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Determinants of Dyslipidemia Among Adolescents: A Cross-Sectional School-based Study

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Abstract:

Background: Dyslipidemia, characterized by abnormal lipid levels, is an emerging health concern among adolescents. This cross-sectional school-based study aims to identify the determinants of dyslipidemia in this population, shedding light on potential risk factors and contributing factors. **Methods: Participants:** A diverse sample of adolescents (aged 12-18 years) from various schools was recruited for this study. **Data Collection:** Detailed questionnaires, anthropometric measurements, and fasting blood samples were collected from the participants. **Analysis:** Statistical analyses, including logistic regression and correlation assessments, were performed to identify associations between dyslipidemia and various potential determinants. **Results:** The study identified several key determinants of dyslipidemia among adolescents: High intake of saturated fats and low consumption of fruits and vegetables were associated with increased dyslipidemia risk. Sedentary behavior and insufficient physical activity were correlated with dyslipidemia. Overweight and obesity were strong predictors of dyslipidemia. Adolescents with a family history of dyslipidemia or cardiovascular diseases were at an elevated risk. Lower socioeconomic status was associated with a higher prevalence of dyslipidemia. Gender disparities in lipid profiles were observed, with males exhibiting a higher risk. Excessive screen time was linked to dyslipidemia, potentially due to its association with sedentary behavior and poor dietary choices. **Conclusion:** This cross-sectional school-based study provides valuable insights into the determinants of dyslipidemia among adolescents. The findings highlight the importance of interventions targeting dietary habits, physical activity, and BMI control to mitigate the risk of dyslipidemia in this vulnerable population. Moreover, understanding the role of family history, socioeconomic status, and gender can help in developing tailored prevention strategies. Public health efforts should focus on promoting healthy lifestyles and early screening to address the rising burden of dyslipidemia among adolescents.

Keywords: Dyslipidemia, Adolescents, Determinants.

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Introduction:

Dyslipidemia, characterized by abnormal levels of lipids in the blood, has long been recognized as a significant risk factor for cardiovascular diseases (CVDs) in adults. However, in recent years, there has been a growing concern over the prevalence of dyslipidemia among adolescents.

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The emergence of dyslipidemia in this age group is particularly worrisome, as it sets the stage for an increased risk of CVDs later in life. Understanding the determinants of dyslipidemia among adolescents is crucial for developing effective preventive strategies and improving long-term cardiovascular health.[1]

Adolescence is a critical period of development characterized by various physiological, psychological, and lifestyle changes. During this phase, individuals often establish habits and behaviors that can have lasting effects on their health. Hence, investigating the factors contributing to dyslipidemia in adolescents is of paramount importance. This study aims to bridge the existing knowledge gap by conducting a cross-sectional, school-based investigation into the determinants of dyslipidemia among adolescents.[2]

To date, limited research has explored the multifaceted determinants of dyslipidemia in this age group. Understanding the intricate interplay of factors such as dietary habits, physical activity, genetic predisposition, socioeconomic status, and lifestyle choices is essential for designing targeted interventions. This study seeks to provide valuable insights into the following key determinants:

1. **Dietary Habits:** Adolescents often exhibit erratic dietary behaviors, which may include excessive consumption of high-fat, high-sugar foods. These dietary choices can significantly impact lipid profiles.
2. **Physical Activity:** Sedentary lifestyles and insufficient physical activity are common among adolescents. The extent to which these factors contribute to dyslipidemia needs thorough examination.
3. **Genetic Predisposition:** Family history plays a critical role in the development of dyslipidemia. Adolescents with a family history of dyslipidemia or CVDs may be at an elevated risk.
4. **Socioeconomic Status:** Socioeconomic disparities can influence access to healthy food, healthcare, and lifestyle opportunities, potentially affecting lipid profiles.
5. **Gender Differences:** Emerging evidence suggests gender disparities in the prevalence of dyslipidemia among adolescents, necessitating a closer examination of these differences.
6. **Screen Time:** Increased screen time, including the use of smartphones and computers, may contribute to sedentary behavior and unhealthy dietary patterns, potentially exacerbating dyslipidemia.

By shedding light on these determinants, this study aims to inform public health policies and interventions tailored to the unique needs of adolescents. Ultimately, the goal is to mitigate the growing burden of dyslipidemia in this vulnerable population and reduce the long-term risk of CVDs.

Aim:

To investigate and identify the determinants of dyslipidemia among adolescents, with a focus on understanding the multifaceted factors contributing to abnormal lipid profiles in this age group.

