Journal of Pharmacy & Allied Medicine

JPAM, 3(2), 113-123, 2025
https://doi.org/10.58985/jpam.2025.v03i02.38
ISSN (Print): 3005-2726

Research Article

Cardiometabolic profile of some staff of Police Academy (POLAC), Wudil, Kano State, Nigeria

Francis Chukwuedozie Nwachukwu*

Nigeria Police Academy, Department of Biochemistry and Forensic Science, Faculty of Science, P. M B 3474, Wudil, Kano State, Nigeria.

Article Information
Received: *18 December 2024*
Revised: *06 July 2025*
Accepted: *08 July 2025*
Published: *25 September 2025*

Academic Editor
Prof. Dr. Christian Celia

Corresponding Author
Prof. Dr. Francis Chukwuedozie Nwachukwu
E-mail: tilong3788@yahoo.com
Tell: +2347064664777

Keywords
Cardiometabilic condition, anthropometrics, glucose, haemoglobin and cholesterol.

Abstract

Many promoting factors of cardiometabolic disease are commonplace in Police Academy (POLAC), such as prolonged sitting, forgoing sleep, poor stress management, and others. The research aimed to establish the cardiometabolic profile of some POLAC staff. Voluntary staff members participated in the study. The participants fasted for at least ten hours. Plasma capillary blood parameters (glucose, haemoglobin, and total cholesterol), blood pressure (BP) and anthropometry (waist and hip circumference, and height and weight) were determined. The Body mass index (BMI) and waist-to-hip circumference ratios were calculated using the appropriate formula. The participants were divided into five groups according to age range (Group1 = 40-45, Group2 = 46-50, Group3 = 51-55, Group4 = 56-60, and Group5 = 61-65). The results showed the presence of high glucose concentrations (glucose > 6.8mmol/L) in all groups, high haemoglobin concentrations (haemoglobin > 17.2g/dl) in two groups (1 and 2), high total cholesterol concentrations (total cholesterol > 240 mg/dl) in four groups (1, 2, 3, and 5), and high BMI (BMI > 24.9 kg/m^2), high BP (BP ≥ 140/90 mmHg) and high waist-to-hip ratio (values > 1) in all groups. The mean glucose, BP and anthropometric measurements were elevated across all groups. Individually, there were no significant differences among the groups. High glucose concentrations, BP and anthropometric values in all groups reflect that glucose concentration impacts body anthropometry alongside BP and anthropometry reflect glucose status. The high total cholesterol concentrations in the four groups rather than all groups showed glucose may trigger an increase in total cholesterol, and other factors may be involved. Haemoglobin concentration is less affected by glucose concentration. Changes in these parameters reflect cardiometabolic health conditions.

1. Introduction

Cardiometabolic syndrome is a state in which multiple risk factors are present simultaneously rather than individually [1]. It describes a cluster of metabolic and cardiovascular abnormalities, including abdominal obesity, insulin resistance, hypertension, dyslipidemia, and atherosclerosis which cause cardiovascular disease (CVD) and diabetes. This constellation of many risk factors under the umbrella of the term- cardiometabolic health may be associated with one another [2], although not in all situations. It can occur in isolation or independently of others. The biochemical basis of disease is the focus of a good understanding of cardiometabolic health conditions. According to Nwachukwu [3], all diseases have a biochemical basis, and cardiometabolic health follows the same biochemical basis. Considering that changes in biochemical parameters can reflect cardiometabolic health, biochemical indicators of syndromes in cardiometabolic health have become screening tools. The constellation of risk factors negatively impacts the synergy of metabolic processes in the body.

The ability to process food that maintains blood sugar, cholesterol, triacylglycerol, blood pressure, and body weight within a healthy range for optimal metabolism provides a profile of cardiometabolic health. Cardiometabolic health reflects internal processes regulated by a homeostatic system. Indisputably, more than 30% of the global population is either obese or overweight [4], and the leading cause of death worldwide is cardiovascular disease [5-6]. To reduce the risk of developing cardiometabolic diseases, public health interventions have traditionally focused on increasing physical activity, improving diet quality, and reducing tobacco use and alcohol intake [7]. There was less progress in physical activity and healthy dietary habits. These lifestyle factors are notoriously difficult to modify [8]. Dietary habits influence the risk factors for cardiometabolic health [9-10]. Furthermore, there is compelling evidence that engaging in 30–60 min of moderate-vigorous intensity physical activity daily improves health and reduces the prevalence of chronic disease [11-13].

The prevalence of cardiometabolic diseases has been increasing recently [14-15], especially in high and middle-income countries [15]. Many working-class individuals engage in unhealthy behaviours such as forgoing sleep, and making poor food choices, etc., and this is an increasingly globally prevalent issue [16]. The reasons for an unhealthy lifestyle are multifactorial, including work, society, family, and others. An unhealthy lifestyle triggers increased stress, cancer, cardiovascular disease, type 2 diabetes, and other conditions culminating in reduced life expectancy and increased mortality rate (Fig 1). An unhealthy lifestyle impacts health through independent, culminative and combined effects. Notably, unhealthy lifestyles could be interrelated [17].

