Revista Contexto & Saúde
Editora Unijuí
Programa de Pós-Graduação em Atenção Integral à Saúde
ISSN 2176-7114 – v. 24, n. 49, 2024
http://dx.doi.org/10.21527/2176-7114.2024.49.14207
HOW TO CITE:
Miranda AMM, Barreto IA, da Luz LVF; Mendes R de A, Faial KRF, Rocha CC da S. et al. Lipid profile of children and adolescents in two quilombola communities in the state of Pará – Brazil. Rev. Contexto & Saúde. 2024;24(49):e14207.

ORIGINAL ARTICLE

Lipid Profile of Children and Adolescents in Two Quilombola Communities in the State of Pará – Brazil

Antônio Marcos Mota Miranda[1], Iann Assis Barreto[2]
Larissa Valéria Feio da Luz[3], Rosivaldo de Alcântara Mendes[4]
Kleber Raimundo Freitas Faial[5], Cássia Cristina da Silva Rocha[6]
Arnaldo Jorge Martins Filho[7], Marisa Eiró Miranda[8]

Highlights:
(1) Dyslipidemia is abnormal levels of lipids or lipoproteins in the blood.
(2) They are risk factors for atherosclerotic disease, heart disease and death.
(3) Found 36.4% hypercholesterolemia and 63.2% hypertriglycerinemia in children.

ABSTRACT

This study aims to describe the lipid profile of children and adolescents living in the quilombola communities of Médio Itacuruçá (Abaetetuba) and Santo Antônio (Concórdia do Pará) in the state of Pará. This observational, descriptive cross-sectional study is based on a secondary database from the project "Epidemiological, clinical and toxicological characterization in two communities environmentally exposed to pesticides in Pará state." The chi-square test and Student's t-test were used to analyze the following variables: weight, height, body mass index, total cholesterol, low-density lipoprotein (LDL), low-density lipoprotein (HDL), and triglycerides in males and females aged 2 to 9 years and 10 to 19 years. The 10-19 age group accounted for 68.7% of the study population. Hypercholesterolemia was identified in 36.4% of the patients, altered LDL in 15.2%, and HDL below the reference value in 60.6%. As for triglycerides, 90.3% of patients aged 2 to 9 years had altered values, and 63.2% of patients aged 10 to 19 years had hypertriglyceridemia. Around 64.6% of the patients had an eutrophic nutritional profile. It was concluded that most children and adolescents had total cholesterol and LDL values within the normal range. However, significant results were obtained for HDL cholesterol and triglycerides above the reference values.

Keywords: Cardiovascular diseases; Child nutrition disorders; Ethnic groups; Lipid metabolism disorders

[1] Evandro Chagas Institute. Belém/PA, Brazil. https://orcid.org/0000-0001-7131-4216
[2] Evandro Chagas Institute. Belém/PA, Brazil. http://lattes.cnpq.br/1841305353608849
[3] University Center of the State of Pará. Belém/PA, Brazil. https://orcid.org/0000-0002-9235-402X
[4] Evandro Chagas Institute. Belém/PA, Brazil. https://orcid.org/0000-0003-0136-321X
[5] Evandro Chagas Institute. Belém/PA, Brazil. https://orcid.org/0000-0002-8575-1262
[6] Evandro Chagas Institute. Belém/PA, Brazil. https://orcid.org/0000-0002-1976-0275
[7] Evandro Chagas Institute. Belém/PA, Brazil. https://orcid.org/0000-0001-9153-1234
[8] Centro Universitário do Estado do Pará. Belém/PA, Brasil. https://orcid.org/0000-0003-1975-207X

INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of death in adults worldwide[1,2], and one of the risk factors is atherosclerotic disease, which is directly related to dyslipidemia. The process of atheromatous plaque formation is progressive, and studies indicate that it begins silently in childhood, persisting until adulthood when the first clinical manifestations occur[3].

Dyslipidemia is characterized by abnormal levels of lipids or lipoproteins in the blood. Its prevalence among children and adolescents ranges from 24 to 40%[4]. This rate has increased progressively in certain countries, especially those adopting more Westernized lifestyles. On the other hand, a decrease in dyslipidemia rates has been observed mainly in countries that have implemented prevention programs[5].

They can be classified as primary when caused by a hereditary defect in lipid metabolism, such as family hyperlipidemia, and secondary when caused by an inadequate lifestyle, chronic diseases, or medication. It should be noted that secondary dyslipidemia prevails over primary dyslipidemia, mainly due to the lifestyle habits of today's society[5].