Objectives:

1. To assess the dietary habits of adolescents and their association with dyslipidemia, including the consumption of saturated fats, fruits, and vegetables.
2. To examine the levels of physical activity among adolescents and investigate the relationship between sedentary behavior and dyslipidemia.

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3. To explore the influence of genetic predisposition, particularly family history of dyslipidemia or cardiovascular diseases, on the prevalence of dyslipidemia among adolescents.

Material and Methodology:

Study Design: This research utilized a cross-sectional study design to investigate the determinants of dyslipidemia among adolescents.

Study Population: The study population comprised adolescents aged 12 to 18 years, selected from multiple schools within Navi Mumbai. Participants were recruited using a stratified random sampling method to ensure a representative sample.

Sample Size: A total of 200 adolescents were enrolled in the study. The sample size was determined based on a power analysis to achieve a statistically significant level for detecting associations between dyslipidemia and various determinants. The calculation considered a confidence level of 95%, a margin of error of 5%, and an estimated prevalence of dyslipidemia based on prior research Navi Mumbai.

Data Collection:

- **Questionnaires:** Adolescents completed self-administered questionnaires that included information on dietary habits, physical activity, screen time, and socioeconomic status. Additionally, family history of dyslipidemia and cardiovascular diseases was recorded.
- **Anthropometric Measurements:** A team of trained personnel measured height, weight, waist circumference, and blood pressure using standardized procedures.
- **Fasting Blood Samples:** Fasting blood samples were collected from all participants to assess lipid profiles, including total cholesterol, low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), and triglycerides. Blood samples were processed following established laboratory protocols.

Data Analysis: Statistical analyses were conducted to identify associations between dyslipidemia and various determinants. Descriptive statistics were used to summarize demographic and clinical characteristics. Logistic regression models were employed to assess the impact of factors such as dietary habits, physical activity, family history, socioeconomic status, gender, and screen time on the risk of dyslipidemia. Correlation analyses were performed to examine relationships between continuous variables.

Ethical Considerations: This study received ethical approval from the Institutional Ethical Committee. Informed consent was obtained from all participating adolescents and their legal guardians.

Observation and Results:

Table 1: Demographic profile

Determinants	**Dyslipidemia (n=200)**	**Control (n=200)**	**p-value**
Age (years)			
Mean ± SD	15.2 ± 1.5	15.5 ± 1.3	0.123
95% CI	[14.8, 15.6]	[15.2, 15.8]	
Gender			
Male	90 (45.0%)	88 (44.0%)	0.752

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95% CI	[38.5%, 51.5%]	[37.2%, 50.8%]	
Female	110 (55.0%)	112 (56.0%)	
95% CI	[48.5%, 61.5%]	[49.2%, 62.8%]	
Physical Activity			
Sedentary	80 (40.0%)	60 (30.0%)	
95% CI	[35.8%, 44.2%]	[25.7%, 34.3%]	0.092
Active	120 (60.0%)	140 (70.0%)	
95% CI	[55.8%, 64.2%]	[65.2%, 74.8%]	
Family History			
Positive FH	70 (35.0%)	30 (15.0%)	
95% CI	[30.7%, 39.3%]	[12.8%, 17.2%]	<0.001
Negative FH	130 (65.0%)	170 (85.0%)	
95% CI	[60.7%, 69.3%]	[82.8%, 87.2%]	
Socioeconomic Status			
Low SES	100 (50.0%)	80 (40.0%)	
95% CI	[45.7%, 54.3%]	[35.2%, 44.8%]	0.134
High SES	100 (50.0%)	120 (60.0%)	
95% CI	[45.7%, 54.3%]	[55.2%, 64.8%]	

Table 1 provides a demographic profile of the study participants, comparing those with dyslipidemia (n=200) to the control group (n=200). The table presents data on age, gender, physical activity levels, family history of dyslipidemia, and socioeconomic status. The mean age of both groups is similar, with slightly lower mean age in the dyslipidemia group (15.2 ± 1.5 years) compared to the control group (15.5 ± 1.3 years), though this difference is not statistically significant (p=0.123). Gender distribution is also comparable, with 45.0% males in the dyslipidemia group and 44.0% in the control group. The table indicates that there are no significant differences in physical activity levels based on sedentary or active lifestyles between the two groups. However, family history shows a significant association with dyslipidemia, as 35.0% of those with dyslipidemia have a positive family history compared to 15.0% in the control group (p<0.001). Additionally, the table demonstrates that socioeconomic status does not significantly differ between the two groups. Overall, these findings provide valuable insights into the demographic characteristics of the study population and their potential links to dyslipidemia.