An unhealthy lifestyle affects cardiometabolic health because many of the diseases triggered by unhealthy lifestyles fall under the umbrella term cardiometabolic diseases. As such, investigations inform interventions to prevent the development of

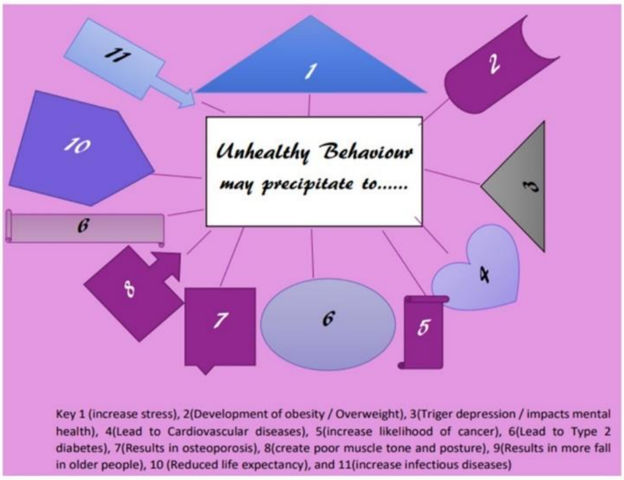

Figure 1. Unhealthy behaviour and linked degenerative processes.

cardiometabolic diseases [18]. Cardiometabolic screening is a step in the development of an informed and strategic intervention plan for improving health and life expectancy.

In the Nigeria Police Academy (POLAC), about nine staff died within ten years, and in each case, it was not an accident. This troubling information is suspected to have originated from cardiometabolic episodes. The cardiometabolic screening could lead to interventions that could scale down cardiometabolic risk factors, cardiometabolic disease development, and reduction of cardiometabolic-related death. The POLAC authority (management authorities) may take clues from this research, which is the expected significance of the current study. The findings will propel these significances, and the aim is to screen the selected POLAC staff for markers of cardiometabolic health.

2. Materials and methods

2.1. Materials

The materials used in this study were intended for on-the-spot assessments. These included the Accu-Answer Isaw (CEO197) and its kits (China), a lancing device, methanol, a portable electronic balance, sphygmomanometer, measuring tape, and standiometer, all sourced from Chriscare Medical Devices Nigeria Limited, as an accredited distributor of medical devices.

2.2. Participants of the health screening component of this observational study

https://doi.org/10.58985/jpam.2025.v03i02.38

The participants were males and females over 40 years of age. They provided oral consent after a one-on-one counselling session. All participants were voluntary volunteered The confidentiality of the participants' health information was assured. Each participant had the right to back off at any stage of the investigation. The researcher used a name code to conceal the individual's identity. The participants were divided into five groups according to age range: Group 1 (40-45), Group 2 (46-50), Group 3 (51-55), Group 4 (56-60), and Group 5 61-65).

2.3. Exclusion and inclusion criteria

The exclusion criteria included those on medication that impacts the cardiometabolic risk factors of research interest. These include regular hypertension, diabetes drug medication, and others. The participants must have been staff members of the institution for at least four years, as the number of years spent may correlate with the length of the impact of the behaviours on their health. Inclusion criteria were those who were not on routine drug medications and were not aware of any existing cardiometabolic issues.

2.4. Study population selection

One hundred (100) POLAC staff members volunteered to participate in the study. Seven (7) Participants were below 30 years of age. Nine (9) participants withdrew on personal grounds, and fifteen (15) were disallowed due to existing ill-health. This resulted in thirty-two (32) participants' exclusion. The remaining sixty-three (68) were included in the final study.

2.5. Anthropometric estimation and blood pressure check

The reference ranges were as per Aminu Kano Teaching Hospital (BMI > 24.9 kg/m^2), high blood pressure (blood pressure ≥ 140/90) and high waist-to-hip ratio (values > 1).

2.6. Height measurement

The participant was in an erect standing position on the floorboard of the standiometer, with their back vertically aligned with the backboard of the standiometer. For an even distribution of the participant's weight, the heels of the feet were placed together and made to touch the vertical board base. The feet were slightly outward at an angle of 60 degrees. For participants with knocked knees, the feet were in a separate position so that the inside of the knees were in contact but not overlapping. In this position, the head and buttocks were in contact with the vertical backboard. At this point, the participant's arms hung freely on the sides of the trunk, and their palms faced the thighs. The participants inhaled air deeply while standing fully without changing their heel position. In the Frankfort horizontal plane position, the examiner gently lowered the horizontal bar onto the crown of the head, applying sufficient pressure to flatten the hair. The measurement was then taken and recorded to the nearest meter. This procedure was followed for all the participants.

2.7. Weight measurement

The participants stood at the centre of the portable electronic weighing scale. While still at the centre of the electronic balance without bending the head, the reading was displayed on the portable electronic scale in kg. This procedure was done for all the participants.

2.8. Waist and hip circumference measurements

2.8.1. Waist circumference

The participants stood upright while holding up their gowns. The examiner, positioned behind the participant, palpated the hip area to locate the right iliac crest. A horizontal line was drawn at the highest point of the iliac crest, intersected by a vertical line marked on the midaxillary line of the body. The examiner then moved to the participant's right side and positioned a measuring tape horizontally around the trunk at the marked level. The recorder circled the participant to ensure that the tape was parallel to the floor and snugged without compressing the skin. The measurement was taken during minimal respiration and recorded to the nearest 0.1 cm. This procedure was for all participants.

2.8.2. Buttocks (Hip) circumference

The participants stood upright with their feet together, distributing their weight evenly on both feet while holding the examination gown. While standing behind the participant, the recorder gathered the side seams of the examination above the hips, creating a fold by inserting the thumb into the fabric. The recorder held the folded seams snugly as the examiner squatted on the participant's right side and positioned the measuring tape around the buttocks, ensuring that it was at maximum extension. The recorder adjusted

https://doi.org/10.58985/jpam.2025.v03i02.38

the tape at the sides and front to ensure that it lies horizontally. The zero end of the tape was below the measurement value. The tape was held snugly but not overly tight, and the examiner recorded the measurement from the right side, calling it out to the recorder. This procedure was for all participants.

Body Mass Index (BMI) and waist – hip ratio were calculated as weight in kilograms divided by the square of height in meters $\left(BMI = \frac{Weight\ (kg)}{Heigh\ X\ Height\ (M^2)}\right)$ and waist divided by hip circumference in centimetres ($Waist - Hip\ ratio = \frac{Waist\ \ (cm)}{Hip\ (cm)}$).

