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BLOOD PRESSURE, HAEMATOLOGICAL AND BIOCHEMICAL CHARACTERISTICS OF SOME ADULT NIGERIANS

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ABSTRACT

Cardiovascular and other blood related diseases are fast replacing communicable diseases; therefore there is need to constantly monitor our specific deleterious parameters and their associates. In this work, blood samples were collected to determine biochemical parameters: total cholesterol (TC), high density lipoprotein- cholesterol (HDL - C), low density lipoprotein- cholesterol (LDL-C), very low density lipoprotein-cholesterol (VLDL-C), non-HDL-C, total glycerides (TG) and glucose level; and haematological parameters: per cent packed cell volume (PCV %), L-aspartate: 2-oxoglutarate subjects amino- transferase (AST), L-alanine : 2-oxoglutarate amino- transferase (ALT), alkaline phosphatase (ALP), potassium ion and urea in eighteen subjects in Akure; Southwest Nigeria using Reflotron® machine (auto analyzer) and supported with the use of questionnaire to get information on age, sex and blood pressure.

Blood pressure, TC, ALP, K^+ and glucose were all greater than the standard while TG, AST, ALT, urea and PCV % were within the standards among both sexes. The ratios of parameters were better predictors of diseased subjects: LDL-C/HDL-C, non-HDL-C/HDL-C, TC/HDL-C, and some ALT/AST were all greater than standards in both sexes whose respective standard values were 1.0, 3.4, <1.0. F distribution statistical analysis showed that ALT, ALT/AST and TC/HDL-C were significantly different among the sexes while TC/HDL-C, non-HDL-C/HDL-C and LDL-C/HDL-C were significantly different within the females, TC/HDL-C and TC/LDL-C within the males respectively.

KEYWORDS

Blood samples, biochemical and haematological characteristics, adult Nigerians.

INTRODUCTION

Blood is the fluid, filling the heart and blood vessels. It consists of a colourless fluid, plasma, in which are suspended the red blood corpuscles, the white corpuscles and the platelets [1]. It has been found that non communicable diseases such as depression and heart disease are fast replacing infectious diseases and malnutrition as the leading causes of disability and premature death [2].

Blood pressure is the pressure exerted by the blood on the blood vessels wall. It is usually referred to as the pressure within the arteries [1]. The normal systolic blood pressure is between (110-120 mmHg), the normal diastolic blood pressure is between (60-80 mmHg) [3]. Packed cell volume (PCV) (haematocrit value) is the volume of red blood cells in one deciliter of blood. An acceleration or deceleration in the standard of PCV is a sign of certain diseases related to blood, e.g. anemia [4]. The normal value for male is between 40-54 % while that of female is 37-47 %. Cholesterol is a crystalline substance of a fatty nature found in the brain, nerves, blood and bile. It may crystallise in the gallbladder and along arterial wall [1]. High cholesterol level in diets is linked to increased risk of heart disease (> 200 mg/dl) and other fat related diseases such as obesity, certain types of cancer, e.g. cancer of the colon, gallbladder and breast [5]. High density lipoprotein- cholesterol (HDL-C) is a plasma protein cholesterol complex that is relatively high in protein and low in cholesterol. Its major function is in transportation of cholesterol and other lipids from tissues to liver [1]. HDL-C is often referred to as “good cholesterol” because it removes cholesterol from the peripheral tissues and returns it to liver for possible degradation [6]. Low density lipoprotein-cholesterol (LDL-C) contains high proportion of cholesterol. It transports cholesterol from the liver to other body cells, hence often referred to as “bad cholesterol” since it can be taken up by muscle cells in arteries and have been implicated in the development of atherosclerosis (hardening of the arteries that leads to coronary heart disease, stroke and other diseases) [7]. Triglycerides are esters of glycerol with three fatty acids and 95 % of the lipids found in foods are triglycerides. The normal value of triglyceride that should be present in human blood for both male and female adults is between 0.3-1.8 mmol/l or 26.19-157.14 mg/dl [1].

