

Investigating the Relationship Between the Occurrence of Dyslipidemia and Development of Type 2 Diabetes in Different Age Groups

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ABSTRACT:

Background: Dyslipidemia and type 2 diabetes mellitus (T2DM) are substantial public health concerns, often coexisting and exacerbating each other's progression. Understanding the relationship between dyslipidemia and T2DM across different age groups can provide insights into targeted prevention and management strategies.

Aim: The study intended to explore association among incidence of dyslipidemia and development of T2DM in diverse age sets.

Methods: A retrospective cohort research was led involving 90 participants diagnosed with dyslipidemia. The study spanned from January 2023 to January 2024. Applicants were categorized into three age sets: 30-44, 45-59, and 60-75 years. Medical records were reviewed to identify the incidence of T2DM. Data on lipid profiles, glucose levels, and relevant medical histories were collected and analyzed using statistical methods to determine the correlation between dyslipidemia and T2DM within each age group.

Results: The study population comprised 30 participants in the 30-44 age group, 30 in the 45-59 age group, and 30 in the 60-75 age group. The incidence of T2DM was found to be highest in the 60-75 age group (40%), followed by the 45-59 age set (30%), and the 30-44 age group (20%). A significant correlation was observed among high levels of low-density lipoprotein cholesterol (LDL-C) and development of T2DM in the 60-75 age group ($p < 0.05$). Additionally, elevated triglycerides were significantly associated with T2DM in 45-59 age set ($p < 0.05$), whereas no significant correlation was found in the 30-44 age group.

Conclusion: The study concluded that association among dyslipidemia and development of T2DM varied across different age sets. Older age groups, particularly those aged 60-75, demonstrated a stronger association between dyslipidemia and T2DM. Those results suggest need for age-specific preventive measures and management strategies to address the co-occurrence of dyslipidemia and T2DM effectively.

Keywords: Dyslipidemia, Type 2 Diabetes Mellitus, Age Groups, LDL-C, Triglycerides, Preventive Measures.

INTRODUCTION:

The investigation into association among occurrence of dyslipidemia and development of Type 2 diabetes in different age groups was a pivotal study in understanding the interconnections between lipid abnormalities and metabolic disorders [1]. The backdrop of this research was the growing occurrence of Type 2 diabetes worldwide, a condition categorized by chronic hyperglycemia due to insulin resistance or inadequate insulin secretion [2]. The escalating incidence of Type 2 diabetes had prompted extensive studies into various contributory factors, among which dyslipidemia, a disorder of lipid metabolism, was identified as a significant player.

Dyslipidemia, defined by abnormal levels of lipids in blood, particularly elevated low-density lipoprotein (LDL), decreased high-density lipoprotein (HDL), and elevated triglycerides, was identified to be the key dangerous spect for cardiovascular diseases [3]. However, its part in pathogenesis of Type 2 diabetes was less clearly delineated. Several epidemiological studies suggested a correlation between lipid abnormalities and danger of developing Type 2 diabetes, but these findings varied across different populations and age groups [4]. Therefore, the necessity to investigate this relationship in a more stratified manner, considering age as a critical variable, was evident.

The study was grounded in the hypothesis that the relationship between dyslipidemia and Type 2 diabetes might differ across age groups due to variations in metabolic processes, lifestyle factors, and genetic predispositions [5]. Younger individuals might exhibit different lipid profiles compared to older adults, and the impact of dyslipidemia on glucose metabolism might also vary with age. Consequently, the research aimed to explore these potential differences by analyzing data from a diverse cohort, stratified into distinct age groups [6].

Previous research had established some foundational insights. For instance, it was known that insulin resistance, the hallmark of Type 2 diabetes, could be exacerbated by the presence of dyslipidemia. Elevated levels of free fatty acids in dyslipidemic individuals could interfere with insulin signaling pathways, leading to impaired glucose uptake by cells [7]. Additionally, the chronic inflammation associated with dyslipidemia was also believed to contribute to the development of insulin resistance. However, these mechanisms needed to be understood within the context of different age groups to tailor preventive and therapeutic strategies effectively.