2.8.3. Blood pressure check

The participants were seated comfortably with their arms supported at the heart level. The cuff was wrapped snugly around the upper arm, ensuring that the artery marker was well-positioned over the brachial artery. The cuff was then inflated rapidly to a pressure of 20–30 mmHg above the point at which the radial pulse was no longer palpable, indicating complete arterial occlusion. Next, the cuff was gradually deflated while the researcher auscultated the brachial artery using a stethoscope. The first audible Korotkoff sound was recorded as the systolic pressure, indicating the resumption of blood flow through the arteries. As deflation continued, the sounds gradually faded and the point at which they disappeared marked the diastolic pressure, representing the resting phase of the cardiac cycle.

2.8.4. Participant preparations

The participants were overnight fasting for 10 ± 1 hours before blood plasma samples were tested (the testing was in the morning). The participants were not allowed to eat after 10 p.m. Testing was completed by 10 a.m. Methanol was used for finger cleaning before the lancet finger prick.

2.8.5. Operation of lancing device, meter calibration and blood sample testing

The cap of the lancet device was removed by twisting it off and inserting it into the holder, which was then pushed firmly. The protected disk was twisted until it separated from the lancet. It was recapped by twisting it back until it was snugged. The end cap of the lancet was held in one hand and the arming barrel in the other hand, then the arming barrel was gently pulled until a click was heard.

2.8.6. Finger pricking (Blood collection)

The lancing device was held firmly against the side of the finger. On this position, it was pressed to release the button, and then the lancing device was removed from the finger. The finger was gently squeezed/massaged until a round drop of blood (at least 1.5 μL) formed on the fingertip.

2.8.7. Calibration of the meter using the code number (Accu-Answer Isaw meter)

The test strip was inserted into the port to activate the meter, with the three contact bars oriented toward the operator. The test strip insertion was smooth and without bending. The meter displayed the same code on the vial. If the code did not match, the 'C' button was pressed to reset it to match the code on the test strip. The new code number would flash on the display for three seconds, then briefly stop flashing, followed by the symbol for the test parameter. It was for the indication of the meter's readiness for testing.

2.8.8. Total cholesterol, haemoglobin and fasting blood sugar testing (using accu-answer isaw)

The test strip was inserted into the calibrated meter port, which was powered on. The test strips were used for cholesterol, glucose, and hemoglobin testing. The test strip was removed from the vial and promptly inserted into the device port. The device meter displayed "CHO" for total cholesterol, "HB" for hemoglobin, and "BG" for glucose, along with the corresponding code numbers from the vials. The reference values from the Aminu Kano Teaching Hospital were used for total cholesterol, haemoglobin, and glucose concentrations. The normal ranges and values were as per the Aminu Kano Teaching Hospital reference range. (glucose > 6.8 mmol/L, haemoglobin > 17.2 g/dl and total cholesterol > 240).

2.9. Statistical analyses

Data were analyzed using SPSS 25.0 (SPSS Inc., Chicago, IL, USA). The generated data are expressed as the mean, and Post-hoc analysis was conducted at a significance level $p<0.05$.

3. Results

The results are presented in Tables 1 to 5 and grouped according to age range (40-45, 46-50, 51- 55, 56-60, and 61-65) as groups 1, 2, 3, 4 and 5. Table 6 presents a comparison of the mean values of the same

https://doi.org/10.58985/jpam.2025.v03i02.38

Table 1. Group 1 Cardiometabolic health among the Age range of 40 -45.

Participant Code	Plasma biochemical parameters			Anthropometric parameters			
	FBS (Mmo/l)	Hb (g/dl)	TC (g/dl)	BMI (kg/m²)	W:H	BLDPS (mmHg)	BLDPD (mmHg)
1	5.75	13.23	119	27.68ʰ	1.02ʰ	120. 05	80.50
2	7.81ʰ	15.20	200	33.12ʰ	0.19	145.50ʰ	100.00ʰ
3	5.74	15.00	300ʰ	26.56ʰ	1.28ʰ	154.50ʰ	91.50ʰ
4	9.22 ʰ	14.00	236	27.15ʰ	0.70	162.50ʰ	95.50ʰ
5	5.28	15.00	232	22.53	1.12ʰ	125.50	80.70
6	8.61ʰ	12.40	224	20.99	0.72	140.00ʰ	100.00ʰ
7	10.02ʰ	13.43	156	32.03ʰ	0.65	118. 00	70.50
8	9.17ʰ	14.40	245ʰ	31.14ʰ	1.45ʰ	150.50ʰ	98.50ʰ
9	5.28	20.37ʰ	173	29.30ʰ	0.73	79.50	45.50
10	9.06ʰ	12.50	190	24.69	0.78	120.50	72.50
11	5.56	13.43	240	31.14ʰ	0.67	145.50ʰ	90.50ʰ
12	6.61	13.07	206	25.49ʰ	0.78	147.50ʰ	100.50ʰ
13	10.27ʰ	14.14	183	22.66	1.02ʰ	127.50	80.50
14	5.67	13.23	119	27.68ʰ	1.02ʰ	120.50	80.50
15	7.78ʰ	15.20	200	33.12ʰ	0.19	147.60	80.20
16	6.94ʰ	15.00	245ʰ	26.56ʰ	1.28ʰ	150.50ʰ	90.50ʰ
17	10.28ʰ	14.00	236	22.15	0.70	113. 00	70.50
18	5.28	15.00	232	22.53	1.12ʰ	165.50ʰ	100.50ʰ
19	11.2ʰ	12.41	224	20.99	0.87	160.50ʰ	100.50ʰ
20	9.97ʰ	13.43	156	32.03ʰ	0.74	110.5	71.50
21	9.72ʰ	14.40	245ʰ	31.14ʰ	1.05ʰ	153.50ʰ	95.50ʰ
22	9.06ʰ	20.37ʰ	173	29.30ʰ	0.73	75.50	45.50
23	9.06ʰ	12.53	190	24.69	0.78	120.50	75.50

FBS=fasting blood sugar, Hb=Haemoglobin, TC=Total cholesterol, BMI=Body Mass Index, W:H=waist to Hip ratio, BLDPS=blood pressure systolic and BLDPD=blood pressure diastolic. Numbers bearing ʰ are above the reference range

parameters across Tables 1 to 5 for the different age ranges.