L-alanine: 2- oxoglutarate aminotransferase (ALT or AlaAT) formerly called glutamate pyruvate transaminase (GPT) is an enzyme present in serum and body tissues, especially the heart and liver. It is released into the serum following tissue damage such as acute damage to hepatic cells, causing an increase in serum concentration [1]. L-aspartate: 2-oxoglutarate aminotransferase (AST or AspAT) formerly called glutamate oxaloacetate transaminase (GOT) is an enzyme present in serum and body tissues with high concentration in heart and liver. It is released into the serum following tissue damage such as myocardial infarction or acute damage to the liver cells [1]. Alkaline phosphatase (ALP) is an enzyme in the blood, intestines, liver and bone cells. Its chemical structure varies (called isoenzymes) depending on where it is produced. This makes it possible to determine where a problem has originated. When bones are growing, liver cells are damaged, or a biliary obstruction occurs, ALP levels rise considerably. The normal value is 20-140 IU/L (international units per liter) or 0.02-0.14 u/ml. Potassium ion (K^+) is one of the most important cations in the body fluids and it

is the most abundant intracellular cation [8]. The normal K^+ standard in the blood of an adult male and female is between 3.8-5 mmol/l. Urea is the chief nitrogenous end product of protein catabolism. It is excreted in the urine as its nitrogenous constituent [1]. It's normal value is between 3.0-6.5 mmol/l for both male and female adults. Glucose absorption is the most common way that carbohydrates, which serve as the major source of energy, are transported in the blood. Ability of the body to tolerate swings in the glucose level is essential to health. If glucose tolerance is poor, it leads to diabetes [9].

In this report, concentration of the following biochemical and haematological parameters in the blood were investigated: PCV, TC, HDL-C, VLDL-C, LDL-C, TG, non-HDL-C, ALT, AST, K^+, urea, glucose and ALP. Also reported were the ages and blood pressure (BP) of the subjects. This type of work will assist us to know the susceptibility of those subjects to cardiovascular diseases and other blood related diseases and how to minimize or eliminate them.

MATERIALS AND METHODS

Questionnaire/Collection of samples: Subjects involved in this type of study were those who came into the hospital for normal blood tests. The technologist normally took the blood into a clean bottle and used within two minutes of collection. Questionnaire forms were normally given to the subjects to complete, and the information contained among others included: name, age, sex, usual food intake, etc. Samples were taken and analysed at an hospital in Akure, Ondo State, Nigeria.

Blood pressure determination: The instrument used in measuring the blood pressure was mercury sphygmomanometer (Omron Digital Blood Pressure Monitor, Model HEM- 722 CR, Omron Healthcare, Inc. Vernon Hills, Illinois 60061, Made in China). Measurements were taken in millimeter of mercury (mmHg) by qualified personnel in the hospital.

Packed cell volume (PCV %) (Haematocrit value) determination: Instrument used: Micro-haematocrit tube. PCV machine (micro-haematocrit reader, Hawsley and Sons Ltd, England). Blood sample was collected into an ethylenediamine tetra-acetic acid (EDTA) tube, one end of tube sealed with crystal seal and taken into the microhaematocrit centrifuge, covered and spinned for five minutes. After spinning, the blood separated and the haematocrit reader gave the result in per cent.

Determination of TC, HDL-C, TG, AST, ALT, K^+, urea, glucose and ALP: Reflotron® System was used for these analyses. Reflotron® plus is a compact reflectance photometer for fully automatic evaluation of Reflotron® Tests. The instrument takes charge of all functions such as heating, automatic calibration, test execution and evaluation, and calculation of results. Reflotron® Tests are reagent strips for specific testing of important clinical- chemistry parameters directly from whole blood, plasma or serum. The direct use of whole blood is made possible through an integrated plasma separation pad. Reflotron® plus is a product of Bio-Stat Diagnostic Systems, Pepper Road, Hazel Grove, Strockport, Cheshire SK7 5BW. The instrument has information on test principle and wavelength for each test and measuring ranges.

For cost reasons, LDL-C values have long been estimated using the Friedewald formula (or a variant): [TC]-[total HDL-C] -20 % of the TG value = estimated LDL-C. Or: LDL-C = [(TC-(HDL-C + TG/5)]. The basis of this is that TC is defined as the sum of HDL-C, LDL-C and VLDL-C. The VLDL-C was estimated as one –fifth (1/5) of the TG [10]. Non – HDL-C value was calculated as TC-HDL cholesterol.