Some of the main factors associated with the increased incidence of secondary dyslipidemia in the pediatric population are obesity, metabolic syndrome, insulin resistance, and a sedentary lifestyle. Socioeconomic and educational factors also influence the presence of increased cardiovascular risk[6].

There is evidence of a relationship between cardiovascular risk factors present in childhood and preclinical vascular lesions, such as thickening of the intima layer in the carotid arteries and femoral artery in adulthood.

Therefore, identifying the most vulnerable population, even in the early years of the disease's progression, allows early intervention in behavioral and modifiable risk factors to prevent the progression of atherosclerotic cardiovascular diseases through appropriate clinical follow-up.

Quilombola communities are a specific segment of the black population characterized by descendants of black Africans who, as enslaved people, escaped from the slave quarters where they lived and formed organized communities[7]; they are considered spaces of resistance and reaffirmation of their indigenous and cultural characteristics.[8]

On the other hand, the food of quilombola communities is endowed with the values and knowledge of their ancestors. Food is seen as the offspring of the land, through effort and sweat, watered with the wisdom of their ancestors, the consent and protection of the saints[9]. However, in the face of urban lifestyle influences, the eating behavior of these communities has changed, especially in the last decade, with the introduction of processed and ultra-processed products. In addition, there have been changes to their identities and their dynamic with natural resources as a source of subsistence, aggravated by the agricultural and territorial conflicts they have faced in recent years, leading to a reconfiguration of their spaces[10].

Knowing the socio-economic and environmental conditions is extremely important to understand the illness process in specific groups, such as the remaining quilombos [10].

his study aimed to describe the lipid profile of children and adolescents living in the quilombola communities of Médio Itacuruçá (Abaetetuba) and Santo Antônio (Concórdia do Pará) in the state of Pará.

METHODS

This Work Plan is based on the research project "Epidemiological, clinical and toxicological characterization in two communities environmentally exposed to pesticides in the Pará State" developed by the Environmental Section (SEAMB) of the Evandro Chagas Institute (IEC). This is an

observational, descriptive cross-sectional study which assessed 43 children and adolescents of both sexes, aged between 2 and 19 years old, from the Médio Itacuruçá community (Abaetetuba) and 56 children and adolescents of both sexes, aged between 2 and 19 years old, from the Santo Antônio community (Concórdia do Pará), whose selection was carried out according to the criteria of length of time living in the community, by indication of the leaders at the study site.

The selected individuals underwent a general medical examination by researchers from the Evandro Chagas Institute, using the propaedeutic estimation technique to estimate weight, height, and BMI. 5 mL of whole blood was collected with 10% EDTA. The biochemical analyses of total cholesterol, HDL, LDL, and triglycerides were separated, placed in KMA tubes, and transported in hermetically controlled boxes. The samples were analyzed in the Pathology section of the Evandro Chagas Institute.

The results of the following laboratory tests were evaluated: total cholesterol (TC), HDL cholesterol (HDL-c), LDL cholesterol (LDL-c), and triglycerides (TG).

The reference values established by the Brazilian Society of Pediatrics' Practical Update Guide: Dyslipidemia in Children and Adolescents - Guidelines for Pediatricians (2020) were used to classify lipid profile values: TC <170 mg/dL, HDL >45 mg/dL, TG (0-9 years) <75 mg/dL, TG (10-19 years) <90 mg/dL, LDL <110 mg/dL.

The reference values used to classify Body Mass Index (BMI) were established by the World Health Organization (WHO) using the Z score in graphs according to gender and age.

The data was meticulously organized in Microsoft Excel 2010, and all the tests were carried out using the powerful Biostat 5.5 software. Graphs and tables were constructed using the tools available in Microsoft Word, Excel, and Bioestat 5.5. Quantitative variables were described as mean ± standard deviation, and qualitative variables as frequency and percentage. The chi-square test tested the independence or association between two categorical variables, and significant associations were detailed using standardized residual analysis to identify the categories that contributed most to the result. Student's t-test or the non-parametric equivalent Mann-Whitney test was used to compare a numerical variable between two groups. Results with $p \leq 0.05$ (two-sided) were considered statistically significant.