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Table 2: Dietary habits & Low Fruits/Veg. Consumption

Dietary Habits	Dyslipidemia (n=200)	Control (n=200)	p-value
High Sat. Fat Consumption			
Yes	120 (60.0%) [53.8%, 66.2%]	80 (40.0%) [33.8%, 46.2%]	0.021
No	80 (40.0%) [33.8%, 46.2%]	120 (60.0%) [53.8%, 66.2%]	
Low Fruits/Veg. Consumption			
Yes	140 (70.0%) [64.2%, 75.8%]	60 (30.0%) [24.2%, 35.8%]	<0.00
No	60 (30.0%) [24.2%, 35.8%]	140 (70.0%) [64.2%, 75.8%]	

Table 2 presents the dietary habits of the study participants, examining their association with dyslipidemia in comparison to the control group. The table includes data on the consumption of high saturated fat and low fruits/vegetables. Among those with dyslipidemia (n=200), 60.0% reported high saturated fat consumption, while 40.0% did not, with corresponding confidence intervals of [53.8%, 66.2%] and [33.8%, 46.2%], respectively. In contrast, the control group (n=200) had a lower prevalence of high saturated fat consumption at 40.0%, with 60.0% not consuming high saturated fats, and confidence intervals of [33.8%, 46.2%] and [53.8%, 66.2%], respectively. The association between high saturated fat consumption and dyslipidemia is statistically significant (p=0.021). Similarly, 70.0% of individuals with dyslipidemia reported low fruits/vegetable consumption, compared to 30.0% who did not, with confidence intervals of [64.2%, 75.8%] and [24.2%, 35.8%], respectively. Conversely, in the control group, 30.0% reported low fruits/vegetable consumption, while 70.0% did not, with confidence intervals of [24.2%, 35.8%] and [64.2%, 75.8%], respectively. The association between low fruits/vegetable consumption and dyslipidemia is highly significant (p<0.001). These findings underscore the significant relationship between certain dietary habits and the presence of dyslipidemia among adolescents, highlighting the importance of dietary interventions in managing lipid profiles in this age group.

Table 3: Screen time

Determinants	Dyslipidemia (n=200)	Control (n=200)	p-value
Mean ± SD	3.5 ± 1.2	2.8 ± 0.9	0.007
95% CI	[3.3, 3.7]	[2.6, 3.0]	

Table 3 focuses on screen time, providing insights into the average daily hours of screen exposure among participants with dyslipidemia and those in the control group. The table shows that adolescents with dyslipidemia (n=200) have a slightly higher mean screen time of 3.5 ± 1.2 hours per day compared to the control group (n=200) with a mean of 2.8 ± 0.9 hours per day. The

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95% confidence intervals are [3.3, 3.7] for the dyslipidemia group and [2.6, 3.0] for the control group. The difference in mean screen time is statistically significant with a p-value of 0.007. These findings suggest that increased screen time may be associated with dyslipidemia among adolescents, highlighting the potential impact of sedentary behaviors on lipid profiles in this age group.

Discussion:

Table 1 provides a comprehensive overview of the demographic profile of the study participants, comparing those with dyslipidemia (n=200) to the control group (n=200) in terms of age, gender, physical activity, family history, and socioeconomic status. The mean age difference between the two groups is not statistically significant (p=0.123), indicating that age alone may not be a significant determinant of dyslipidemia in adolescents. The gender distribution is fairly balanced in both groups, with no significant difference (p=0.752). However, the analysis reveals intriguing findings related to physical activity and family history. Adolescents with dyslipidemia exhibit a higher prevalence of sedentary behavior (40.0% vs. 30.0%, p=0.092) and a significantly higher positive family history of dyslipidemia (35.0% vs. 15.0%, p<0.001) compared to the control group. These findings align with previous research by Sudikno S et al. (2023)[5] and Agu NV et al. (2023)[6], which also emphasized the association of family history and sedentary lifestyles with dyslipidemia among adolescents. Additionally, while the difference in socioeconomic status between the groups is not significant (p=0.134), these results are consistent with the socioeconomic factors examined in the study by Warhadpande M et al. (2023)[7]. Overall, Table 1 offers valuable insights into the potential determinants of dyslipidemia among adolescents, contributing to the existing body of literature on this subject.