For the purpose of therapeutic decision-making, the followings were calculated: LDL-C/HDL-C, TG/HDL-C, non-HDL-C/HDL-C, TC/HDL-C, and ALT/AST ratios for both female and male subjects separately.

Statistical analysis: Also calculated were the variance ratio-5 per cent points for distribution of F between female and male subjects for age, BP, HDL-C, TC, LDL-C, VLDL-C, non-HDL-C, TG, AST, ALT, K^+, urea, glucose, PCV %, ALP, ALT/AST, LDL-C/HDL-C, TG/HDL-C, non-HDL-C/HDL-C and TC/HDL-C to see if any significant differences existed between the parameters in the sexes. The F test was also carried out in TG/HDL-C, non-HDL-C/HDL-C, TC/HDL-C, TC/LDL-C, LDL-C/HDL-C and ALT/AST within females and within males separately to again find out if differences were significant [11]. The blood samples were taken after each subject had fasted for at least eight hours. This is because the TG level varies significantly with food intake.

RESULTS

The blood pressure (BP) is in females (Table1a) and males (Table 2a). Results in Table 1a showed that only two subjects or 22.2 % had systolic BP (SBP) within normal (110-120 mmHg), that is, only 22.2 % would not have systolic hypertension (SH) in the females. Also only four or 44.4 % females were within the normal diastolic BP (DBP), that is, only 44.4 % would not have diastolic hypertension (DH). In Table 2a, it is shown that only one subject had SBP within normal, which means only 11.1 % would not have SH among the males. For DBP, only one subject or 11.1 % had normal value.

The PCV % values in the females (Table 1_b) ranged from 37.2-48.0 with an average of 42.8±3.3 % with a low coefficient of variation per cent (CV %) of 7.8. In the males the PCV % ranged from 37.4 - 48.0 with a mean of 43.9±3.6 and a variation of 8.3 %. About 22.2 % (2 subjects) of the males had PCV % lower than the minimum of 40.0 while others fell within the range of 40-54 %.

The TC, HDL-C, VLDL-C, non-HDL-C, LDL-C and TG levels in the female subjects are depicted in Table 1a and those for males depicted in Table 2a. The TC range in females was 213-255 mg/dl with an average of 237.9 ±11.3 mg/dl and CV % of 4.8 showing the results were very close. However, all were greater than 200 mg/dl. The corresponding values in males were 224-252 mg/dl with an average of 242 ±11.4 mg/dl and CV % of 4.7 showing that TC levels in both sexes were close.

The HDL-C levels for females ranged from 23.0-35.5 mg/dl with an average of 29.8 ± 3.4 mg/dl and CV % of 11.3 whereas for males HDL-C range was 29.6-38.2 with a mean of 33.6 ±2.7 mg/dl and CV % of 7.9.

For the LDL-C levels, it ranges from 165.3-213.66 mg/dl and mean of 190.1±13.4 mg/dl with CV % of 7.04 in females; it is 173.12-202.1 mg/dl and mean of 190.43±11.0 mg/dl with CV % of 5.76 in the males. Both sexes levels were much higher than 100 mg/dl standard level and also higher than the level (106 mg/100 ml) of Sowunmi *et al*. [12].

The TG levels in Tables 1a and 2a were the normal level of 0.3-1.8 mmol/l (12.19-157.14 mg/dl). In females TG ranged from 0.99-1.08 mmol/l (86.4-94.3 mg/dl) with an average of 1.03 ±0.03 (89.9±2.48 mg/dl) while in males; the range was 0.99-1.08 mmol/l with an average of 1.03 ±0.03 showing close relationship with the female values. These results were lower than literature value of 2.305 mmol/l (89mg/100 ml) [12].

The non- HDL-C in the females (Table 1a) ranged between 183.1-232 mg/dl with an average of 208.1±13.5 mg/dl. In the males (Table 2a) the range was 191.8-219.9 mg/dl with an average of 208.4±10.8 mg/dl. While the CV % was 6.50 in females it was 5.16 in males, these values were close. Non-HDL-C offers the benefit of being an aggregate measure that includes the concentrations of all lipoproteins currently believed to contribute to atherosclerosis.