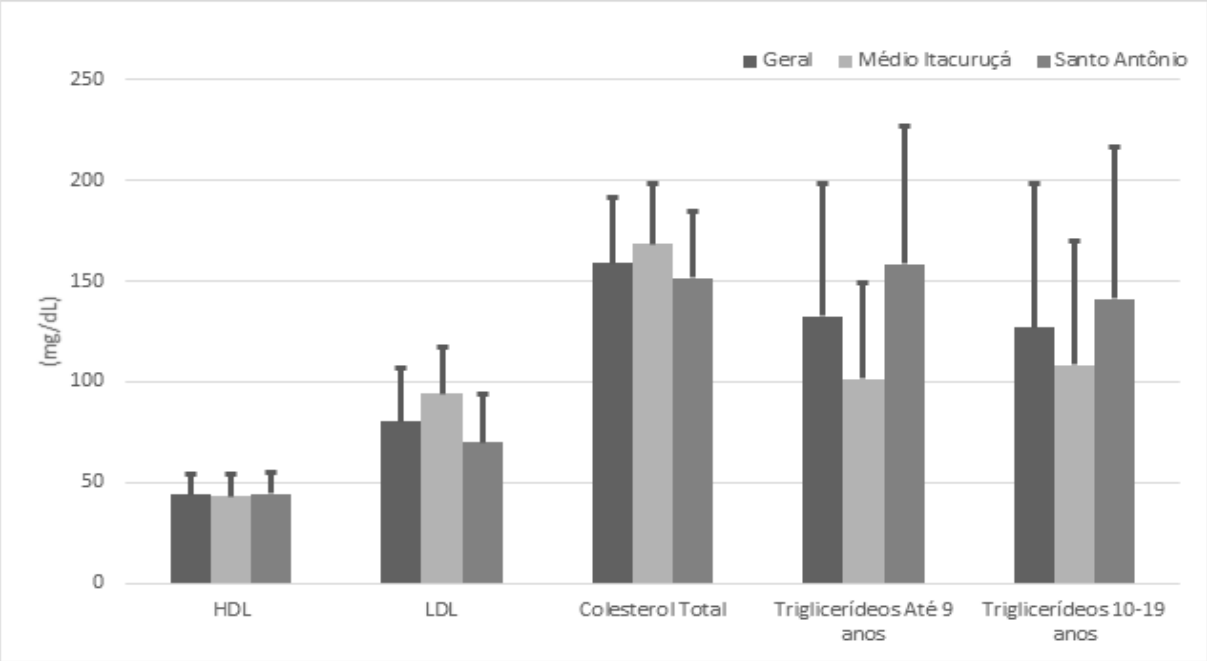
The project was approved by the Evandro Chagas Institute's Human Research Ethics Committee – CEP – Opinion 2.658.533 and CAAE: 80180617.1.0000.0019, preserving the essential and necessary terms for the proper ethical conduct of the research and complying with the Guidelines and Regulatory Norms for Research Involving Human Beings (CNS Resolution No. 466/2012), using the Free and Informed Consent Form (TCLE) and the Free and Informed Assent Form (TALE) among the study participants.

RESULTS

Characterization of the Participants

Our study, which included 99 children and adolescents, uncovered some significant findings. The general average HDL was 43.9 mg/dL± 10.6, with a slightly lower average in the Médio Itacuruçá community (43.2 mg/dL ± 11.0) and a slightly higher average in the Santo Antônio community (44.4 mg/dL ± 10.3). The LDL levels also showed significant variations, with the Médio Itacuruçá community having an average of 94.1 mg/dL ± 23.0 and Santo Antônio 69.8 mg/dL ± 24.2. The average TG up to the age of 9 was 132.7 mg/dL ± 65.4, with 101.5 mg/dL ± 47.4 in Médio Itacuruçá and 158.4 mg/dL ± 68.2 in Santo Antônio. In the 10-19 age group, the average was 108.4 mg/dL ± 61.3 in the Médio Itacuruçá community and 141.1 mg/dL ± 75.6 in the Santo Antônio community. These findings, which provide valuable insights into pediatric health metrics, are graphically presented in figure 1.

Comparison of cholesterol and triglyceride levels among children and adolescents from the Médio Itacuruçá (Abaetetuba-PA) and Santo Antônio (Concórdia do Pará-PA) communities, assessed during 2017.



Source: Authors.

About the prevalence of dyslipidemia, 39.4% of the participants had HDL > 45 mg/dL, 15.2% had LDL ≥ 110 mg/dL, 36.4% had TC > 170 mg/dL, 90.3% had TG≥ 75 mg/dL in the age group up to 9 years and 63.2% had TG≥ 90 mg/dL in the age group between 10 and 19 years. When comparing by location, 78.6% of individuals under the age of 10 had hypertriglyceridemia in Médio Itacuruçá and 100% in Santo Antônio. In the 10-19 age group, hypertriglyceridemia was present in 37.9% of the population of Médio Itacuruçá and 82.1% of the population of Santo Antônio. Table 1 summarizes the numerical values for total cholesterol, LDL, HDL, and TG levels by location and age group.

