ORIGINAL RESEARCH

ASSESSMENT OF ADIPONECTIN, TRIGLYCERIDE, AND CHOLESTEROL LEVELS AMONG ELDERLY RESIDENTS OF NNEWI, ANAMBRA STATE, NIGERIA

Authors:

IHIM, Augustine Chinedu[1]*, UDECHUKWU, Juliet Chinaza[1], OBI, Patrick Chinedu[2], IKWELLE, Tochukwu Anthony[1], OBI, Collins Uchechukwu[1], OGALAGU, Romanus Ogai[3], OSAKUE, Nosakhare[1]

Author Affiliations:

[1]. Department of Clinical Chemistry, Nnamdi Azikiwe University, Nnewi Campus, Anambra State, Nigeria.
[2]. Department of Internal Medicine, Federal University Teaching Hospital Owerri, Imo State, Nigeria
[3]. Department of Biochemistry, Tansian University, Umunya, Anambra State, Nigeria

***Corresponding author:**
Dr. Ihim Augustine Chinedu
Email: ac.ihim@unizik.edu.ng;
Phone: +2348035985883;
Orchid ID 0000-0001-9991-0714

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ABSTRACT

Background: The WHO defines aging as beginning at 65 years or older, highlighting the need to understand the interplay between adiponectin, triglycerides, and cholesterol in promoting elderly health. Critical to metabolic and cardiovascular well-being, these biomarkers interact complexly, serving as indicators and potential targets for improving overall health in aging populations.

Aim: This research aims to evaluate the levels of adiponectin, triglycerides, and cholesterol among elderly residents of Nnewi, Anambra State, Nigeria, to better understand their metabolic and cardiovascular health status.

Methods: This study evaluated serum levels of adiponectin, triglycerides, cholesterol, and BMI in 90 participants, including 45 elderly subjects (65 years and above) and 45 younger controls. Spectrophotometric methods were used for biomarker analysis, with statistical assessments conducted using t-tests and correlation analysis.

Results: There were no significant differences in the mean serum levels of adiponectin, triglycerides, and cholesterol between the test and control groups (p = 0.38, 0.88, and 0.25, respectively; $p > 0.05$). However, the test group exhibited significantly higher mean values for BMI, SBP, and DBP (25.87 ± 5.03, 140.22 ± 22.41, and 87.78 ± 17.31, respectively; $p < 0.05$) compared to the control group. Correlation analysis revealed a weak positive correlation between triglycerides (TG) and waist circumference (WC) ($r = 0.298$, $p = 0.047$), as well as between cholesterol (CHOL) and diastolic blood pressure (DBP) ($r = 0.326$, $p = 0.029$) in the test group.

Conclusion: These findings highlight the interplay between metabolic and cardiovascular factors, suggesting that elevated BMI and blood pressure may be linked to subtle changes in lipid metabolism and its relationship with anthropometric measures in the test group.

Keywords: Aging, Metabolic health, Adiponectin, Triglycerides, Cholesterol

INTRODUCTION

Aging, an inevitable process, is often measured by chronological age, with individuals aged 65 years or older typically classified as "elderly"[1]. As the global population continues to age, understanding the complex interactions among adiponectin, triglycerides, and cholesterol becomes vital for enhancing the health and well-being of older adults. These biomarkers play critical roles in metabolic and cardiovascular health, serving as both indicators and potential targets for interventions to improve aging outcomes. Adiponectin, an adipocyte-derived hormone with anti-inflammatory and insulin-sensitizing properties, is central to metabolic regulation[2]. Maintaining adequate adiponectin levels is crucial in the elderly, as reduced levels have been associated with insulin resistance, inflammation, and increased risk of cardiovascular diseases[3]. Moreover, adiponectin levels have been linked to longevity, with higher levels correlating to a reduced risk of cardiovascular diseases, type 2 diabetes, and metabolic syndrome[4,5]. Triglycerides, a key marker of dyslipidaemia, often increase with age and pose significant cardiovascular risks[6]. Elevated triglyceride levels in older adults are associated with metabolic syndrome, insulin resistance, and even cognitive decline[7]. As a known risk factor for cardiovascular events, triglyceride monitoring in the elderly is crucial for early detection and intervention[8]. Cholesterol, an essential lipid for cell membrane integrity and hormone synthesis, has a nuanced relationship with aging. While high cholesterol levels are linked to cardiovascular risks, excessively low levels have been associated with cognitive decline, necessitating careful management[9]. Cholesterol management strategies in the elderly must balance cardiovascular protection and cognitive preservation[10]. These biomarkers do not function independently but interact complexly, influencing overall health. For instance, adiponectin is inversely correlated with triglycerides and positively correlated with high-density lipoprotein cholesterol (HDL-C)[11]. Investigating these interconnections in aging populations could reveal targeted intervention strategies to mitigate age-related health challenges effectively.