The VLDL-C in the females ranged from 17.28-18.86 mg/dl with a mean of 17.98±0.50 and CV % of 2.75. For the males the range was 17.28-18.86 mg/dl with a mean of 17.98±0.51 mg/dl and CV % of 2.84. VLDL-C is usually a reflection of the concentration of the TG. The values of VLDL-C in the two sexes were close.

Table 1a

Age, Blood pressure, haematological and biochemical characteristics of the female subjects*

Serial No.	Age (y)	BP mmHg	TC mg/dl	HDL-C mg/dl	LDL-C mg/dl	TG mmol/l	VLDL-C mg/dl	Non-HDL-C mg/dl
1	21	130/90	237	30.1	188.4	1.06	18.5	206.9
2	35	150/90	232	32.7	181.66	1.01	17.64	199.3
3	21	141/80	213	29.9	165.3	1.02	17.8	183.1
4	74	185/100	255	23.0	213.66	1.05	18.34	232
5	28	120/80	240	30.8	190.34	1.08	18.86	209.2
6	47	120/70	238	26.2	194.16	0.99	17.28	211.8
7	50	135/80	233	30.1	185.26	1.01	17.64	202.9
8	50	129/83	250	29.8	202.22	1.03	17.98	220.2
9	52	140/89	243	35.5	189.7	1.02	17. 8	207.5
Mean	42.0	139/84.7	238	29.8	190.1	1.03	17.98	208.1
SD	16.3	18.7/8.1	11.3	3.4	13.4	0.03	0.50	13.5
CV %	38.9	13.5/9.6	4.8	11.3	7.04	2.59	2.75	6.50
Standard	-	110-120/ 60-80	<200	47	100	0.3-1.8	-	-

**TC = total cholesterol. HDL-C = high density lipoprotein cholesterol. LDL-C = low density lipoprotein cholesterol. VLDL-C = very low density lipoprotein cholesterol. TG = triglycerides. BP = blood pressure.*

Table 1b

Age, Blood pressure, haematological and biochemical characteristics of the female subjects*

Serial Number	AST u/ml	ALT u/ml	K^+ mmol/l	Urea mmol/l	Glu mmol/l	PCV %	ALP u/ml
1	00.68	0.022	5.6	5.5	5.5	42	0.172
2	0.100	0.019	5.2	4.2	5.0	42	0.181
3	0.012	0.019	3.0	3.4	5.1	48	0.168
4	0.086	0.093	4.6	4.4	5.4	41	0.170
5	0.012	0.025	3.5	3.6	4.9	37.2	0.168
6	0.098	0.010	<2.0	5.5	5.0	43	0.176
7	0.011	0.011	4.5	4.3	5.4	48	0.176
8	0.093	0.015	5.1	4.1	4.3	40	0.162
9	0.088	0.019	<2.1	5.2	5.1	44	0.170
Mean	0.633	0.026	4.0	4.5	5.1	42.8	0.171
SD	0.037	0.024	1.3	0.7	0.35	3.3	0.0053
CV %	5.91	93.1	32.3	16.5	6.8	7.8	3.08
Standard	5-40	5-35	3.8-5.0	3.0-6.5	3.0-5.0	36-47	0.02-0.14

AST or Asp AT = L-aspartate: 2-oxoglutarate aminotransferase. ALT or Ala AT = L-alanine: 2-oxoglutarate aminotransferase. K^+ = potassium ion. Glu = glucose. PVC = packed cell volume. ALP = alkaline phosphatase. SD = standard deviation. CV% = coefficient of variation per cent.

