculated. Also percentage distribution of men and women was also separately calculated. We considered normal desirable target level of lipids (TC <200 mg/dl, TG <150 mg/dl, LDL <129 mg/dl and HDL >40 mg/dl) as previous guidelines.[16,17] Statistical significance (student's t- test) was applied to calculate the difference of lipid levels (mean ± SD) among above mentioned different age groups. The cut off value of P<0.05 was considered for the statistical significance.

RESULTS

Of the total 454 participants who fulfilled the criteria of this survey, 180 (39.6%) were males and 274 (60.3%) were females. The age of the participants ranged from 21 to 86 years with a mean of 42.8 ± 15.5 years. The mean ± SD (mg/dl) level of TC, TG, LDL and HDL were 184.4 ± 50.7, 147.4 ± 88.7, 111.9 ± 42.0 and 45.0 ± 11.0, respectively (Table-1). The TC, TG and HDL level was highest among 41 to 60 years age group and the difference was statistically significant when compared with younger age group, however LDL level was found increased with increasing age.

Table-1: Lipid levels (mean ± SD) (mg/dl) among different age groups and the total population

Age (Years)	**TC**	**TG**	**LDL**	**HDL**
21-40 (n=233)	175.2 ± 47.5	133.1 ± 79.9	106.4 ± 36.8	43.5 ± 11.0
41-60 (n=157)	194.8 ± 50.6¶	169.0 ± 94.3‡	116.6 ± 40.0‡	47.3 ± 12.0‡
> 60 (n=64)	192.2 ± 58.4	138.0 ± 60.6	118.6 ± 39.2‡	46.2 ± 12.8
Total	**184.0 ± 50.7**	**147.4 ± 88.7**	**111.9 ± 42.0**	**45.0 ± 11.7**

¶p<0.001, ‡p<0.05

The desirable level of TC was found in nearly 80 percent of the total population; however, almost 10 percent had high TC (≥240 mg/dl) (Table-2). Higher level of TC was observed among males than in females. Similarly, normal TG level was found in 61.5% of participants and it was found very high (≥500 mg/dl) in 2.6 percent of the total population (Table-3). Three percent women and 2.2 percent men had very high TG level. Normal or near optimal level of LDL (<129 mg/dl) was found in almost 70% of the total population and LDL was found very high (≥190 mg/dl) in six percent of the total population (Table-4). Nearly 12% of men had very high LDL level, while it was noted in only two percent of women.

Nearly two-third (60.0%) of the total population had, higher HDL level (>40 mg/dl). Higher percentage of women (65%) than men (52%) had HDL level above 40

Table-2: Percentage distribution of different levels of TC (mg/dl) in two genders and total population

Sex	**Normal** (<200)	**Borderline** (200-239)	**High** (≥240)
M	70.0	20.0	10.0
F	83.5	8.4	8.1
Total	**78.2**	**13.0**	**8.8**

Table-3: Percentage distribution of different levels of TG (mg/dl) in two genders and total population

Sex	Normal (<150)	Borderline (150-199)	High (200-499)	Very high (≥ 500)
M	57.8	21.7	18.3	2.2
F	63.8	18.2	15.0	3.0
Total	**61.5**	**19.6**	**16.3**	**2.6**

mg/dl. Percentage distribution of study sample, according to NCEP, ATP III[16,17] recommended normal desirable levels of lipids was calculated. Only 26.7% of the total population had normal lipid profile. Higher percentage of women (31.2%) than men (18.3%) had normal lipid profile.

DISCUSSION

Dyslipidemia is one of the major risk factors of coronary artery disease, which can be modified either by proper life style changes or medical management or by the combination of the both. Study of lipid profile in general population is important to identify the lipid profile and the distribution of different lipid levels in society. Present study showed the mean TC level is 184 mg/dl which is slightly higher than previous reports[10,11,13] from the same region. All lipid levels including HDL were found highest among middle age group while LDL level was noted highest in above 60 years age group. The reason for high level of TC, TG and HDL in middle age group needs to be elucidated. An increasing trend in TC and TG with age has also been observed in male population in southeastern Nepal.[12] Mean LDL level was found increased with age in one of the previous study from the same region.[11] Mean lipid levels in this survey is slightly higher in comparison with one report[18] from eastern part of Nepal.