MATERIALS AND METHOD

The study was a longitudinal study design which evaluated the levels of total cholesterol, triglyceride, adiponectin, and BMI in elderly individuals residing in the Nnewi metropolis. A total of 90 subjects were recruited for the study, comprising 45 male and/or female participants aged 65 years and above as test subjects and 45 younger individuals as the control group. Their heights in meters and weights in kilograms were measured, recorded and used to calculate their BMI (kg/m^2) by dividing their weight with the value of the square of their heights in meters as described by [12] . Overweight and obesity were defined as Body Mass Index (BMI) ≥ 25 and 30 kg/m2, respectively.

Written consent was sought and obtained from the participants, and structured questionnaires were administered to obtain demographic information from the participants. Five millilitre(5 ml) venous blood sample was collected aseptically from each student and dispensed into plain tubes. The samples were allowed to clot, followed by centrifugation at 5,000 rpm for 5 minutes to separate serum for the evaluation of total cholesterol, adiponectin, and triglyceride. Statistical analysis was performed using an independent Student's t-test, with significance determined at $p < 0.05$. Additionally, the correlation between the parameters was assessed using Pearson's correlation coefficient.

Ethical approval: The study sought and obtained ethical approval from the Ethics Committee of the Faculty of Health Sciences and Technology College of Health Sciences Nnamdi Azikiwe University with reference no. FHST/REC/023/566

RESULTS

The Mean Values of Adiponectin, Triglycerides and Cholesterol in the Elderly living in Nnewi Metropolis and the Control(Mean ± S.D)

There was no significant difference in the mean level of serum Adiponectin of the test group (428.87± 69.55 pg/ml) compared with the control group (659.00±14.00 pg/ml) (p>0.05).

There was no significant difference in the mean level of serum Triglyceride of the test group (1.23±0.31 mmol/l) compared with the control group (1.03± 0.31 mmol/l) (p>0.05).

There was no significant difference in the mean level of serum Cholesterol of the test group (3.76 ± 0.54 mmol/l) compared with the control group (3.79 ± 0.52 mmol/l) (p>0.05).

Table 1: Mean Values of Adiponectin, Triglycerides and Cholesterol in the Elderly living in Nnewi Metropolis and the Control (Mean ± S.D)

Parameter	Test Group (N = 45) Mean ± S.D	Control Group (N= 45) Mean ± S.D	T-value	P-value
Adiponectin (pg/ml)	428.87 ± 69.55	659.00 ± 14.00	-1.101	0.38
Triglyceride (mmol/L)	1.23 ± 0.31	1.03 ± 0.31	3.076	0.88
Cholesterol (mmol/L)	3.76 ± 0.54	3.79 ± 0.52	0.318	0.25

** Statistical significance at P<0.05*

Body Mass Index, Waist circumference, Systolic and Diastolic Blood pressure in the Test group (Elderly) and Control group (Young)(Mean ± S.D).

There existed significant higher mean values of BMI, SBP and DBP (25.87 ± 5.03, 140.22± 22.41, 87.78 ± 17.31) of the test group compared with the control (23.37 ± 4.24, 36.77± 45.01, 114.27±8.24) (P<0.05).However , no significiant difference existed in the mean values of waist circumference (31.54± 4.23) of the test group compared to the control group (36.77± 45.01) (p>0.05)

Table 2: Body Mass Index, Waist circumference, Systolic and Diastolic Blood pressure in the Test group (Elderly) and Control group (Young)(Mean ± S.D).

Parameter	Test group (n=45) Mean ± SD	Control group (n=45) Mean ± SD	T-value	P-value
BMI (kg/m^2)	25.87 ± 5.03	23.37 ± 4.24	2.549	0.013
WC (cm)	31.54 ± 4.23	36.77 ± 45.01	-0.775	0.441
SBP (mmHg)	140.22 ± 22.41	114.27 ± 8.24	7.293	0.001
DBP (mmHg)	87.78 ± 17.31	79.40 ± 9.71	2.832	0.016

** Statistical significance at P<0.05*

Key:
BMI=Body Mass Index
SBP= systolic blood pressure
DBP= diastolic blood pressure
WC= Waist Circumference

Association between Adiponectin vs Triglyceride, Cholesterol studied in the Test group(Elderly)

No association existed between AD vs TG (r= -0.190, p=0.212) and AD vs CHOL (r=0.092, p=0.546) in the elderly (test group). In the control group, no significant association was observed between AD and TG (r = 0.251, p = 0.096) or between AD and CHOL (r = -0.051, p = 0.740) (p < 0.05).