Table 1 – Classification and comparison of cholesterol and triglyceride levels among children and adolescents from the Médio Itacuruçá (Abaetetuba- PA) and Santo Antônio (Concórdia do Pará- PA) communities, assessed in 2017

Variable (mg/dL)		Médio Itacuruçá (n=43)	Santo Antônio (n=56)	
HDL				0,550
≤ 45	60 (60,6)	28 (65,1)	32 (57,1)	
> 45	39 (39,4)	15 (34,9)	24 (42,9)	
LDL				0,091
< 110	84 (84,8)	33 (76,7)	51 (91,1)	
≥ 110	15 (15,2)	10 (23,3)	5 (8,9)	
CT				0,103
< 170	63 (63,6)	23 (53,5)	40 (71,4)	
≥ 170	36 (36,4)	20 (46,5)	16 (28,6)	
TG Até 9 anos				0,162
< 75	3 (9,7)	3 (21,4)	0 (0,0)	
≥ 75	28 (90,3)	11 (78,6)	17 (100,0)	

TG 10-19 anos				<0,001
< 90	25 (36,8)	*18 (62,1)†*	*7 (17,9)**	
≥ 90	43 (63,2)	*11 (37,9)**	*32 (82,1)†*	

Up to 9 years old, there were 14 individuals in Médio Itacuruçá and 17 in Santo Antônio. Ten years onwards, there were 29 in Médio Itacuruçá and 39 in Santo Antônio. Categorical variables are shown as n (%). Percentages are relative to the total of each column. The chi-square test was used in all cases. *: This frequency was lower than would have been expected by chance. †: this frequency was higher than expected.

Source: Authors.

Regarding the difference between the sexes, results showed a prevalence of reduced HDL in 66% of the male population and 55.1% of the female population and increased LDL levels in 10% of the male population and 20.4% of the female population. Total cholesterol was above the normal range in 32% of males and 40.8% of females. Hypertriglyceridemia was identified in 86.7% of boys aged between 2 and 9 years and 74.3% between 10 and 19 years of age; in the female population between 2 and 9 years, the prevalence was 83.3%, and between 10 and 19 years, it was 33.3% as shown in tables 2 and 3.

Table 2 – Classification and comparison of male cholesterol and triglyceride levels among children and adolescents from the Médio Itacuruçá (Abaetetuba-PA) and Santo Antônio (Concórdia do Pará-PA) communities, assessed in 2017

Variable (mg/dL)	General	Médio Itacuruçá (n=16)	Santo Antônio (n=34)	p-valor
HDL				1,000
<= 45	33 (66,0)	11 (68,8)	22 (64,7)	
> 45	17 (34,0)	5 (31,3)	12 (35,3)	
LDL				0,003
< 110	45 (90,0)	*11 (68,8)**	*34 (100,0)†*	
>= 110	5 (10,0)	*5 (31,3)†*	*0 (0,0)**	
CT				0,028
< 170	34 (68,0)	*7 (43,8)**	*27 (79,4)†*	
>= 170	16 (32,0)	*9 (56,3)†*	*7 (20,6)**	
TG Até 9 years				0,509
< 75	2 (13,3)	2 (25,0)	0 (0,0)	
>= 75	13 (86,7)	6 (75,0)	7 (100,0)	
TG 10-19 years				0,184
< 90	9 (25,7)	4 (50,0)	5 (18,5)	

Up to 9 years old, there were eight individuals in Médio Itacuruçá and 7 in Santo Antônio. Ten years onwards, there were 8 in Médio Itacuruçá and 27 in Santo Antônio. Categorical variables are shown as n (%). Percentages are relative to the total of each column. The chi-square test was used in all cases. *: This frequency was lower than would have been expected by chance. †: this frequency was higher than expected.

Source: Authors.

Table 3 – Classification and comparison of cholesterol and triglyceride levels, in females, among children and adolescents from the Médio Itacuruçá (Abaetetuba-PA) and Santo Antônio (Concórdia do Pará-PA) communities, assessed in 2017

Variable (mg/dL)	General	Médio Itacuruçá (n=27)	Santo Antônio (n=22)	p-valor
HDL				0,349
<= 45	27 (55,1)	17 (63,0)	10 (45,5)	
> 45	22 (44,9)	10 (37,0)	12 (54,5)	
LDL				0,994
< 110	39 (79,6)	22 (81,5)	17 (77,3)	
>= 110	10 (20,4)	5 (18,5)	5 (22,7)	