The age range of 40-45 years included 23 participants (Table 1). In plasma concentration: 15, 2, and 4 participants were higher than the reference limit concentrations for glucose, haemoglobin, and total cholesterol. In the anthropometric and blood pressure parameters, 15, 9, and 11 participants exceeded the reference limit values for body mass index, waist to hip ratio, and blood pressure, respectively. The age range 46-50 years included 14 participants (Table 2). In terms of plasma concentrations, 7, 1 and 5 participants had glucose, haemoglobin, and total cholesterol levels exceeding the reference limits, respectively. In the anthropometric and blood pressure parameters, 7, 7, and 5 participants higher than the reference limit values for body mass index, waist to hip ratio, and blood pressure, respectively.

The age range 51-55 years included 14 participants (Table 3). In plasma concentration, 4 participants had higher than the reference limit concentrations for glucose, and total cholesterol, but none for haemoglobin concentration. In the anthropometric and blood pressure parameters, 4, 5 and 4 participants had values higher than the reference limit values for body mass index, waist to hip ratio, and blood pressure, respectively. The age range of 56-60 years had 7 participants (Table 4). In plasma concentration, 5 participants had higher values than the reference limit concentration for glucose and none for haemoglobin and total cholesterol concentrations. In the anthropometric and blood pressure parameters, 5, 4, and 2 participants had higher values than the reference limit values for body mass index, waist to hip, and blood pressure, respectively. The age range 61-65 had 7 participants (Table 5). In plasma concentration, 7 and 2 participants had higher values than the reference limit concentration for glucose and

https://doi.org/10.58985/jpam.2025.v03i02.38

Table 2. Group 2 Cardiometabolic health among the Age range of 46-50.

Participant	Plasma biochemical parameters			Anthropometric parameters			
Code	FBS (mg/dl)	Hb (g/dl)	TC (mg/dl)	BMI (kg/m²)	W:H	BLDPS (mmHg)	BLDPS (mmHg)
24	5.17	14.23	250[h]	32.00[h]	1.20[h]	90.50	50.50
25	5.61	13.07	296[h]	25.49[h]	0.78	145 00[h]	100.50[h]
26	10.28[h]	14.14	183	22.66	1.02[h]	125.30	83.50
27	9.28[h]	15.50	250[h]	19.99	1.00	101.50	73.50
28	7.11[h]	16.00	244[h]	23.67	1.00	155. 50[h]	90.00[h]
29	11.17[h]	13.37	231	21.45	0.56	168. 00[h]	100.00[h]
30	5.56	12.31	203	23.20	0.73	120.00	80.50
31	10.39[h]	14.11	208	22.43	0.70	135.50	85.00
32	10.83[h]	13.40	219	29.42[h]	1.03[h]	120.00	75.50
33	5.11	15.75	188	29.32[h]	1.02[h]	70.00	70.00
34	9.28[h]	18.00[h]	232	31.42[h]	1.21[h]	168.5[h]	100.00[h]
35	5.78	14.16	104	22.47	0.87	121.50	80.00
36	5.61	16.04	282[h]	31.00[h]	1.40[h]	166.00[h]	110.5[h]
37	5.50	14.43	149	29.00[h]	1.02[h]	105.50	70.50

FSB=Fasting blood sugar, Hb=Haemoglobin, TC=Total cholesterol, BMI=Body Mass Index, W:H=waist to Hip ratio, BLDPS=blood pressure systolic and BLDPD=blood pressure diastolic. Numbers bearing [h] are above the reference range

Table 3. Group 3 Cardiometabolic health among the Age range of 51- 55.

Participant	Plasma biochemical parameters			Anthropometric parameters			
Code	FBS (Mmo/l)	Hb (g/dl)	TC (mg/dl)	BMI (kg/m²)	W:H	BLDPS (mmHg)	BLDPD (mmHg)
38	6.44	15.12	189	21.14	0.89	120.50	80.00
39	5.56	16.80	174	23.41	0.86	135.50	90.50
40	6.17	16.43	244[h]	33.76[h]	1.33[h]	160.50[h]	100.00[h]
41	11.33[h]	15.34	211	29.12[h]	1.19[h]	113.50	70.50
42	5.38	14.87	243[h]	24.00	0.76	100.00	70.00
43	6.44	13.33	238	23.21	0.80	120.00	70.50
44	6.17	15.00	232	20.32	1.11[h]	171.50[h]	100.00[h]
45	9.89[h]	16.41	278[h]	19.98	1.32[h]	141.00[h]	90.00[h]
46	10.90[h]	15.55	162	32.12 [h]	0.78	120.00	85.00
47	5.56	15.23	117	23.15	0.76	112.50	70.50
48	6.61	14.11	195	22.05	0.88	100.00	60.00
49	11.56[h]	15.23	243[h]	21.23	1.09 [h]	150.50[h]	100. 00[h]
50	4.89	14.68	188	29.31[h]	0.73	90.00	60.50
51	4.51	15.04	119	19.41	0.91	100.00	70.00

FBS=Fasting Blood Sugar, Hb=Haemoglobin, TC=Total cholesterol, BMI=Body Mass Index, W:H=waist to Hip ratio, BLDPS=blood pressure systolic and BLDPD=blood pressure diastolic. Numbers bearing [h] are above the reference range.

total cholesterol and none had higher haemoglobin concentration. In the anthropometric and blood pressure parameters, 7, 5, and 4 participants exceeded the reference limit values for body mass index, waist to hip ratio, and blood pressure, respectively. Higher-than-reference glucose concentrations and all anthropometric values, along with blood pressure values were obtained in all age ranges (Tables 1 to 5).