Table 3: Association Between Adiponectin Vs Triglyceride, Cholesterol Studied In The Test Group(Elderly)

PARAMETERS	r	p-value
Ad Vs TG	-0.190	0.212
Ad Vs Chol	0.092	0.546

** Statistical significance at P<0.05*

Table 4: Correlation Of The Parameters Measured In The Control Group

PARAMETERS	r	p-value
Ad Vs TG	0.251	0.096
Ad Vs Chol	0.051	0.740

** Statistical significance at P<0.05*

Key:
AD=Adiponectin
TG=Triglyceride
Chol= Cholesterol

Association between Adiponectin, Triglyceride & Cholestreol with Body Mass Index,Waist Circumference,Systolic&Diastolic Blood pressure in the Elderly.

In elderly participants, a weak positive correlation was observed between triglycerides (TG) and waist circumference (WC) (r = 0.298, p = 0.047). No significant associations were found between TG and diastolic blood pressure (DBP) (r = 0.258, p = 0.088), body mass index (BMI) (r = -0.252, p = 0.095), or systolic blood pressure (SBP) (r = 0.133, p = 0.385). Similarly, adiponectin (AD) showed no significant associations with BMI (r = 0.062, p = 0.685), WC (r = -0.139, p = 0.361), SBP (r = -0.005, p = 0.973), or DBP (r = 0.145, p = 0.341). Cholesterol (CHOL) was not significantly associated with BMI (r = -0.257, p = 0.880), WC (r = 0.130, p = 0.395), or SBP (r = 0.216, p = 0.154), but a weak positive correlation was found between CHOL and DBP (r = 0.326, p = 0.029).

Table 5: Association between Adiponectin, Triglyceride and Cholestreol with Body Mass Index,Waist Circumference,Systolic&Diastolic Blood pressure in the Elderly

Parameters		BMI (kg/m^2)	WC (cm)	SBP (mmHg)	DBP (mmHg)
Adiponectin (pg/ml)	r-value	0.062	-0.139	-0.005	0.145
	P-value	0.685	0.361	0.973	0.341
Triglyceride (mmol/L)	r-value	-0.252	0.298	0.133	0.258
	P-value	0.095	0.047	0.385	0.088
Cholesterol (mmol/L)	r-value	-0.257	0.130	0.216	0.326
	P-value	0.088	0.395	0.514	0.029

** Significant at P<0.05*

Association Between Adiponectin, Triglyceride And Cholesterol With Body Mass Index, Waist Circumference, Systolic And Diastolic Blood Pressure In The Control Group

In the control group, adiponectin showed no significant associations with BMI (r = 0.036, p = 0.814), WC (r = 0.037, p = 0.809), SBP (r = -0.609, p = 0.650), or DBP (r = 0.016, p = 0.917). Triglycerides (TG) exhibited a weak positive correlation with BMI (r = 0.344, p = 0.021), but no significant associations were found with WC (r = 0.088, p = 0.960), SBP (r = 0.201, p = 0.185), or DBP (r = 0.237, p = 0.117). Similarly, cholesterol (CHOL) showed no significant correlations with BMI (r = 0.114, p = 0.455), WC (r = -0.160, p = 0.294), SBP (r = 0.056, p = 0.714), or DBP (r = 0.163, p = 0.283) in the control participants.

Table 6: Association Between Adiponectin, Triglyceride And Cholesterol With Body Mass Index, Waist Circumference, Systolic And Diastolic Blood Pressure In The Control Group

Parameters		BMI (kg/m^2)	WC (cm)	SBP (mmHg)	DBP (mmHg)
Adiponectin (pg/ml)	r-value	-0.036	-0.037	-0.069	0.016
	P-value	0.814	0.809	0.650	0.917
Triglyceride(mmol/L)	r-value	0.344	0.008	0.201	0.237
	P-value	0.021	0.960	0.185	0.117
Cholesterol(mmol/L)	r-value	0.114	-0.160	0.056	0.163
	P-value	0.455	0.294	0.714	0.283

