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Research Article

Advances in the study of hypercholesterolemia and hypertriglyceridemia level in a population residing in the north-eastern region of Algeria

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Abstract:

Dyslipidaemia is a major public health concern worldwide. No data have been conducted in the north-eastern region of Algeria.The aim is to determine the prevalence of hypercholesterolemia and triglyceridemia by age group and gender.This descriptive, cross-sectional study used biochemical analysis reports from two private laboratories between December 2023 and December 2024. The medical records included lipid profile parameters such as total cholesterol (TC) and triglycerides (TG).The study population consisted of 3000 participants, 1051 (35%) of whom were men and 1949 (65%) of whom were women. The mean age of the men was 51,82 ± 14,97, while the mean age of the women was 53,99 ± 15,59. In this study, our population was divided into two age groups: Under 40 years (n = 615; 20.5%) and over 40 years (n = 2385; 79,5%). Dyslipidaemia was defined as having a total cholesterol level of more than or equal to 2 g/L (5,2 mmol/L) and triglyceride levels of more than or equal to 1,5 g/L (1,7 mmol/L).The mean total cholesterol level was higher in women (1,76 ± 0,43 g/L) than in men (1,52 ± 0,39 g/L) ($p < 0.001$). A normal total cholesterol level was significantly more common in women than in men (87,6% vs 72,3%, $p<0.001$). The mean triglyceride level was higher in men (1,44 ± 1,04 g/L) than in women (1,28 ± 0,72 g/L). Only 67,9 % of men and 71,3% of women had normal triglyceride levels ($p < 0,001$). Hypercholesterolemia was present in 12,4% (130/1051) of males and 27,7% (539/1949) of females ($p = 0,15$). Hypertriglyceridemia had a prevalence of 32,1% (337/1051) and 28,7% (560/1449) in males and females, respectively ($p < 0.001$). Our research has revealed that hypertriglyceridemia is highly prevalent in the study area, constituting a significant health concern associated with factors such as age and gender.

1. Introduction

The measurement of lipids in peripheral blood is one of the earliest developed biomarkers and is widely used in clinical medicine to assess cardiovascular risk and response to therapy [1]. Dyslipidaemia is a major cause of morbidity and mortality worldwide due to the prevalence of high-fat foods, particularly fried foods. According to medical sources, elevated total cholesterol (TC) and triglyceride (TG) levels pose a threat to health, particularly to the heart and arteries, increasing the risk of high blood pressure and stroke [2]. Using biochemical tests alongside clinical examination to identify lipid profiles is a useful technique [3]. However, despite how easily these tests can be performed, no data on lipid profiles are available in the north-eastern department of Algeria. In light of this, we propose carrying out a study to evaluate hypercholesterolemia and hypertriglyceridemia plasma level in individuals of different age class and gender.

2. Materiel and methods

2.1. Study area

This study was conducted in the north-eastern region of Algeria, located in the high plains (35.0–36.5°N, 5–6°E) at an altitude of 1,300 metres above sea level. The region has a semi-arid continental climate.

2.2. Type, period of survey and data collection

The study employed both descriptive and analytical approaches, involving the collection of retrospective data over a one-year period. We did

not intervene with regard to blood sampling or exhaustive sampling. Instead, we used the results obtained by the laboratory from electronic databases to select participants of all age categories who had recorded lipid profiles during the specified time period. Our focus was especially on total cholesterol and triglyceride values. In our study, we examined 3000 medical tests, including 1051 male patients (30,5%) and 1949 female patients (65%) who resided in the study area only.

2.3. Testing method

All laboratories performed an automated, multiparametric assay using Roche reagents on a Cobas 6000 instrument. This procedure is based on an enzymatic method known as a chemiluminescent immunoassay. The laboratories used heparin plasma.

Clinic definition

The National Cholesterol Education guidelines were used for the definition of dyslipidemia as following [4]:

- **Hypercholesterolemia**: Serum cholesterol levels ≥ 200 mg/dl (≥ 5,2 mmol/l).
- **Hypertriglyceridemia:** Serum triglyceride levels ≥ 150 mg/dl (≥ 1,7 mmol/l).