Table 6 shows that the mean glucose concentrations across all age groups exceeded the reference ranges. The highest and lowest mean glucose levels were 8.19 mg/dL in the 61–65 age group and 7.24 mg/dL in the 51–55 age group, respectively. The mean haemoglobin, total cholesterol, blood pressure, and body mass index (BMI) across age groups generally fell within reference limits in the study. However, only the BMI in the 51–55 age group (24.44 kg/m²) was within the normal range. The highest mean haemo-

https://doi.org/10.58985/jpam.2025.v03i02.38

Table 4. Group 4 Cardiometabolic health among the Age range of 56-60.

Participant Code	Plasma biochemical parameters			Anthropometric parameters			
	FBS (Mmo/l)	Hb (g/dl)	TC (mg/dl)	BMI (kg/m2)	W-H	BLDPS (mmHg)	BLDPD (mmHg)
52	6.67	12.30	118	27.68^h	1.02^h	120.50	80.00
53	7.56^h	14.21	215	31.21^h	0.16	150.50^h	102.00^h
54	6.94^h	14.00	202	27.43^h	1.21^h	165. 00^h	99.00^h
55	9.44^h	14.78	232	21.15	0.70	110.50	73.00
56	5.56	14.90	232	21.63	1.10^h	135.50	90.50
57	11.11^h	15.12	234	29.96^h	1.04^h	114.50	75.50
58	7.94^h	16.00	199	29.86^h	0.92	125.50	77.00

FBS=Fasting blood sugar, Hb=Haemoglobin, TC=Total cholesterol, BMI=Body Mass Index, W:H=waist to Hip ratio, BLDPS=blood pressure systolic and, BLDPD=blood pressure diastolic.
Numbers bearing ^{h} are above the reference range

Table 5. Group 5 Cardiometabolic health among the Age range of 61-65.

Participant Code	Plasma biochemical parameters			Anthropometric parameters			
	FBS (Mmo/l)	Hb (g/dl)	TC (mg/dl)	BMI (kg/m²)	W-H	BLDPS (mmhg)	BLDPD (mmhg)
59	5.67^h	14.23	118	27.18^h	1.03^h	125.50	81.00
60	10.50^h	14.54	226	23.18	0.70	155.00^h	100.50^h
61	7.61^h	16.00	200	31.21^h	0.17	135.50	94.50^h
62	5.80	15.98	200	28.61^h	1.05^h	155.50^h	100.00^h
63	5.56	15.00	320^h	27.30^h	1.20^h	161.50^h	100. 00^h
64	9.61^h	16.00	224	24.00	0.83	135.50	90.50
65	11.33^h	15.40	240^h	32.41^h	1.30^h	140.50^h	96.00^h
66	5.28	13.32	173	29.40^h	0.76	73.50	47.50
67	9.17^h	13.65	180	23.12	0.78	120.50	70.50
68	11.38^h	14.31	154	29.00^h	1.26^h	110.50	75.50

FBS=Fasting Blood Sugar, Ha=Haemoglobin, TC=Total cholesterol, BMI=Body Mass Index, W: H=waist to Hip ratio, BLDPS=blood pressure systolic and, BLDPD=blood pressure diastolic. Numbers bearing ^{h} are above the reference range.

Table 6. Comparison of the mean plasma biochemical, anthropometric, and blood pressure parameters across the different age ranges.

Age in years	40 -45	46-50	51- 55	56-60	61-65
FBS (mg/dl)	7.97±2.065	7.62±2.42	7.24±2.51	7.89±1.86	8.19±2.50
Ha (g/dl)	14.42±2.09	14.61±1.50	15.22±0.91	14.47±1.16	14.84±0.99
TC (mg/dl)	205.39±43.58	217.07±50.74	202.36±48.11	204.57±40.85	203.5±54.87
BMI (kg/m2)	27.16± 4.02	25.97± 4.20	24.44± 4.68	26.90±+ 4.05	27.54± 3.25
W-H	0.85±0.31	0.97± 0.22	0.96± 0.21	0.88±0.35	0.91± 0.34
BLDPS (mmHg)	132.83±24.28	128.06±30.31	123.96±24.62	131.71±19.94	131.35±26.04
BLDPD(mmHg)	83.37±16.08	83.57±15.77	79.82±14.37	85.29±11.82	85.6±17.16

No significant difference exist among the group at p>0.05.

globin level was 15.22 g/dL in the 51–55 age group, while the lowest was 14.42 g/dL in the 40–46 age group. For total cholesterol, the highest mean value was 217 mg/dL in the 46–50 age group, and the lowest was 202.36 mg/dL in the 51–55 group (Table 6). Systolic blood pressure was highest (132.83 mmHg) in the 40–45 years age group and lowest (123.96 mmHg) in the 51–55 years age group. Diastolic pressure was highest (85.6 mmHg) in the 61–65 group and lowest (79.82 mmHg) in the 51–55 years age group (Table 6). For anthropometric measures, the highest BMI was 27.54 kg/m² (61–65 years age group) and the lowest was 24.44 kg/m² (51–55 years age group). The waist-to-hip ratio ranged from a high of 0.97 (46–50 years

https://doi.org/10.58985/jpam.2025.v03i02.38

age group) to a low of 0.85 (40–46 years age group) (Table 6). Overall, there were no statistically significant differences among the age groups (P > 0.05) (Table 6).

4. Discussion

This study screened for cardiometabolic risk factors in both males and females in the POLAC. Haemoglobin, cholesterol, glucose, blood pressure and body anthropometry are sensitive indicators for monitoring cardiometabolic syndromes and cardiometabolic health [19-20]. The participants were grouped by age range, as reported [21].