** Significant at $P<0.05$*

DISCUSSION

Understanding the interplay between adiponectin, triglycerides, and cholesterol is vital for supporting the health and well-being of the elderly, especially as the global population ages. Adiponectin, a hormone involved in regulating glucose metabolism and fat oxidation, plays a protective role against conditions like obesity, type 2 diabetes, and cardiovascular diseases[13]. However, its levels tend to decline with age, contributing to increased risks of metabolic dysfunction[14]. This decline is often accompanied by elevated triglycerides, which are linked to insulin resistance and cardiovascular complications, and imbalances in cholesterol, such as higher LDL levels and lower HDL levels, which exacerbate these risks. The findings of this study revealed no significant differences in the mean serum levels of Adiponectin, Triglycerides, and Cholesterol between the test group and the control subjects. Previous studies have demonstrated that higher serum levels are linked to an increased risk of total and cardiovascular mortality and increased risk of coronary heart disease (CHD) in a large population of older adults[15,16]. The test group of elderly subjects exhibited significantly higher mean values for body mass index (BMI), systolic blood pressure (SBP), and diastolic blood pressure (DBP) compared to the control group. Body mass index (BMI) is positively and independently linked to increased morbidity and mortality from hypertension, cardiovascular disease, type II diabetes mellitus, and other chronic conditions[17]. Overweight and obesity heighten the risk of high blood pressure (BP), cardiovascular diseases, type II diabetes, and certain cancers. A BMI above 21 kg/m^2 contributes to 58% of diabetes cases and 21% of global ischemic heart disease[18]. In developing countries, high BP, influenced by aging and modernization, is a leading cause of cardiovascular deaths, accounting for 7.1 million fatalities annually[18,19]. A cross-sectional study conducted by Mungreiphy et al. among Tangkhul Naga tribal males in Northeast India revealed that body weight, BMI, and blood pressure increase with age. The study also identified a strong positive correlation between age, BMI, and blood pressure, aligning with the findings of the present study[20]. Kapoor et al [20] and Tandon reported this increase in BMI and blood pressure with age in their respective studies[21]. A positive correlation was observed between the triglycerides (TG) and waist circumference (WC) in the elderly group. Waist circumference (WC) is a key predictor of chronic diseases and mortality, even after accounting for BMI[22]. Its measurement and BMI are important in primary care, and the triglyceride glucose-WC index serves as a novel diabetes predictor[23]. A study by Raj et al. examined the relationship between triglyceride levels and waist circumference in men and women, revealing that individuals with larger waist circumferences had higher triglyceride levels, highlighting a significant association between waist circumference and hypertriglyceridemia[24]. A study by Zhang et al. on factors influencing triglyceride (TG) levels among adults in Northeast China found a positive association between body mass index (BMI), waist circumference (WC), and TG levels across all quantiles[25]. Additionally, the impact of WC on TG levels was shown to be more pronounced as TG levels increased[25]. Cholesterol and DBP showed a weak positive correlation in the elderly group. A longitudinal study by Wong et al. demonstrated a relationship between LDL-C and CVD events only when blood pressure (BP) was <140/90 mmHg[26]. Additionally, an association between HDL-C and CVD events was observed up to a BP of 160/100 mmHg, indicating that elevated BP increases the risk of CVD in elderly individuals across all lipid levels. These findings align with the results of the current study. An analysis of pooled data from six large prospective U.S. cohort studies revealed that elevated diastolic blood pressure (DBP) and low-density lipoprotein (LDL) levels during young adulthood were linked to an increased risk of coronary heart disease (CHD)[27]. Additionally, elevated systolic blood pressure (SBP) and DBP in young adults were associated with a higher risk of heart failure (HF), independent of exposures later in life. These findings indicate that elevated SBP, DBP, and LDL during early adulthood independently contribute to the risk of developing CHD and HF in later life.

CONCLUSION

The results from this study underscore a complex interplay between adiponectin, triglycerides, cholesterol, and metabolic health in elderly subjects, highlighting significant association between triglycerides, waist circumference, cholesterol, and blood pressure. This emphasizes the importance of early interventions targeting these factors to mitigate the risk of cardiovascular diseases and metabolic dysfunction in aging populations.

Conflicts of Interest: The authors declare that they have no conflicts of interest.

Contributors: ACI, PCO, and NO conceived and designed the research proposal. CUO, JCU, OAI, and ACI performed sample collection, experiments, and data analysis. CUO, ACI, ROO, and OAI contributed to the final version of the manuscript. All authors have read and approved the final manuscript.

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