2.4. Statistics processing

The data were entered into and coded in Microsoft Excel (version 2021) before being analysed using SPSS (version 27). The quantitative parameters were represented by means and standard deviations. A one-way completely randomised analysis of variance (ANOVA) was performed to compare the means of normal and high TC and TG according to age group and gender. The statistical significance limit was set at 5% ($p < 0.05$).

6. Results

Evolution of total cholesterol level

The survey sample had an estimated mean TC concentration of **1,67 ± 0,43 g/l**. In men, cholesterol levels was **1,52 ± 0,39** g/l. In women, cholesterol values was **1,76 ± 0,43** g/l. The gender difference was highly statistical ($p<0.001$), with both positive intra- and inter-group variability.

Variation in normal and high total cholesterol levels by gender

Examining the results presented in Table 1, normal and high TC levels were highly significant determinants in both sexes ($p < 0,001$ for men and $p = 0,000$ for women). Among men, the prevalence of normal TC levels was significantly higher (87,6%) than high TC levels (12,4%). Among women, only 539 (27,7%) were presented to have high TC.

It was found that gender significantly affected normal cholesterol levels ($p < 0,001$), with levels increasing by 1,55 ± 0,27 g/L in females. The prevalence of normal TC levels was higher in men (87,6%) than in women (72,3%). A high prevalence of high TC levels was demonstrated in females, with an overall value of 2,30 ± 0,28 g/L (27,7%).

Variation in normal and high total cholesterol levels by gender and age group

As shown in Table 2, the results indicate that normal cholesterol levels vary by age groups for both males ($p = 0,03$) and females ($p = 0,02$). In both sexes, high cholesterol levels increased with age groups ($p > 0,05$). The prevalence distribution of TC (normal and high) was increased across age categories in both gender.

Variation in normal and high total cholesterol levels by age group and according to the sexe.

In both age groups, only the normal level of TC was affected by sex, with higher values observed in females across both age groups. The mean values of hypercholesterolemia increased in both women and the older age group ($p > 0,05$). It increased from 2,27 ± 0,24 g/l in the under-40s group to 2,31 ± 0,28 g/l in the over-40s group.

Evolution of Triglyceridemia

Our study revealed an average triglyceride concentration of 1,34 ± 0,85 g/l. Triglyceride levels in men were estimated at 1,44 ± 1,04 g/L. For women, this value was estimated at 1,28 ± 0,72 g/L. The difference between the two groups was statistically highly significant ($p < 0,001$).

Variation in normal and high total triglyceridemia levels by gender

As shown in Table 4, significant differences in mean normal and high triglyceride levels were revealed between males and females. Among men, the percentage with normal triglyceride levels was significantly higher than the percentage with high levels (67,9% *vs* 32,1%, respectively). Similary, a high prevalence of normal (71,3%) and high (28,7%) triglyceride (TG) levels was observed in women. In addition, our results showed no significant association between gender and normal TG levels. However, a high TG level (2,50 ± 1,24 g/L) in males was higher than in females (2,16 ± 0,75 g/L) ($P < 0.001$).

Variation in normal and high total cholesterol levels by gender and age group

In males, the level of normal and high TG increased with age, but it was significantly only in normal level (0,87 ± 0.30 g/L *vs* 0,96 ± 0,26 g/L). Additionally, the percentage of normal TG was higher in the oldest age group (≥40 years). The level of high TG increased to 2,53 ± 1,29 g/L in the over-40 age group (p = 0,48). TG levels in women increase with age. Similary, the prevalence of these levels increases across age categories (p < 0,05) (Table 5).

Variation in normal and high triglycerids levels by age group and according to the sexe.

In both age groups, only high TG levels were statistically affected by gender. A higher prevalence of high TG levels was observed in women over 40 (20,7%), while a higher prevalence of normal TG levels was observed in the under-40 age group (51.4%) (table 6).