In all age ranges (Group 1 to 5), the presence of plasma high glucose concentration (concentration above reference limit) was observed, depicting the endemic nature of the high glucose concentration in the study participants (Tables 1 to 5). The mean glucose concentration was higher than the reference concentration limit in all age ranges (Table 6), making the glucose concentration the most critical parameter. By extension, it is a prevalent condition in the larger society to the larger society, [22]. Over time, participants could suffer from the consequences of high glucose concentrations, ranging from micro-vascular to macrovascular complications [23]. High glucose concentration predispose body proteins and lipids to glycation, distorting the features and functions of the affected macromolecules. Moreover, high glucose concentration, called hyperglycemia, induces oxidative stress and inflammation, intensifies endothelial dysfunction, vascular damage, and others [24] (Fig. 2). Prolonged exposure to high glucose concentrations promotes insulin resistance [25]. High glucose concentration over time reduces the effectiveness of insulin action and other factors [25]. Diabetes is a diseases associated with cardiometabolic syndrome. It is usually diagnosed in individuals above 40 years of age [26] making the selected age groups appropriate for the research. Furthermore, Insulin resistance degenerates into the failing ability to cope with metabolic necessities [27] and by projection, it was the underlying cause of many diseases in cardiometabolic conditions [28]. Insulin resistance is a window of opportunity for the development of cardiometabolic syndromes or diseases.

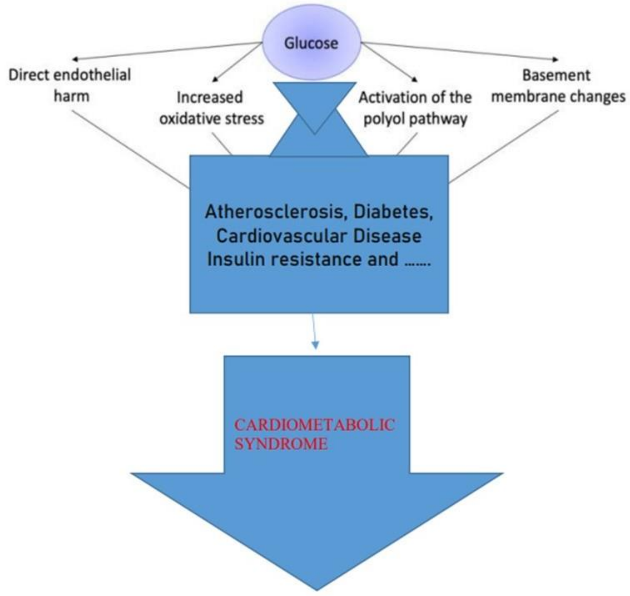

Figure 2. Potential relationship between glucose and cardiometabolic conditions.

High cholesterol (above the reference concentration limit) is a cardiometabolic marker. It did not cut across all age ranges and was sparse within the affected age groups. Prolonged elevated cholesterol levels are a risk factor for hypertension, another condition in the constellation of cardiometabolic conditions [29]. Aside from hypertension, persistent high cholesterol levels trigger for many sequels in cardiometabolic syndrome [30]. The mean cholesterol concentration among the age range was not above the reference limit, showing that high cholesterol is less of a problem in the selected participants. It is important to note that cholesterol plays a lesser role as a contributing factor to the cardiometabolic syndrome observed in the groups. The haemoglobin concentrations were within the reference limit in most of the age ranges, and the mean haemoglobin level was within the reference range, making it an insignificant contributor to cardiometabolic syndrome.

Among the anthropometric parameters checked (waist-to-hip ratio, and body mass index) the blood pressure values which were higher than the reference limit in all the groups (Table 1to 5), making them a contributing factor to the condition of hypertension. The presence of higher-than-reference values in all age groups may be a consequence of the combined presence of high glucose and cholesterol concentrations in the groups investigated. High blood

https://doi.org/10.58985/jpam.2025.v03i02.38

pressure is a risk factor for hypertension (increased systolic and diastolic pressure), regardless of the glucose level [31]. Hypertension is among the constellation of symptoms that make up the cardiometabolic syndrome.

A possible cause of distorted biochemical and accompanying anthropometry (total cholesterol, BMI, and others) was a high glucose concentration (Tables 1 to 5). [32]. High glucose concentration triggers an increase in cholesterol levels, which might lead to the development of atherosclerotic plaques [33] and poor anthropometric status among participants. Metabolic health remained consistent across the various age categories, as evidenced by the lack of statistically significant differences, indicating a uniform pattern in the measured parameters across age ranges.

5. Conclusions

The cardiometabolic risks were found to be present in the study participants, and there was no difference in metabolic syndrome across the age groups. High glucose off-limit concentrations likely triggered other parameters to the concentrations above their reference limits. Glucose concentration—was the major contributor to cardiometabolic disease among the participants.

Considering the findings of this study, periodic glucose screening and blood pressure measurements are needed among the POLAC community. It is advisable at the individual level. Again, it is recommended that a comprehensive lipid profile with sex categorization and additional diabeties marker assessments be conducted.

Ethical Statement

This research was in line with the Nigeria Police Academy ethical standards on the use of humans for research purposes. The project output of the research was deposited in the Department of Biochemistry and Forensic Science and received departmental approval following submission to the Department of Biochemistry and Forensic Science of the Nigeria Police Academy.

Disclaimer (artificial intelligence)

Author(s) hereby state that no generative AI tools such as Large Language Models (ChatGPT, Copilot, etc.) and text-to-image generators were utilized in the preparation or editing of this manuscript.

Authors' contributions

It is not applicable because a single author constructed this manuscript.

Acknowledgements

The researcher is grateful to members of Police Academy Staff and community and my students who assisted me during the bench work.