CT				1,000
< 170	29 (59,2)	16 (59,3)	13 (59,1)	
>= 170	20 (40,8)	11 (40,7)	9 (40,9)	
TG Até 9 anos				0,790
< 75	1 (6,3)	1 (16,7)	0 (0,0)	
>= 75	15 (93,8)	5 (83,3)	10 (100,0)	
TG 10-19 anos				0,016
< 90	16 (48,5)	*14 (66,7)†*	*2 (16,7)**	
>= 90	17 (51,5)	*7 (33,3)**	*10 (83,3)†*	

Up to 9 years old, there were six individuals in Médio Itacuruçá and 10 in Santo Antônio. Ten years onwards, there were 21 in Médio Itacuruçá and 12 in Santo Antônio. Categorical variables are shown as n (%). Percentages are relative to the total of each column. The chi-square test was used in all cases. *: This frequency was lower than would have been expected by chance. †: this frequency was higher than expected.

Source: Authors.

Characterization and Comparison of Profiles According to Z Score

Overral, 64.6% had an eutrophic nutritional profile, and 23.2% were overweight. The prevalence of obesity was 7.1% (95%CI = 3.1% to 14.5%). Considering only Médio Itacuruçá, the prevalence of obesity was 9.3% and overweight 32.6%, while in Santo Antônio, this prevalence was 5.4% for obesity and 16.1% for overweight. When comparing the sexes, 84% of the males had an eutrophic nutritional profile.

DISCUSSION

Chronic non-communicable diseases (NCDs) are the leading cause of death worldwide, accounting for around 70% of global deaths. Among the NCDs, cardiovascular disease accounts for 45% of deaths worldwide and 30% of causes of death in Brazil[2, 11,14], and among the main risk factors for cardiovascular disease is dyslipidemia.

It is, therefore, essential to establish the prevalence of dyslipidemia in the age groups in this study, given that the atherosclerotic process begins in childhood and extends into adulthood. It mainly affects the population between the 3rd and 4th decade of life, with significant clinical events and a major socio-economic impact[15]. There still needs to be studies demonstrating the national and global prevalence of dyslipidemia in the pediatric population, which makes it difficult to compare the data in this study.

In general, and considering the differentiation by sex and age group, there is a similarity in the mean values of the lipids measured, with differences in prevalence according to the type of dyslipidemia studied, but maintaining the similarity between the Médio Itacuruçá and Santo Antônio communities, with the values for the female population and the 10-19 age group being higher than those for the male population and the 2-9 age group. These findings are similar to those of The Bogalusa Heart Study, which identified higher serum lipid values in females, with an increase from the school and adolescent age groups[16].

LDL cholesterol

The prevalence of dyslipidemia due to increased LDL cholesterol was 15.2% in the general population studied. These figures were lower than those observed in the general pediatric population in a study carried out at a university hospital in São Paulo (prevalence of 36%)[18] and in a survey on dyslipidemia in schoolchildren aged 6 to 19 from the private school system in Belém-Pará, although the figures were close (prevalence of 18.6%)[19].

About the difference between the sexes, a prevalence of 10% was found in males and 20.4% in females. These data are similar to those found in a study of children and adolescents in Florianópolis (SC), which identified higher levels of total cholesterol, HDL, and LDL in girls, with a more significant difference during adolescence5. Nevertheless, this pattern is contrary to data presented on the prevalence of dyslipidemia in the adult population at a hospital in Goiânia, which showed higher rates in the male population.[20]

Total Cholesterol

The data on total cholesterol in the population studied showed a prevalence of values above 170 mg/dL of 36.4%. In males, the overall prevalence was 32%, with a considerable difference between the samples from the Médio-Itacuruçá and Santo Antônio communities, with 56.3% and 20.6%, respectively. For females, the overall prevalence was 40.8%, with no significant differences between the communities.

These figures are higher than those described by the study of schoolchildren in the Belém public school system (21.1%) and by the ERICA study (Study of Cardiovascular Risks in Adolescents)21,22 for the northern region of Brazil (16.4%) and are close to the prevalence of dyslipidemia observed in the outpatient population of children and adolescents (44%)[18].

HDL cholesterol

HDL cholesterol, which acts as a cardiovascular protective factor, was another component of the lipid profile with significant alterations found. An overall prevalence of 60.6% was found, slightly higher in the Médio-Itacuruçá community (65.1%) than in the Santo Antônio community (57.1%).

The ERICA study revealed a high prevalence of low HDL dyslipidemia in the Brazilian population, particularly in the north (58.7%) and northeast (51.6%)[21,22]. These results align closely with our findings in the communities studied, providing further validation of our research.