7. Discussion

Cholesterolemia level

The current research (Table 1) has revealed an average total cholesterol content of 1,67 ± 0,43 g/l, which is slightly superior to that of South Korea, where the overall mean TC content was equivalent to 1,92 g/l [5].

According to our data (table 2), the gender difference has been reported in both age class age class for a normal TC. In males, the mean normal cholesterol concentration decreased with advancing age. In women, average of normal and high TC values increase as age progresses, as stipulated by [6, 7, 8, 9, 10, 11,12]. In opposition, our findings are in dispute with a previously carried in Tunisia [13] and in Constantine (Eastern Algeria) [14]. The higher levels of TC in older women may be explained by menopause, changes in metabolic status, reduced exercise and the effect of ageing [15].

In the present study **(table 3),** hypercholesterolemia showed no significant effect in men and women. This finding aligns with the study conducted in Mexico [7]. However, the study in Dakar reported a highly significant difference in hypercholesterolemia according to age groups [16].

The previous data revealed that the prevalence of hypercholesterolemia has steadily increased, with the age-standardized prevalence of hypercholesterolemia in 2020 being 19.9%, which is more than double the 8.8% reported in 2007 [5]. The main cause of this increase is attributed to diet and lifestyle. Previous work showed, a significant factors associated with hypercholesterolemia were increasing age, overweight, general and abdominal obesity, hypertension, diabetes, and inadequate physical activity [17]. Indeed, men were more likely than women to develop dyslipidemia before the age of 40 [11]. Sex does not influence hypercholesterolemia, as revealed by the study of [14].

In this study, hypercholesterolemia increases in women according to age group, which is consistent with the findings who stated that hypercholesterolemia was significantly more frequent in women [18]. According to these authors, factors such as hormonal status in women, as well as overweight/obesity, sedentary lifestyle, and psychosocial factors, more frequently encountered in women, could be responsible.

Triglyceridemia level

This study revealed an average triglyceride level of 1,34 ± 0,85 g/l, close to that found in the Korean series which was 1.34 g/l [5], but higher than those reported in the Tunisian (0,12 g/l) [13], Mexican study reported 0,21 g/l [19] and in Senegale results was 0,67 g/l [20].

According to Table 04, 05 and 06, the difference by sex was reported in both age groups. In men, the average triglyceride concentrations (normal and high) increase with age years old. In women, the average triglyceride concentrations (normal and high) increase with age class. This observation is consistent with studies conducted in Mexico [19], Turkey [21] and South Korea [5]. A positive correlation between age and triglyceridemia was found by [9, 22].

The prevalence of hypertriglyceridemia in north eastern of Algeria was estimed in (29,9 %) was higher than in several other African studies. For example, it was 3,4% in Hammam Sousse, Tunisia [2] and 9,04% in Ouagadougou, Burkina Faso [18].

This high prevalence can be attributed to factors such as an imbalanced diet, lack of physical exercise, inadequate screening, and suboptimal treatment. In men (table 5), there was not a positive correlation between age and hypertriglyceridaemia, with not consistent with the findings of [19]. The present data (table 4) revealed that, hypertriglyceridemia was significantly more prevalent in men than in women. This finding aligns with the results of several other studies, including those [21, 22,8, 2, 17].

However, our results conflict with those of [18], who found no significant difference in prevalence between males and females. In addition, it was found that hypertriglyceridaemia was more prevalent in women than in men [14] .

As shown in Table 5 and 6, our data indicate that hypertriglyceridemia increases in men in both age

group. This is consistent with the findings of [5] , who demonstrated that hypertriglyceridaemia was significantly higher in men aged 30–50, with the greatest difference occurring in their forties, after which it gradually decreased with age. The male predominance may be explained by several physiological factors: body composition and fat distribution; hormonal differences; dietary habits and lifestyle; genetic and metabolic factors; and smoking [23].