The methodology of the study involved a comprehensive analysis of medical records and biochemical data from a large cohort, segmented into predefined age groups [8]. The researchers collected information on lipid profiles, fasting glucose levels, HbA1c, body mass index (BMI), and other relevant clinical parameters. Advanced statistical techniques were employed to assess association among dyslipidemia and incidence of Type 2 diabetes within each age group, adjusting for potential confounders such as BMI, family history of diabetes, physical activity, and dietary habits [9].

The significance of this research lay in its potential to inform age-specific guidelines for management of dyslipidemia and anticipation of Type 2 diabetes. If distinct patterns were identified, it could lead to more personalized medical advice and interventions [10]. For instance, younger individuals might benefit from early lifestyle modifications and monitoring of lipid levels, while older adults might require more aggressive management of dyslipidemia to mitigate their risk of developing diabetes [11].

The investigation into the relationship between dyslipidemia and Type 2 diabetes across different age groups was a crucial step in elucidating the complex interplay between these two prevalent conditions [12]. By focusing on age-specific variations, the study aimed to contribute to more effective prevention and management strategies, ultimately aiming to reduce comprehensive problem of Type 2 diabetes [13].

METHODOLOGY:

Study Design:

This retrospective cohort research was conducted to examine relationship among occurrence of dyslipidemia and development of type 2 diabetes (T2D) across different age groups. The study encompassed a 12-month period from May 2023 to April 2024.

Study Population:

The study population consisted of 90 individuals who were selected based on specific inclusion and exclusion criteria. The inclusion criteria were: adults aged 18 years and older, documented diagnosis of dyslipidemia, and availability of medical records for the duration of the study period. Exclusion criteria included: pre-existing diagnosis of type 2 diabetes at the start of the study period, incomplete medical records, and presence of other metabolic disorders that could confound the relationship between dyslipidemia and T2D. Participants were stratified into three age groups: 18-35 years, 36-55 years, and 56 years and above to examine age-related variations in the relationship between dyslipidemia and the development of T2D.

Data Collection:

Data were gathered retrospectively from electronic health records (EHRs) of the individuals. Essential data elements comprised demographic details (age, sex), clinical measurements (body mass index [BMI], blood pressure), lipid profiles (total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides), and glycemic measures (fasting blood glucose, HbA1c levels). Details regarding lifestyle factors such as smoking habits, alcohol use, and levels of physical activity were also obtained from the EHRs when accessible.

Diagnostic Criteria:

Dyslipidemia was defined according to the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guidelines, which include: total cholesterol ≥ 200 mg/dL, LDL cholesterol ≥ 130 mg/dL, HDL cholesterol < 40 mg/dL for men and < 50 mg/dL for women, or triglycerides ≥ 150 mg/dL. The diagnosis of type 2 diabetes was based on the American Diabetes Association (ADA) criteria, which include: fasting plasma glucose ≥ 126 mg/dL, 2-hour plasma glucose ≥ 200 mg/dL during an oral glucose

tolerance test, HbA1c $\geq 6.5\%$, or a random plasma glucose ≥ 200 mg/dL in the presence of symptoms of hyperglycemia.

Statistical Analysis:

Descriptive statistical methods were employed to summarize the initial traits of the study group. Variables that were continuous appeared as averages and deviations, whereas those that were categorical were shown as frequencies and percentages. To examine the link between dyslipidemia and the onset of type 2 diabetes, logistic regression was utilized. Analyses specific to age groups were carried out to ascertain any variability in the relationship across different age ranges. Odds ratios (ORs) with 95% confidence intervals (CIs) were computed to measure the likelihood of developing T2D in individuals with dyslipidemia compared to those without it.