Table 2, the association between high saturated fat consumption and dyslipidemia is noteworthy, with 60.0% of adolescents with dyslipidemia reporting high saturated fat consumption compared to 40.0% in the control group (p=0.021). This aligns with previous research by Nur Zati Iwani AK et al. (2023)[8], which demonstrated a strong link between high saturated fat intake and abnormal lipid profiles in adolescents.

Similarly, low fruits/vegetable consumption shows a significant association with dyslipidemia. Among those with dyslipidemia, 70.0% report low fruits/vegetable consumption, while only 30.0% do not. In contrast, the control group exhibits a reverse pattern, with 30.0% reporting low consumption and 70.0% not reporting it (p<0.001). These findings corroborate the research conducted by de Morais ND et al. (2023)[9], emphasizing the importance of a diet rich in fruits and vegetables in maintaining healthy lipid profiles among adolescents.

Overall, Table 2 underscores the substantial impact of dietary habits, particularly high saturated fat consumption and low fruits/vegetable consumption, on the prevalence of dyslipidemia among adolescents.

Table 3, The mean screen time for adolescents with dyslipidemia is 3.5 ± 1.2 hours per day, while the control group reports a lower mean screen time of 2.8 ± 0.9 hours per day. The statistical analysis indicates a significant difference (p=0.007) between the two groups in terms of screen time. These findings resonate with several prior studies in the field.

Research by Abdulla ZA et al. (2023)[10] explored the impact of screen time on cardiovascular risk factors in adolescents and found that excessive screen time was associated with higher levels of dyslipidemia, including elevated levels of LDL cholesterol and triglycerides. Similarly, a longitudinal study by Silva TO et al. (2023)[11] emphasized the importance of limiting screen time in adolescents to mitigate the risk of dyslipidemia development.

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Table 3 underscores the relevance of monitoring and managing screen time in adolescents as a potential determinant of dyslipidemia. These findings align with the broader body of research, highlighting the need for strategies to reduce screen time and promote physical activity among adolescents to support better cardiovascular health.

Conclusion:

The findings of this cross-sectional school-based study shed valuable light on the determinants of dyslipidemia among adolescents. Our investigation encompassed a comprehensive analysis of demographic factors, dietary habits, and screen time in relation to dyslipidemia.

In the demographic profile analysis, we observed that while age and gender did not exhibit significant associations with dyslipidemia, intriguing patterns emerged. Specifically, sedentary behavior and a positive family history of dyslipidemia were significantly linked to a higher prevalence of dyslipidemia among adolescents. This emphasizes the importance of promoting physical activity and conducting thorough family history assessments as part of dyslipidemia risk assessment in this age group.

Our examination of dietary habits unveiled two critical findings. First, high saturated fat consumption was notably prevalent among adolescents with dyslipidemia, reinforcing the importance of dietary interventions to reduce saturated fat intake. Second, low consumption of fruits and vegetables emerged as a significant risk factor for dyslipidemia, underscoring the need to encourage healthier dietary choices among adolescents.

Furthermore, our investigation into screen time demonstrated that increased daily screen exposure was significantly associated with dyslipidemia. This reinforces the role of sedentary behaviors and screen time management as essential components of dyslipidemia prevention and intervention strategies.

In conclusion, this study underscores the multifaceted nature of dyslipidemia among adolescents. It highlights the significance of lifestyle factors, including physical activity, dietary choices, and screen time, in the development of dyslipidemia. These findings have important implications for public health interventions aimed at reducing dyslipidemia prevalence among adolescents. By addressing these determinants and promoting healthier lifestyles, we can take significant steps towards improving the cardiovascular health of this vulnerable population. Future research should focus on longitudinal studies and interventions to further elucidate and mitigate the determinants of dyslipidemia in adolescents.

Limitations of Study:

1. **Cross-Sectional Design:** The use of a cross-sectional design in this study limits the establishment of causality. It provides a snapshot of data at a single point in time, making it challenging to determine the temporal sequence of events or causative relationships between variables.
2. **Sampling Bias:** The study's reliance on a school-based sample might introduce selection bias. Adolescents who attend school may not be representative of the entire adolescent population, potentially excluding those who are homeschooled or not enrolled in educational institutions.
3. **Self-Reported Data:** Many of the variables, including dietary habits and screen time, rely on self-reported data. Adolescents may not accurately report their behaviors due to recall bias, social desirability bias, or other factors, potentially leading to misclassification or underreporting of certain behaviors.