Funding

This research received no external funding.

Availability of data and materials

All relevant data are within the paper. Additional data will be made and available on request according to the journal policy.

Conflicts of interest

The author declares and confirms that there are no known conflicts of interest, no known competing financial interests, or personal relationships that could have appeared to influence the work reported in this paper.

References

1. O'Hearn, M.; Lauren, B.N.; Wong, J.B.; Kim, D.D.; Mozaffarian, D. Trends and disparities in cardiometabolic health among U.S. adults, 1999-2018. J. Am. Coll. Cardiolog. 2022, 80(2), 138–151. https://doi.org/10.1016/j.jacc.2022.04.046
2. Eroglu, T.; Capone, F.; Schiattarella, G.G. The evolving landscape of cardiometabolic diseases. eBioMed. 2024, 109, 105447. https://doi.org/10.1016/j.ebiom.2024.105447
3. Nwachukwu, F.C. Inflammatory reaction - A posit to the double-edged sword. Int. J. Biol. Pharm. Sci. Arch. 2021, 01(02), 197-209. https://doi.org/10.30574/ijbpsa.2021.1.2.0036
4. Ng, M.; et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980-2013: A systematic analysis for the Global Burden of Disease Study. 2013. Lancet (London, England). 2014, 384 (9945), 766–781. https://doi.org/10.1016/S0140-6736(14)60460-8
5. Vaduganathan, M.; Mensah, G.A.; Turco, J.V.; Fuster, V.; Roth, G.A. The global burden of

https://doi.org/10.58985/jpam.2025.v03i02.38

cardiovascular diseases and risk: A compass for future health. J. Am. Coll. Cardiolog. 2022, 80(25), 2361–2371. https://doi.org/10.1016/j.jacc.2022.11.005
6. Amini, M.; Zayeri, F.; Salehi, M. Trend analysis of cardiovascular disease mortality, incidence, and mortality-to-incidence ratio: results from global burden of disease study 2017. BMC public health. 2021, 21(1), 401. https://doi.org/10.1186/s12889-021-10429-0
7. Cannon, C.P. Cardiovascular disease and modifiable cardiometabolic risk factors. Clin. Cornerstone. 2007, 8(3), 11–28. https://doi.org/10.1016/s1098-3597(07)80025-1
8. Dulloo, A.G.; Miles-Chan, J.L.; Montani, J.P. Nutrition, movement and sleep behaviours: their interactions in pathways to obesity and cardiometabolic diseases. Obesity Rev. J. Int. Assoc. Study Obes. 2017, 18 Suppl. 1, 3–6. https://doi.org/10.1111/obr.12513
9. Mozaffarian, D. Dietary and policy priorities for cardiovascular disease, diabetes, and obesity: A comprehensive review. Circulation. 2016, 133(2), 187–225. https://doi.org/10.1161/CIRCULATIONAHA.115.018585
10. Micha, R.; Peñalvo, J.L.; Cudhea, F.; Imamura, F.; Rehm, C.D.; Mozaffarian, D. association between dietary factors and mortality from heart disease, stroke, and type 2 diabetes in the United States. JAMA. 2017, 317(9), 912–924. https://doi.org/10.1001/jama.2017.0947
11. Warburton, D.E.; Nicol, C.W.; Bredin, S.S. Health benefits of physical activity: The evidence. Can. Med. Assoc. J. 2006, 174(6), 801–809. https://doi.org/10.1503/cmaj.051351
12. Haskell, W.L., Lee, I.M., Russell, R.P., Pate, R.R., Powell, K.E.; Blair, S.N., Franklin, B.A.; Bauman, A. Physical activity and public health. updated recommendation for adults from the American college of sports medicine and the american heart association. Circulation, 2007, 116, 1081-1093. https://doi.org/10.1161/circulationaha.107.185649
13. Oja, P.; Titze, S. Physical activity recommendations for public health: development and policy context. The EPMA J. 2011, 2(3), 253–259. https://doi.org/10.1007/s13167-011-0090-1
14. Halcox, J.P.; Banegas, J.R.; Roy, C.; Dallongeville, J.; De Backer, G.; Guallar, E.; Perk, J.; Hajage, D.; Henriksson, K.M.; Borghi, C. Prevalence and treatment of atherogenic dyslipidemia in the primary prevention of cardiovascular disease in Europe: EURIKA, a cross-sectional observational study. BMC Cardiovas. Disord. 2017, 17(1), 160. https://doi.org/10.1186/s12872-017-0591-5
15. Balakumar, P.; Maung, U.K.; Jagadeesh, G. Prevalence and prevention of cardiovascular disease and diabetes mellitus. Pharm. Res. 2016, 113(Pt A), 600–609. https://doi.org/10.1016/j.phrs.2016.09.040
16. Song, Y.; Liu, J.; Zhao, Y.; Gong, L.; Chen, O.; Jiang, X.; Zhang, J.; Hao, Y.; Zhou, H.; Lou X.; Wang, X. Unhealthy lifestyles and clusters status among 3637 adolescents aged 11–23 years: a school-based cross-sectional study in China. BMC Public Health. 2023, 23, 1279. https://doi.org/10.1186/s12889-023-16197-3
17. Tang, Z.; Yang, X.; Tan, W.; Ke, Y.; Kou, C.; Zhang, M.; Liu, L.; Zhang, Y.; Li, X.; Li, W.; Wang, W.; Patterns of unhealthy lifestyle and their associations with depressive and anxiety symptoms among Chinese young adults: A latent class analysis. J. Affect. Disor. 2024, 352, 267-277. https://doi.org/10.1016/j.jad.2024.02.055
18. James, E.; Freund, M; Booth, A.; Duncan, M. J., Johnson, N., Short, C. E., Wolfenden, L., Stacey, F.G., Kay-Lambkin, F.; Vandelanotte, C. Comparative efficacy of simultaneous versus sequential multiple health behavior change interventions among adults: A systematic review of randomised trials. Prevent. Med. 2016, 89, 211–223. https://doi.org/10.1186/s12872-017-0591-5
19. Mahmood, S.S.; Levy, D.; Vasan, R.S.; Wang, T.J; The framingham heart study and the epidemiology of cardiovascular disease: a historical perspective. Lancet. 2014, 383(9921), 999–1008. https://doi.org/10.1016/S0140-6736(13)61752-3
20. Eckel, R.H.; Alberti, K.G.; Grundy, S.M.; Zimmet. Z. The metabolic syndrome. Lancet. 2010, 375(9710), 181–183. https://doi.org/10.1016/S0140-6736(09)61794-3
21. Moffatt, S.M.; Stewart, D.F.; Jack, K.; Dudar, M.D.; Bode, E.D.; Mathias, K.C.; Smith, D.L. Cardiometabolic health among United States firefighters by age. Prevent. Medicine Rep. 2021, 23, 101492. https://doi.org/10.1016/j.pmedr.2021.101492
22. Faselis, C.; Katsimardou, A.; Imprialos, K.; Deligkaris, P.; Kallistratos, M.; Dimitriadis, K. Microvascular complications of type 2 diabetes mellitus. Curr. Vas. Pharmacol. 2020, 18(2), 117–124. https://doi.org/10.2174/1570161117666190502103733.
23. Zakir, M.; Ahuja, N.; Surksha, M.A.; Sachdev, R.; Kalariya, Y.; Nasir, M.; Kashif, M.; Shahzeen, F.; Tayyab, A.; Khan, M.S.M.; Junejo, M.; Manoj, K.F.; Varrassi, G.; Kumar, S.; Khatri, M. T. Cardiovascular Complications of diabetes: from microvascular to macrovascular pathways. Cureus. 2023, 24, 15(9), e45835. https://doi.org/10.7759/cureus.45835.
24. Jyotsna, F.; Ahmed, A.; Kumar, K.; Kaur, P; Chaudhary,