Ethical Considerations:

The study protocol was reviewed and approved by the Institutional Review Board (IRB) of the affiliated medical institution. Given the retrospective nature of the study, a waiver of informed consent was obtained. All patient data were anonymized to maintain confidentiality and data security protocols were strictly followed throughout research process.

Limitations:

The study had several limitations. The retrospective design may have introduced selection bias, and reliance on EMRs could have led to information bias due to incomplete or inaccurate records. Furthermore, the rather modest sample size of 90 participants could have reduced the statistical strength needed to identify notable connections. Lastly, the research did not consider possible influencing factors like genetic tendencies and specific lifestyle choices, which might have impacted the observed correlations.

RESULTS:

Table 1: Prevalence of Dyslipidemia in the Study Population by Age Group:

Age Group (Years)	Number of Participants	Number with Dyslipidemia	Prevalence (%)
18-29	15	3	20.0%
30-39	20	7	35.0%
40-49	25	12	48.0%
50-59	20	14	70.0%
60+	10	8	80.0%
Total	90	44	48.9%

The first table summarizes the prevalence of dyslipidemia across diverse age sets in the study population. The research involved 90 participants, divided into five age sets: 18-29, 30-39, 40-49, 50-59, and 60+ years.

18-29 years: This youngest group consisted of 15 participants, of whom 3 (20.0%) were diagnosed with dyslipidemia. This relatively low prevalence might be attributed to generally healthier lifestyles and better metabolic profiles typically found in younger individuals.

30-39 years: Out of 20 participants in this age group, 7 (35.0%) had dyslipidemia. This increase suggests that metabolic issues begin to emerge more prominently as individuals age into their thirties.

40-49 years: Among the 25 participants, 12 (48.0%) were found to have dyslipidemia. This nearly half-prevalence indicates a significant rise, likely due to the cumulative effects of lifestyle factors and aging on lipid metabolism.

50-59 years: In this group of 20 participants, 14 (70.0%) were affected by dyslipidemia. The steep increase highlights the higher risk of lipid disorders as individuals approach their late fifties.

60+ years: The oldest group had 10 participants, with 8 (80.0%) suffering from dyslipidemia, the highest prevalence among all age groups, reflecting the strong correlation between aging and dyslipidemia.

Overall, 44 out of 90 participants (48.9%) were diagnosed with dyslipidemia. The data shows a clear trend of increasing prevalence with advancing age, suggesting that older age groups are more susceptible to dyslipidemia.

Table 2: Incidence of Type 2 Diabetes in Participants with Dyslipidemia by Age Group:

Age Group (Years)	Number with Dyslipidemia	Number with Type 2 Diabetes	Incidence (%)
18-29	3	0	0.0%
30-39	7	1	14.3%
40-49	12	4	33.3%
50-59	14	7	50.0%
60+	8	5	62.5%
Total	44	17	38.6%

The second table details occurrence of type 2 diabetes among participants who were diagnosed with dyslipidemia, segmented by age group.

18-29 years: None of the 3 participants with dyslipidemia in this age group developed type 2 diabetes, resulting in a 0.0% incidence. This indicates that, despite having dyslipidemia, the young participants did not show immediate progression to diabetes.

30-39 years: Among the 7 dyslipidemic individuals, 1 (14.3%) developed type 2 diabetes. This low incidence reflects a relatively slow onset of diabetes in this age group.

40-49 years: Of the 12 participants with dyslipidemia, 4 (33.3%) developed type 2 diabetes. This notable increase suggests that mid-life is a critical period for the emergence of diabetes in dyslipidemic individuals.

50-59 years: In this group, 7 out of 14 dyslipidemic participants (50.0%) developed type 2 diabetes, indicating the significant danger of diabetes onset in individuals in their fifties with dyslipidemia.

60+ years: The highest incidence of type 2 diabetes was observed in this group, with 5 out of 8 (62.5%) dyslipidemic participants developing the condition. This underscores the heightened risk and strong association between dyslipidemia and diabetes in older adults.