On the other hand, a study on dyslipidemia in private school students in Belém found lower percentages of HDL cholesterol, with a prevalence of dyslipidemia in 29.5% of the population studied, with no difference between males and females[19].

Triglycerides

TG was the component with the highest percentage of alteration in the lipid profile, with alarming values, especially in the child population aged 2 to 9. In this group, the prevalence of high TG dyslipidemia was 90.3%, with an average of 143.6 mg/dL and a slight predominance in females. In the group aged between 10 and 19 years, the values remained surprisingly high, with a prevalence of 63.2% and an average of 108.2 mg/dL, with a predominance in males.

Regarding the differences in the communities evaluated, we can highlight a significant difference in the age group over ten years of age, with a prevalence of 37.9% in the Itacuruçá community and 82.1% in the Santo Antônio community. These findings contrast strongly with data obtained by the study of schoolchildren in Belém (prevalence of 15.8%)18 and the study of the adolescent population in the northern region of Brazil in the ERICA study (prevalence of 9.6%)[21,22].

According to a study on the socio-environmental and epidemiological characterization of quilombola communities in northeastern Pará, data related to eating habits obtained through the application of a questionnaire showed that cassava flour was the most consumed food, followed by chicken and beef, preserved foods, and processed meats, as well as rice and beans23. Despite some foods considered healthy as part of the communities' menu, the large percentage of processed meats hurts nutrition, as they are foods rich in fat and poor in nutrients.

In this context, new eating habits resulting from external factors may be directly related to the findings of the high prevalence of dyslipidemia due to hypertriglyceridemia and reduced HDL cholesterol observed in the present study, as well as atherosclerotic disease in Brazilian quilombos.

In addition, it is observed that this pattern of combined dyslipidemia, found in the population studied, where there is little change in LDL cholesterol levels, with a predominance of changes in HDL cholesterol and TG, has already been described as a predominant pattern in childhood[24]. It is highly associated with obesity, with a prevalence of up to 40% in obese individuals.

Nutritional profiles according to the Z Score

According to the study data, the eutrophic nutritional profile is predominant in the population studied (64.6%). However, there is a significant difference in prevalence between the Santo Antônio community (73.2%) and the Médio Itacuruçá community (53.5%). The second largest portion is formed by individuals classified as overweight and at risk of being overweight, with a prevalence of 24.2%.

The 2021 Food and Nutrition Surveillance System (SISVAN) on the quilombola population found that 19.35% of children between 1 and 5 years old are at risk of being overweight, 11.29% are overweight, and 4.84% are obese. In the age group between 5 and 10 years old, the prevalence of overweight was 12.5%, obesity 11.6%, and severe obesity 6.63%. In adolescents, the figures indicate that 16.07% are overweight, 8.04% are obese, and 3.57% are severely obese[25].

The prevalence of obesity and severe obesity in the study population was 7.1% and 1.0%, respectively, similar to the general data found in the quilombola population in Brazil.

CONCLUSION

Based on the analyses performed in this study, it was observed that the highest incidence of dyslipidemia was hypertriglyceridemia and low HDL, a pattern already described as the most prevalent in childhood. Thus, it can be inferred that the incidence of dyslipidemia in the pediatric age group is an important predictor of cardiovascular morbidity and mortality in adulthood. It affects populations in both developing and developed countries and has shown increasing levels in the population due to changes in lifestyle habits acquired in recent decades.

Therefore, the need for more research on the subject focused on the quilombola population in the state of Pará is reinforced. This will help us better understand the socio-environmental characteristics that favor the contribution of other risk factors to the genesis of dyslipidemia during childhood, even in eutrophic patients.

It is concluded that health education measures are essential in Quilombo communities' schools and Basic Health Units (UBS) for children and adolescents and their families. These measures should emphasize the importance of practicing regular physical activities and healthy eating habits, considering the cultural characteristics and socioeconomic conditions of the population.

REFERENCES

[1] Nascimento BR, Brant LCC, Oliveira GMMD, Malachias MVB, Reis GMA, Teixeira RA, et al. Epidemiologia das doenças cardiovasculares em países de língua portuguesa: dados do" Global Burden of Disease", 1990 a 2016. Arquivos Brasileiros de Cardiologia, 2018;110:500-511. DOI: https://doi.org/10.5935/abc.20180098

[2] Oliveira GMMD, Brant LCC, Polanczyk CA, Biolo A, Nascimento BR, Malta DC, et al. Estatística cardiovascular – Brasil 2020. Arquivos Brasileiros de Cardiologia, 2020;115:308-439. DOI: https://doi.org/10.36660/abc.20200812