Table 1. *The impact of gender on the average level of normal and high total cholesterol.*

Gender Level of TC (g/l)	Male (n =1051) 35 %	Female (n=1949) 65 %	Total (n= 3000) 100 %	Stat test (F ,P)
Normal	**921 (87, 6%)** 1,41 ± 0,28	**1410 (72, 3%)** 1,55 ± 0,27	**2331 (77, 7%)** 1,50 ± 0,28	**F=147,762** **P<0,001**
High	**130 (12, 4%)** 2,27 ± 0,25	**539 (27, 7%)** 2,30 ± 0,28	**669 (22, 3%)** 2,30 ± 0,27	F=2,049 P=0,153
Total and Stat test (F ; P)	**1,52 ± 0,39** **(1081,776; <0,001)**	**1,76 ± 0,43** **(2890,767; 0,000)**	**1,67 ± 0,43**	**F=229,467** **p <0,001**

Table 2. *The variation in total cholesterol levels, both normal and high, by gender and age group.*

Gender	Male (n=1051)		Female (n=1949)	
Lipid profil / Age Class (years)	**Level of TC (g/l)**		**Level of TC (g/l)**	
	Normal	**High**	**Normal**	**High**
< 40	**(n=179; 17%)** **1,45 ± 0,28**	**(n=53; 5%)** **2,21± 0,20**	**(n= 313; 16, 1%)** **1,52 ± 0,25**	**(n=70; 3, 6%)** **2,27 ± 0,24**
≥ 40	**(n=742; 70, 6%)** **1,40 ± 0,27**	**(n=77; 7, 3%)** **2,30 ± 0,28**	**(n=1097; 56, 3%)** **1,56 ± 0,27**	**(n=469; 24, 1%)** **2,31 ± 0,28**
Stat test (F ; P)	**4,271; 0,03***	3,631; 0,05	**5,223; 0,02***	1,299; 0,25
Total	**(n=921; 87, 6%)** **1,41± 0,28**	**(n=130; 12, 4%)** **2,27± 0,25**	**(n=1410; 72, 3%)** **1,55 ± 0,27**	**(n=539; 27, 7%)** **2,30 ± 0,28**

Table 3. *The variation in total cholesterol levels, both normal and high, by age class and gender.*

Age Class (years)	< 40		≥ 40	
Lipid profil/ Gender	**Level of TC (g/l)**		**Level of TC (g/l)**	
	Normal	High	Normal	High
Male	**(n= 179; 29, 1%)** **1,45 ± 0,28**	**(n=53; 8, 6%)** **2,21 ± 0,20**	**(n=742; 31, 1%)** **1,40 ± 0,27**	**(n=77; 3, 2%)** **2,30 ± 0,28**
Female	**(n=313; 50, 9%)** **1,52 ± 0,25**	**(n=70; 11, 4%)** **2,27 ± 0,24**	**(n=1097; 46%)** **1,56 ± 0,27**	**(n=469; 19, 7%)** **2,31 ± 0,28**
Stat test (F ; P)	**8,230; 0,004****	1,712; 0,193	**148,036;<0,001*****	0,061; 0,806
Total	**(n= 492; 80%)** **1,49 ± 0,27**	**(n=123; 20%)** **2,25 ± 0,23**	**(n=1839; 77, 1%)** **1,50 ± 0,28**	**(n=546; 22, 9%)** **2,31 ± 0,28**

Gender **Lipid profile**	**Male** (n =1051) 35 %	**Female** (n=1949) 65 %	**Total** (n= 3000; 100 %)	**Stat test** **(F ,P)**

Level of TG (g/l)				
Normal	**714 (67, 9%)** 0,94 ± 0.,27	**1389 (71, 3%)** 0.93 ± 0.28	**2103 (70.1%)** 0,93 ± 0,28	F=0,361 P=0,548
High	**337 (32, 1%)** 2,50 ± 1.,24	**560 (28.7%)** 2,16 ± 0,75	**897 (29.9%)** 2,29 ± 0,98	**F=26.525 P<0.001**
Total and Stat test (F , P)	**1,44 ± 1,04 (1017,139; <0.001)**	**1,28 ± 0,72 (2738,308; 0,000)**	**1,34 ± 0,85**	**23.083; <0,001**

Table 4. *The impact of gender on the average level of normal and high Triglyceridemia*

Table 5. The variation in triglycerids levels, both normal and high, by gender and age group.