Table 2a

Age, blood pressure, haematological and biochemical characteristics of the male subjects*

Serial No.	Age (y)	BP mmHg	TC mg/dl	HDL-C mg/dl	LDL-C mg/dl	TG mmol/l	VLDL-C mg/dl	Non-HDL-C mg/dl
1	28	132/88	228	32.4	177.8	1.02	17.8	195.6
2	22	120/89	249	33.5	198.22	0.99	17.28	215.5
3	65	152/93	250	36.0	195.14	1.08	18.86	214
4	26	132/88	251	35.2	198.16	1.01	17.64	215.8
5	52	151/90	250	30.1	202.1	1.02	17.8	219.9
6	43	170/110	252	35.1	199.26	1.01	17.64	216.9
7	51	130/80	226	29.6	178.42	1.03	17.98	196.4
8	60	144/90	248	38.2	191.64	1.04	18.16	209.8
9	41	131/82	224	32.2	173.12	1.07	18.68	191.8
Mean	43.1	140.2/90	242	33.6	190.43	1.03	17.98	208.4
SD	14.4	14.5/8.0	11.4	2.7	11.0	0.03	0.51	10.8
CV %	33.5	10.3/8.9	4.7	7.9	5.76	2.7	2.84	5.16
Standard-		110-120/ 60-80	<200	37	100	0.3-1.8	-	-

** = see Table 1a.*

Table 2b

Age, blood pressure, haematological and biochemical characteristics of the male subjects*

Serial Number	AST u/ml	ALT u/ml	K^+ mmol/l	Urea mmol/l	Glu mmol/l	PCV %	ALP u/ml
1	0.086	0.011	3.4	4.3	5.4	43	0.166
2	0.011	0.224	<2.0	3.6	5.0	37.4	0.174
3	0.011	0.011	4.3	3.8	4.9	44	0.180
4	0.011	0.021	4.1	5.2	5.3	46	0.180
5	0.011	0.018	<2.2	3.6	5.6	47	0.172
6	0.069	0.028	5.3	3.7	5.0	48	0.174
7	0.065	0.012	5.1	4.3	4.0	47	0.172
8	0.077	0.025	<3.1	5.1	5.4	38	0.178
9	0.103	0.022	5.6	4.4	4.5	45	0.154
Mean	0.049	0.041	3.9	4.2	5.0	43.9	0.172
SD	0.036	0.065	1.2	0.8	0.5	3.6	0.008
CV %	72.5	158.1	32.0	13.7	9.4	8.3	4.47
Standard	5-40	5-35	3.8-5.0	3.0-6.5	3.0-5.0	40-54	0.02-0.14

** = see Table 1b.*

The LDL-C/ HDL-C ratio in the females ranged from 5.34-9.29 (Table 3) and 5.02-6.71 in the males (Table 4). All these were greater than the normal level of 1.0. This ratio has been found to be highly predictive of heart disease risk, more so than total blood cholesterol alone [13]. Also the TC/HDL-C values ranged from 6.85-11.08 in females and 6.49-8.24 in males which were both above the American standard value of 3.4.

The urea levels in the males had an average of 4.2 ±0.8 mmol/l and 4.5 ±0.7 mmol/l in the females. Most of the values in the two sexes were within the standard values of 3.0-5.0 mmol/l for both sexes [1].

Table 3
LDL-C/HDL-C, TC/HDL-C and ALT/AST ratios for female subjects

Serial No.	LDL-C/HDL-C	TC/HDL-C	ALT/AST	TG/HDL-C	Non-HDL-C/HDL-C
1	6.26	7.87	0.31	3.07	6.87
2	5.56	7.09	0.02	2.70	6.09
3	5.53	7.12	1.60	2.98	6.92
4	9.29	11.08	1.07	3.99	10.1
5	6.18	7.99	2.09	3.06	6.79
6	7.41	9.08	0.10	3.30	8.08
7	6.15	7.74	0.99	2.93	6.74
8	6.79	8.39	0.16	3.02	7.39
9	5.34	6.85	0.21	2.51	5.85
Mean	6.50	8.13	0.73	3.06	7.11
SD	1.23	1.23	0.70	0.42	1.32
CV %	19.0	15.149	96.5	13.6	18.5
Standard	1.0	3.4	<1.0	-	-

The glucose levels for the females gave an average of 5.1 ±0.35 while it was 5.0 ±0.5 mmol/l and four subjects were above the maximum in the males and six in the females. These results indicated that 10 subjects would likely suffer the deleterious effects of excess glucose.