M.H.; Kumar, S.; Khan, E.; Khanam, B.; Shah, S. U.; Varrassi, G.; Khatri, M.; Kumar, S; Kakadiya, K. A.; Exploring the complex connection between diabetes and cardiovascular disease: analyzing approaches to mitigate cardiovascular risk in patients with diabetes. Cureus. 2023a, 15(8), e43882. https://doi.org/10.7759/cureus.43882

25. Chakraborty, S.; Verma, A.; Garg, R.; Singh, J.; Verma, H. Cardiometabolic risk factors associated with type 2 diabetes mellitus: A mechanistic insight. Clin. Med. Insight. Endocrin. Diabet. 2023, 16, 11795514231220780. https://doi.org/10.1177/11795514231220780
26. Kaur, R.; Kaur, M.; Singh, J. Endothelial dysfunction and platelet hyperactivity in type 2 diabetes mellitus: molecular insights and therapeutic strategies. Cardiovas. Diabet. 2018, 17(1), 121. https://doi.org/10.1186/s12933-018-0763-3
27. Li, M.; Chi, X.; Wang, Y.; Setrerrahmane, S.; Xie, W.; Xu, H. Trends in insulin resistance: Insights into mechanisms and therapeutic strategy. Signal Transd. Target. Ther. 2022, 7(1), 216. https://doi.org/10.1038/s41392-022-01073-0
28. Jyotsna, F.; Mahfooz, K.; Patel, T.; Parshant, F.; Simran, F.; Harsha, F.; Neha, F.; Jyotishna, D.; Mishra, D.; Subedi, S.; Khatri, M.; Kumar, S.; Varrassi, G. A systematic review and meta-analysis on the efficacy diabetes mellitus. Cureus. 2023b, 15(7), e41746. https://doi.org/10.7759/cureus.41746
29. Kirk, E.P.; Klein, S. Pathogenesis and pathophysiology of the cardiometabolic syndrome. J. Clin. Hyp. (Greenwich, Conn.). 2009, 11(12), 761–765. https://doi.org/10.1111/j.1559-4572.2009.00054.x
30. Kanthe, P.; Patil, B.S.; Shrilaxmi, C. B.; Deshpande, A.; Shaikh, BG.; Aithala, M. Atherogenic index as a predictor of cardiovascular risk among women with different grades of obesity. Int. J. Collab. Res. Int. Med. Public Health. 2010, 4(10), 1767–1774. https://www.researchgate.net/publication/262936709_Atherogenic_Index_as_a_Predictor_of_Cardiovascular_Risk_among_Women_with_Different_Grades_of_Obesity
31. Yamada, M.H.; Fujihara, K.; Kodama, S.; Sato, T.; Osawa, T.; Yaguchi, Y.; Yamamoto, M.; Kitazawa, M.; Matsubayashi, Y.; Yamada, T.; Seida, H.; Ogawa, W.; Sone, H. Associations of systolic blood pressure and diastolic blood pressure with the incidence of coronary artery disease or cerebrovascular disease according to glucose status. Diabetes Care. 2021, 44(9), 2124–2131. https://doi.org/10.2337/dc20-2252
32. Wang, L.; Yan, N.; Zhang, M.; Pan, R.; Dang, Y.; Niu, Y. The association between blood glucose levels and lipids or lipid ratios in type 2 diabetes patients: A cross-sectional study. Front. Endocrin. 2022, 13, 969080. https://doi.org/10.3389/fendo.2022.969080
33. Brunzell, J.D.; Ayyobi, A.F. Dyslipidemia in the metabolic syndrome and type 2 diabetes mellitus. Am. J. Med. 2003, 115, Suppl 8A, 24S–28S. https://doi.org/10.1016/j.amjmed.2003.08.011

https://doi.org/10.58985/jpam.2025.v03i02.38