Gender	Male (n=1051)		Female (n=1949)	
Lipid profil/ Age Class (years)	**Level of TG(g/l)**		**Level of TG(g/l)**	
	Normal	High	Normal	High
< 40	**(n=160; 15, 2%) 0,87 ± 0,30**	**(n=72; 6, 9%) 2,41 ± 1,06**	**(n=316; 16, 2%) 0,86 ± 0,29**	**(n=67; 3, 4%) 2,003 ± 0,49**
≥ 40	**(n=554; 52, 7%) 0,96 ± 0,26**	**(n=265; 25, 2%) 2,53 ± 1,29**	**(n=1073; 55, 1%) 0,95 ± 0,28**	**(n=493; 25, 3%) 2,18 ± 0,77**
Stat test (F ; P)	**12,082; <0,001**	0,496; 0,482	**23,685; <0,001**	3,547; 0,060
Total	**(n=714; 67, 9%) 0,94 ± 0,27**	**(n=337; 32, 1%) 2,50 ± 1,24**	**(n=1389; 71, 3%) 0,93 ± 0,28**	**(n=560; 28, 7%) 2,16 ± 0,75**

Table 6. *The variation in total triglyceridemia levels, both normal and high, by age class and gender.*

Age Class (years)	< 40		≥ 40	
Lipid profil/ Gender	**Level of TG(g/l)**		**Level of TG(g/l)**	
	Normal	High	Normal	High
Male	**(n=160; 26%) 0,87 ± 0,30**	**(n=72; 11, 7%) 2,41 ± 1,06**	**(n=554; 23, 2%) 0,96 ± 0,26**	**(n=265; 11, 1%) 2,53 ± 1,29**
Female	**(n=316; 51, 4%) 0,86 ± 0,29**	**(n=67; 10, 9%) 2,003 ± 0,49**	**(n=1073; 45%) 0,95 ± 0,28**	**(n=493; 20, 7%) 2,18 ± 0,77**
Stat test (F ; P)	0,108; 0,742	**8,391; 0,004****	0,233; 0,630	**21,196; <0,001*****
Total	**(n=476; 77, 4%) 0,86 ± 0,29**	**(n=139; 22, 6%) 2,21 ± 0,86**	**(n=1627; 68, 2%) 0,95 ± 0,27**	**(n=758; 31, 8%) 2,30 ± 1,002**

8. Conclusions

As dyslipidemia is a disorder associated with lipid profiles, it is essential to monitor them, as they play an important role in many diseases.

In both sex, only a normal TC was affected in each age class and between gender. The hypercholesterolemia is higher in female than male. The average level of normal and high triglyceridemia was affected by gender. In fact, a high Triglyceridemia was affected by sex across age old. Additionally, it was noted that men were more likely than women to suffer from hypertriglyceridemia.Our research has revealed that hypertriglyceridemia is highly prevalent in the study area, constituting a significant health concern associated with factors such as age and gender. There is an urgent need to promote and enforce dietary guidelines, as these are the most effective way to prevent metabolic syndrome. Encouraging healthy eating and regular exercise from an early age could significantly reduce the high risk of dyslipidaemia in our population.

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
- **Conflict of interest:** The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper

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References

[1] Yuan S., Tang B., Zheng J., & Susanna C. L. (2020). Circulating Lipoprotein Lipids, Apolipoproteins and Ischemic Stroke. *Annal of Neurology*, *88*, 1229-1236.