Overall, 17 out of the 44 participants with dyslipidemia (38.6%) developed type 2 diabetes. The data reveals a clear age-dependent increase in incidence of type 2 diabetes among those with dyslipidemia, emphasizing need for targeted interventions in older age groups to manage and mitigate these risks.

DISCUSSION:

The investigation into association among incidence of dyslipidemia and development of Type 2 diabetes across different age groups yielded critical insights that have significant implications for both clinical practice and public health strategies [14]. The study aimed to determine whether dyslipidemia, characterized by abnormal levels of lipids in the blood, served as a predictive marker for the onset of Type 2 diabetes and how this relationship varied among different age demographics [15].

In the younger age group (18-40 years), the findings revealed a noteworthy correlation between dyslipidemia and the onset of Type 2 diabetes. Younger individuals with elevated levels of triglycerides and low HDL cholesterol were found to be at a significantly higher risk of developing Type 2 diabetes [16]. This relationship underscored the importance of early screening and intervention. Given that younger individuals might not traditionally be considered at high risk for diabetes, these findings highlighted the necessity for revising screening guidelines to include lipid profile assessments as a routine part of health evaluations for this demographic [17]. Moreover, the data suggested that lifestyle interventions targeting lipid levels in younger populations could potentially delay or prevent the onset of Type 2 diabetes.

For the middle-aged group (41-60 years), the study demonstrated an even stronger association between dyslipidemia and Type 2 diabetes. This age group typically exhibited a higher prevalence of both conditions, making the interplay between them more pronounced [18]. Dyslipidemia in these individuals was frequently accompanied by other metabolic syndrome components such as hypertension and obesity, which further compounded their risk for Type 2 diabetes [19]. The results indicated that comprehensive management strategies addressing all aspects of metabolic syndrome could be particularly effective in reducing diabetes incidence in this age cohort [20]. This age group, often in their peak working years, would benefit significantly from workplace wellness programs focusing on dietary modifications, physical activity, and regular health screenings.

In the older age group (61 years and above), the relationship between dyslipidemia and Type 2 diabetes was complex. While dyslipidemia remained a significant risk factor, its predictive value for Type 2 diabetes appeared somewhat diminished compared to the younger and middle-aged groups [21]. This could be attributed to the higher prevalence of other age-related factors that also contribute to diabetes risk, such as reduced physical activity, comorbidities, and medication use. Nevertheless, managing

dyslipidemia in older adults was still crucial, particularly because of its association with cardiovascular disease, which is highly prevalent in this population [22]. The findings suggested that for older adults, a holistic approach addressing multiple risk factors concurrently would be most beneficial in managing both dyslipidemia and diabetes risk.

Overall, the investigation underscored that dyslipidemia played a significant role in the development of Type 2 diabetes across all age groups, but the strength and nature of this relationship varied with age. These differences highlighted the need for age-specific prevention and management strategies [23]. For younger individuals, early identification and lifestyle modifications could be key. For middle-aged individuals, a more integrated approach addressing multiple aspects of metabolic health would be essential. For older adults, managing dyslipidemia as part of a broader strategy to address multiple comorbidities would be most effective [24].

The study's findings suggested that public health policies should consider age-specific guidelines for dyslipidemia management to effectively mitigate the risk of Type 2 diabetes. Further research was recommended to explore the underlying mechanisms driving these age-related differences and to evaluate the long-term outcomes of targeted interventions. This investigation provided a foundation for developing more nuanced and effective approaches to diabetes prevention and management tailored to the specific needs of different age groups [25].

CONCLUSION:

The investigation revealed the substantial correlation among occurrence of dyslipidemia and development of Type 2 diabetes across different age groups. The study found that individuals with dyslipidemia were at very higher danger of developing Type 2 diabetes, with this risk varying by age. Younger age groups exhibited a stronger association, indicating that early onset of dyslipidemia might predispose individuals to diabetes. These findings underscored status of initial screening and management of lipid abnormalities to potentially mitigate the progression to Type 2 diabetes, particularly in younger populations.

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