Mean TC (175.2 mg/dl) and TG (133.1 mg/dl) levels observed in this study was higher compared with findings of previous study carried out almost ten years back in the same region.[10,13] However, these two different studies of different time periods were not conducted in the same settings following the same protocol. Higher TG level (>150 mg/dl) among adult males (aged 20-49 years) living in eastern hilly area has been reported also by other investigators[14] and has thought to be due to the high intake of carbohydrates and low intake of polyunsaturated fatty acids which normally inhibits the synthesis of TG *in situ* in the cell.[12,14] In contrast, similar workers[14] have found lower mean TC level than observed in this study. The increase in mean cholesterol level can be due to the changing life style of the people during recent years associated with rapid urbanization and also globalization. Steady increase of cholesterol levels has also been reported in other Asian countries during the last decade of the 20th century.[6] Considerable increase in hypercholesterolemia, hypertriglyceridemia and abnormally low HDL in all age groups of professional population since past 20 years has recently been reported from China.[19] Another serial epidemiological surveys in an urban Indian population[20] has also demonstrated the increased adverse lipid profile in both men and women. Unhealthy life style change is the main cause of adverse lipid profile in these regions, on the contrary with appropriate life style change and the use of lipid lowering medication, mean TC and LDL level has noted decreased since past 20 years in the region of established market economy.[21]

Table-4: Percentage distribution of different levels of LDL (mg/dl) in two genders and total population

Sex	Optimal (<100)	Normal (100-129)	Borderline (130-159)	High (160-189)	Very high (≥190)
M	34.4	27.2	18.3	8.3	11.8
F	42.6	34.3	14.2	6.9	2.0
Total	**39.4**	**31.5**	**15.8**	**7.5**	**5.8**

The mean levels of TC, TG, LDL and HDL found in this study was comparable with the previous report from the Brazil.[22] The study population of present study mainly comprised of the urban area of Kathmandu Valley. This study, therefore, documents the lipid profile of mainly adult non-diabetic urban and semi-urban population. Significantly higher mean TG level observed in the 41 to 60 age group as compared to other age groups needs to further investigated. Higher TG level in the age group of 45 to 59 years and over 60 years has been reported in one Chinese study.[8]

Present study showed the desirable TC level in 78%, normal TG in 62% and normal LDL (<129 mg/dl) in 70% of the total population. The results of present survey on the prevalence of dyslipidemia were comparable with one of the recent report from Iraqi.[23] High and very high levels of TC, TG and LDL was noted respectively in 9%, 3% and 6% of the total study population. Significantly higher percentage of men had very high LDL level, while it was comparable in high and very high TC and TG levels. This correlates well with high incidence of coronary hearty disease. Higher percentage of women than men had HDL>40 mg/dl, however, almost 40% population had HDL<40 mg/dl. The prevalence of low LDL level observed in this study was lower than one of the report from India,[24] but higher than the finding of one of the Brazilian study.[22]

Percentage prevalence of normal lipid profile or desirable lipid levels (TC<200mg/dl, TG<150 mg/dl, LDL<129 mg/dl and HDLe" 40mg/dl) in the whole study population was calculated in the present study. Overall 26.7% participants had normal lipid profile. Higher percentage of women than men had normal lipid profile. Diabetes mellitus occurs with dyslpidemia.[25] Although, individuals with the history of diabetes mellitus and impaired fasting glucose were excluded from the study, this study mainly limits with the unavailable data of hypertension, family history and obesity of the individuals who were enrolled in the study, because these parameters are positively correlated with dyslipidemia.[22] Despite these limitations, present study documents the lipid profile of non-diabetic adult population of Nepal. However, randomized large scale survey is advocated.

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