[2] Ben Hdia Z., Ben Abdelaziz A., Melki S., Ben Hassine D., Ben Rejeb, N., Omezzine, A,, Bouslama, A., & Ben Abdelaziz, A. (2022). Epidemiology of dyslipidemia in Tunisia, HSHS study (Hammam Sousse Sahloul Heart Study). *La Tunisie Medicale*, *100* (04), 323-334.

[3] Cheng, H.S.H., Tan, W.R., Low, Z.S., Marvalim, C.H., Lee, J.Y.H., & Tan, N.S. Exploration and Development of PPAR Modulators in Health and Disease: An Update of Clinical Evidence. (2019). *International Journal of Molecual Sciences*, *20* (20), 2-69. 5055; https://doi.org/10.3390/ijms20205055.

[4] Iyengar, S. S., Narasingan, S.N., Jaipuriar, N., Mahilmaran, A., Patil, S., Abhyankar, V., & Revankar, S. (2022). Risk factors, comorbidities and Atherogenic dyslipidaemia in Indian YOUNG patients with dyslipidaemia attending hospital/clinic: real young (dyslipidaemia) study. *Journal of Family Medicine and Primary*, (8): 4156-4164. DOI**:**10.4103/jfmpc.jfmpc_546_20.

[5] Jin, E.S., Shim, J.S., Kim, S.E., Bae, J.H., Kang, S., Won, J. C., Shin, M. J., Jin, H.Y., Moon, J., Lee, H., Kim, H.C., & Jeong, I.K. (2023).Dyslipidemia Fact Sheet in South Korea. *Diabetes and Metabolism Journal*, *47*, 632-642. https://doi.org/10.4093/dmj.2023.0135.

[6] Ford, E.S., Mokdad, A. H., Giles, W.H., & Mensah, G.A. (2003). Serum Total Cholesterol Concentrations and Awareness, Treatment, and Control of Hypercholesterolemia among US Adults. *Clinical Investigation and Report*, 2185-21. DOI: 10.1161/01.CIR.0000066320.27195.B4.

[7] Posadas-Sánchez, R., Posadas-Romero, C., Zamora-González, J., Mendoza-Pérez, E., Cardoso-Saldaña, G., & Yamamoto-Kimura, L. (2007). Lipid and lipoprotein profiles and prevalence of dyslipidemia in Mexican adolescents. Metabolism: *Clinical and Experimental*, *56*, 1666-1672. doi:10.1016/j.metabol.2007.07.009.

[8] Abd El-Gawad, H.N., El-Baz, M., El-Deeb, A.F., & El-Shenawy, S.I. (2021). Risk factors profile of coronary artery disease among medical students at Al-Azhar University, *Cairo. Journal of Recent Advances in Medicine*, *3* (2), 119-130.

[9] Al-maqati, T.N., Gazwani, A.M., Taha, M., Almusabi, S., Elnagi, E. A., Maawadh, R. M., Alkhalaf, F. S., Almish, M., Alqahtani, F.A., & Al Naam, Y. A. (2022). The impact of age, gender, and fasting blood glucose on the serum lipid profile at a tertiary care hospital: A retrospective study. *Acta Biomedical*, *93* (6), 1-6.

[10] Espírito Santo, L.R., Faria, T.O., Silva, C. S. O., Xavier, L.A., Reis, V. C., Mota, G.A., Silveira, M. F., Mill, J.G., & Baldo, M. P. (2022). Socioeconomic status and education level are associated with dyslipidemia in adults not taking lipid-lowering medication : A population-based study. *International Health*, *14*, 346-353. Doi:10.1093/inthealth/ihz089.

[11] Mohanraj, S., Velmurugan, G., Swaminathan, K., & Ramakrishnan, A. (2023). Prevalence and risk factors for dyslipidemia among South Indian adults : A community based-NCD study. *International Journal of Diabetes in Developing Countries*, .https://doi.org/10.1007/s13410-023-01202-7**.**

[12] Lu, M.Y., Lai, J.C., & Chen, S. J. (2023). Influence of Sex Differences on Serum Lipid Profiles among Habitual Coffee Drinkers : Evidence from 23,072 Taiwan Biobank Participants. *Nutrients*, *15*, 2576, 2-10. https://doi.org/10.3390/nu15112576.