[3] Sapunar J, Aguilar-Farías N, Navarro J, Araneda G, Chandía-Poblete D, Manríquez V, Brito R, Cerda Á. Alta prevalencia de dislipidemias y riesgo aterogénico en una población infanto-juvenil. Revista Médica de Chile. 2018;146(10):1112-1122. DOI: http://dx.doi.org/10.4067/S0034-98872018001001112

[4] Almeida CAN, Mello ED, Mello PP, Mello PD, Zorzo RA, Filho DR. Consenso da Associação Brasileira de Nutrologia sobre Manejo da Dislipidemia Secundária à Obesidade Infanto-Juvenil. International Journal of Nutrology, 2017; [cited 2022 Oct. 20] 10(4):161-178. Disponível em: https://www.thieme-connect.com/products/ejournals/abstract/10.1055/s-0040-1705648

[5] Giuliano IdCB, Coutinho MSSdA, Freitas SFTd, Pires MMdS, Zunino JN, Ribeiro RQdC. Lípides séricos em crianças e adolescentes de Florianópolis, SC: estudo Floripa saudável 2040. Arquivos Brasileiros de Cardiologia. 2005;85:85-91. DOI: https://doi.org/10.1590/S0066-782X2005001500003

[6] Alves C. Endocrinologia pediátrica. 1. ed. Barueri, SP: Editora Manole; 2019.

[7] Ferreira HS, Lamenha MLD, Xavier Júnior AFS, Cavalcante JC, Santos AM. Nutrição e saúde das crianças das comunidades remanescentes dos quilombos no Estado de Alagoas, Brasil. Rev Panam Salud Publica. 2011; [cited 2022 Oct. 20] 30(1):51-58. Disponível em: https://www.scielosp.org/pdf/rpsp/v30n1/v30n1a08.pdf

[8] Miranda AMM. Pesquisa em saúde e ambiente na Amazônia. 1. ed. Guarujá, SP: Editora Científica; 2021. p. 182.

[9] Araújo MSG, Lima Filho LD. Cultura, Trabalho e alimentação em comunidades negras e quilombolas do Paraná. Ateliê Geográfico, Goiânia, 2012; [cited 2022 Oct. 20] 6(3):113-131. Disponível em: https://www.revistas.ufg.br/atelie/article/download/21060/12370/0

[10] Ramos NMJR, Oliveira E, Pires YP, Nassar SE, Fernandes RSSM et al. Caracterização socioepidemiológica em comunidades quilombolas do nordeste do Pará-Amazônia, Brasil. Guarujá: Científica, 2021; [cited 2022 Oct. 20]. Disponível em: http://repositorio.ufpa.br/handle/2011/13159

[11] Malta DC, Bernal RTI, Lima MG, Araújo SSCD, Silva MMAD, Freitas MIDF, et al. Noncommunicable diseases and the use of health services: analysis of the National Health Survey in Brazil. Revista de saúde pública. 2017;51. DOI: https://doi.org/10.1590/S1518-8787.2017051000090

[12] Nascimento BR, Brant LCC, de Oliveira GMM, Malachias MVB, Reis GMA, Teixeira RA, Malta DC, França E, Souza MFM, Roth GA, Ribeiro ALP. Cardiovascular disease epidemiology in portuguese-speaking countries: data from the Global Burden of Disease, 1990 to 2016. Arquivos brasileiros de cardiologia, 2018; [cited 2022 Oct. 20]. 110:500-511. Disponível em: https://www.scielo.br/j/abc/a/kRLBQhC7fDSzqYy3HxR9LNn/?format=pdf&lang=en

[13] Malta DC, Bernal RT, Souza MF, Szwarcwald CL, Lima MG, Barros MB. Social inequalities in the prevalence of self-reported chronic non-communicable diseases in Brazil: national health survey 2013. International journal for equity in health. 2016;15(1):1-11. DOI 10.1186/s12939-016-0427-4

[14] GBD 2016 Brazil Collaborators. Burden of disease in Brazil, 1990-2016: a systematic subnational analysis for the Global Burden of Disease Study 2016. Lancet. 2018;392(10149):760-75. DOI: https://doi.org/10.1016/S0140-6736(18)31221-2

[15] Simão AF, Précoma DB, Andrade JPD, Correa H, Saraiva JFK, Oliveira, et al. I Diretriz Brasileira de Prevenção Cardiovascular. Arquivos Brasileiros de Cardiologia. 2013; [cited 2022 Oct. 20]. 101:1-63. Disponível em: http://publicacoes.cardiol.br/consenso/2013/Diretriz_Prevencao_Cardiovascular.pdf