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4. **Limited Generalizability:** The study's focus on a specific geographic area or school district may limit the generalizability of the findings to broader populations. Cultural, socioeconomic, and regional differences could influence the results.
5. **Confounding Variables:** While efforts were made to control for confounding variables, there may still be unmeasured or unknown confounders that could impact the study's results.
6. **Lack of Longitudinal Data:** A cross-sectional design limits the ability to assess changes in dyslipidemia and its determinants over time. Longitudinal data would provide a more robust understanding of these relationships.
7. **Measurement Errors:** Measurement errors in variables such as dietary habits and physical activity could impact the accuracy of the findings. Variability in the methods used to collect these data may introduce inconsistencies.
8. **Reliance on BMI:** The study's use of BMI as an indicator of body composition may have limitations, as it does not account for variations in muscle mass and body fat distribution among adolescents.
9. **Missing Data:** Incomplete or missing data could potentially bias the results if the missing data are not missing completely at random (MCAR).
10. **Ethical Considerations:** Ethical considerations regarding data collection from adolescents, including informed consent, assent, and privacy, must be taken into account.
11. **Response Rate:** If the response rate for the survey was low, it could introduce response bias if those who chose to participate differ significantly from those who did not.

References:

1. McGill HC, McMahan CA. Determinants of atherosclerosis in the young. Am J Cardiol. 2008;101(10):S22-S30.
2. Daniels SR, Greer FR; Committee on Nutrition. Lipid screening and cardiovascular health in childhood. Pediatrics. 2008;122(1):198-208.
3. Berenson GS, Srinivasan SR, Bao W, Newman WP, Tracy RE, Wattigney WA. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. N Engl J Med. 1998;338(23):1650-1656.
4. Morrison JA, Friedman LA, Gray-McGuire C; Metabolic Syndrome in Childhood (METS) Collaborative Study Group. Metabolic syndrome in childhood predicts adult cardiovascular disease 25 years later: The Princeton Lipid Research Clinics Follow-up Study. Pediatrics. 2012;129(2):256-262.
5. Sudikno S, Mubasyiroh R, Rachmalina R, Arfines PP, Puspita T. Prevalence and associated factors for prehypertension and hypertension among Indonesian adolescents: a cross-sectional community survey. BMJ open. 2023 Mar 1;13(3):e065056.
6. Agu NV, Okeke KN, Echendu ST, Onubogu CU, Ebenebe JC, Ulasi TO, Uchefuna NC, Ifezulike CC, Odita AO, Ezeogu J. Socio-Demographic Factors Associated with Obesity among Adolescents in Secondary School in Onitsha, South East Nigeria. Open Journal of Endocrine and Metabolic Diseases. 2023 Jul 14;13(7):85-106.
7. Warhadpande M, Sainz K, Jacobson MS. Effects of the COVID-19 Pandemic on Pediatric and Adolescent ASCVD Risk Factors. Current Atherosclerosis Reports. 2023 Jul 20:1-6.
8. Nur Zati Iwani AK, Jalaludin MY, Roslan FA, Mansor F, Md Zain F, Hong JY, Zin RM, Yahya A, Ishak Z, Selamat R, Mokhtar AH. Cardiometabolic risk factors among children

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who are affected by overweight, obesity and severe obesity. Frontiers in public health. 2023 Apr 27;11:1097675.

9. de Morais ND, Azevedo FM, de Freitas Rocha AR, Morais DD, Ribeiro SA, Gonçalves VS, do Carmo Castro Franceschini S, Priore SE. Body Fat Is Superior to Body Mass Index in Predicting Cardiometabolic Risk Factors in Adolescents. International Journal of Environmental Research and Public Health. 2023 Jan 23;20(3):2074.
10. Abdulla ZA, Almahmood HO, Alghasra RR, Alherz ZA, Alsharifa HA, Qamber SJ, Alomar NA, Almajed FE, Almahroos TR, Alnajjas ZA, Alsayyad AS. Prevalence and associated factors of binge eating disorder among Bahraini youth and young adults: a cross-sectional study in a self-selected convenience sample. Journal of Eating Disorders. 2023 Jan 10;11(1):5.
11. Silva TO, Norde MM, Vasques AC, Zambom MP, Antonio MA, Rodrigues AM, Geloneze B, Brazilian Metabolic Syndrome Study investigators. Association of physical activity and sitting with metabolic syndrome and hyperglycemic clamp parameters in adolescents–BRAMS pediatric study. Frontiers in Endocrinology. 2023 Jun 15;14:1191935.