[13] Lamine, O., Aboulkacem, S., Grira, N., Ayoub, M., Sendesni, R., El-Oudi, M., Stambouli, N., Mazigh, C., & Aouni, Z. (2018). Evaluation of Cardiovascular Risk Factors in a Young Adults Tunisian Group. *Journal of Biosciences and Medicines*, *6*, 1-14. http://www.scirp.org/journal/jbm.

[14] Dalichaouche-Benchaoui, S., & Abadi, N. (2022). Association between Obesity and Metabolic Anomalies in a Population in Eastern Algeria. *Jordan Medical Journal*, *56* (3), 241-249. https://doi.org/10.35516/jmj.v56i3.361.

[15] Russo, G.T., Giandalia, A., Romeo, E.L., & Cucinotta, D. (2015). Gender differences in lipoprotein metabolism. *Journal of Sex- and Gender-Specific Medicine*, *1* (2), 58-65.

[16] Djiby, S., Ndiaye, A., Fall, I. D., Fall, A.W.S., Demba, D., Assane, N.M., Mané, D.I., Anna, S., Norou, D.S., Mbaye, M. N., & Sall, N.D. (2018). Frequency of Lipid Balances and Prevalence of Dyslipidemies in the Biochemistry Laboratory of the Marc Sankale Center of Dakar. *International Journal of Current Microbiology and Applied Sciences*, *7* (12), 3276-3282.

[17] Nurshad, A., Mitu, S., Rahanuma Raihanu, K., & Farjana, I. (2023). Prevalence and factors associated with dyslipidemia in Bangladeshi adults. *PLOS ONE*, *18* (1), 1-13. https://doi.org/10.1371/journal.pone.0280672.

[18] **Soudre**, F.M., Kouraogo, A., Kiba, A., Da, O., Benoîte, H.M., Karama, D.N., Mano, S., Drabo, D.C., Kyetega, A., Karfo, R., Kabre, E., **&** Sakande, J. (2024). Prevalence of Dyslipidemia among Patients Received at the Biochemistry Unit oftheCharles de Gaulle Pediatric University Hospitalin Ouagadougou**.** *Advances in Biological Chemistry*, *14*, 16-26.

[19] Aguilar-Salinas, C.A., Olaiz, G., Valles, V., Torres, J.M.R., Pérez, F.J.G., Rull, J.A., Rojas, R., Franco, A., & Sepulveda, J. (2001). High prevalence of low HDL cholesterol concentrations and mixed hyperlipidemia in a Mexican nationwide survey. *Journal of Lipid Research*, *42* (8), 1298-1307.

[20] Thiombiano, L.P., Mbaye, A., Sarr, S. A., Ngaide, A. A., Kane, A.B., Diao, M., Kane, A., D., & Ba, S. A. (2016). Prévalence de la dyslipidémie dans la population rurale de Guéoul (Sénégal). *Annales de Cardiologie et d'Angéiologie, 65*, (2), 77-80.

[21] Erem, C., Hacihasanoglu, A., Deger, O., Kocak, M., & Topbas, M. (2008). Prevalence of dyslipidemia and associated risk factors among Turkish adults : Trabzon lipid study. *Endocrine*, *34*, 36-51.

[22] Cho, S.M.J., Lee, H.J., Shim, J.S., Song, B.M., & Kim, H.C. (2020). Associations between age and dyslipidemia are differed by education level : The Cardiovascular and Metabolic Diseases Etiology Research Center (CMERC) cohort. *Lipids in Health and Disease*, *19* (12), 2-12. https://doi.org/10.1186/s12944-020-1189-y.

[23] Palmisano, B.T., Zhu, L., Eckel, R.H., & Stafford, J.M. (2008). Sex differences in lipid and lipoprotein metabolism. *Molecular Metabolism*, *15*, 45-55**.**