[16] Berenson GS, Srnivasan SR, Bogalusa Heart Study Group. Cardiovascular risk factors in youth with implications for aging: the Bogalusa Heart Study. Neurobiology of aging, 2005;26(3)303-307. DOI: https://doi.org/10.1016/j.neurobiolaging.2004.05.009

[17] Berenson, G S et al. "Risk factors in early life as predictors of adult heart disease: the Bogalusa Heart Study." The American journal of the medical sciences. 1989;298(3):141-51. DOI: https://doi.org/10.1097/00000441-198909000-00001

[18] Faria ECD, Dalpino FB, Takata R. Lípides e lipoproteínas séricos em crianças e adolescentes ambulatoriais de um hospital universitário público. Revista Paulista de Pediatria, 2008; [cited 2022 Oct. 20] 26(1):54-58. Disponível em: https://www.scielo.br/j/rpp/a/3jhFRyRbjQH3vg7c8mVs5hx/citation/?lang=pt

[19] Ribas SA, Silva LCSD. Dislipidemia em escolares na rede privada de Belém. Arquivos Brasileiros de Cardiologia. 2009; [cited 2022 Oct. 20] 92:446-451. Disponível em: http://publicacoes.facthus.edu.br/index.php/saude/article/download/116/159

[20] De Paula AG, Campos PTS, Teófilo MNG, Gomes CM, Costa SHN, Blanch GT. Prevalência de dislipidemia em indivíduos atendidos no laboratório de um hospital de Goiânia-GO. Revista Brasileira Militar de Ciências. 2020;6(15). DOI: https://doi.org/10.36414/rbmc.v6i15.54

[21] Bloch KV, Szklo M, Kuschnir MCC, De Azevedo Abreu G, Barufaldi LA, Klein CH, et al. The Study of Cardiovascular Risk in Adolescents–ERICA: rationale, design and sample characteristics of a national survey examining cardiovascular risk factor profile in Brazilian adolescents. BMC Public Health. 2015;15(1):1-10. DOI: DOI 10.1186/s12889-015-14

[22] Faria Neto JR, Bento VFR, Baena CP, Olandoski M, Gonçalves LGDO, Abreu GDA, et al. ERICA: prevalence of dyslipidemia in Brazilian adolescents. Revista de Saúde Pública. 2016; 50. DOI: https://doi.org/10.1590/S01518-8787.2016050006723

[23] Ramos NMJM, Oliveira E, Pires YP, Nassar SE, Fernandes RSSM, Ramos JBS et al. Caracterização socioambiental e epidemiológica em comunidades quilombolas do nordeste do Pará – Amazônia, Brasil. In: Miranda, AMM. Pesquisa em Saúde & Ambiente na Amazônia: Perspectivas para Sustentabilidade Humana e Ambiental na Região. Guarujá: Editora Científica; 2021; [cited 2022 Oct. 20] 182-192. Disponível em: https://downloads.editoracientifica.com.br/articles/210504562.pdf

[24] Kavey REW. Combined dyslipidemia in childhood. Journal of clinical lipidology, 2015;9(5 Suppl):41-56. DOI: https://doi.org/10.1016/j.jacl.2015.06.008

[25] Sistema de Vigilância Alimentar e Nutricional – SISVAN [Homepage na internet]. Relatório sobre o Estado Nutricional do Brasil em 2021 [cited 2022 Feb. 22]. Disponível em: https://sisaps.saude.gov.br/sisvan/

Submitted: March 24, 2023
Accepted: March 6, 2024
Published: October 16, 2024

Author contributions

Antônio Marcos Mota Miranda: Coordinator of field research, data collection, manuscript writing, and research conduction.

Iann Assis Barreto: Application of statistical techniques, data collection, and manuscript writing.

Larissa Valéria Feio da Luz: Application of statistical techniques, data collection, and manuscript writing.

Rosivaldo de Alcântara Mendes: Supervision and execution of laboratory methodologies.

Kleber Raimundo Freitas Faial: Supervision and execution of laboratory methodologies.

Cássia Cristina da Silva Rocha: Supervision and execution of laboratory methodologies.

Arnaldo Jorge Martins Filho: Supervision and execution of laboratory methodologies.

Marisa Eiró Miranda: Supervision and critical analysis of the results.

All authors approved the final version of the text.

Conflict of interest: There is no conflict of interest.

Financing: Does not have financing.

Corresponding author:
Antônio Marcos Mota Miranda
Evandro Chagas Institute
Rodovia BR 316, km 07, s/n, Bairro Levilândia, Ananindeua/PA – Brasil. 67030-000
marcosmota@iec.gov.br