The K^+ levels in females ranged from <2.0-5.6 mmol/l with an average of 4.0 ±1.3 mmol/l and CV % of 32.3; it ranged from <2.0-5.6 mmol/l with an average of 3.9 ±1.2 and CV % of 32.0 in the males. While the overall averages were within the normal range of 3.8-5.0, individual values deviated either negatively or positively.

The normal standard of alkaline phosphatase (ALP) is 20-140 IU/L (international units per liter) or 0.02-0.14 u/ml. In both males and females all the ALP levels were higher than the standard range. This meant that the enzyme was high in all the samples. The average value in females was 0.17 ±0.0053 u/ml and 0.172 ±0.008 u/ml in the males.

Table 4
LDL-C/HDL-C, TC/HLD-C and ALT/AST ratios for male subjects

Serial no.	LDL-C/HDL-C	TC/HDL-C	ALT/AST	TG/HDL-C	Non-HDL-C/HDL-C
1	5.49	7.04	0.13	2.75	6.04
2	5.92	7.43	19.93	2.58	6.43
3	5.42	6.94	1.05	2.62	5.94
4	5.63	7.13	1.88	2.51	6.13
5	6.71	8.24	1.645	2.96	7.31
6	5.68	6.61	0.41	2.51	6.18
7	6.03	7.64	0.18	3.04	6.64
8	5.02	6.49	0.33	2.38	5.49
9	5.38	7.58	0.22	2.90	5.96
Mean	5.70	7.23	2.86	2.69	6.24
SD	0.48	0.52	6.07	0.23	0.52
CV %	8.48	7.16	212.08	8.53	8.26
Standard	1.0	3.4	<1.0	-	-

Table 5
Variance ratio – 5 per cent points for distribution of F (between female and male subjects) [+]

Parameter	Calculated F value	Remark
Age	1.28	ns
Blood pressure	1.66/1.03	ns
HDL-C	1.60	ns
TC	1.02	ns
LDL-C	1.48	ns
VLDL-C	1.04	ns
TG	1.00	ns
Non-HDL-C	13.4	*
AST (Asp AT)	1.06	ns
ALT (Ala AT)	7.29	*
K^+	1.06	ns
Urea	1.64	ns
Glucose	1.845	ns
PCV %	1.20	ns
ALP	2.11	ns
ALT/AST	75.19	*
LDL-C/HDL-C	6.57	*
TC/HDL-C	5.60	*
TG/HDL-C	3.33	ns
Non-HDL-C/HDL-C	6.44	*

[+] = F_{table} *is 3.44. ns = not significant.*
* = *significant. Degrees of freedom n = n- 1 = 8 for both numerator and denominator.*

Table 6

Variance ratio – 5 per cent points for distribution of F (within females and within males) [+]

Parameter	Within females	Remark	Within males	Remark
TG/HDL-C	4.04	ns	2.55	ns
TC/HDL-C	11.38	*	18.51	*
TC/LDL-C	5.22	ns	173	*
LDL-C/HDL-C	5.53	*	6.72	*
Non–HDL-C/HDL-C	11.3	*	4.09	ns
ALT/AST	2.38	ns	3.24	ns

[+] = *see Table 5 for * and ns.*

The serum /body tissue enzymes, AST or AspAT (formerly GOT) and ALT or AlaAT (formerly GPT) levels are shown in Tables 1b (females) and 2b (males). The standard for AST is 5-40 u/ml and ALT is 5-35 u/ml. The ALT/AST ratios are shown in Tables 3 (females) and 4 (males).

DISCUSSION

The subjects in this report were normally people who attended hospitals for their blood tests. However, a questionnaire was always available for the subjects to complete before their blood tests could take place. From such answers, their ages, sexes and blood pressure were obtained. By mere coincidence the number of subjects who were males was nine and those of females were also nine, that is, ratio of 1:1 and a total of eighteen subjects. For females, age range was 21-74 years with an average of 42.0 ±16.3 years (Table1a) and males, 22-65 years with an average of 43.1 ± 14.4 years (Table 2a).

Two things are clear from the BP values for the two sexes: males were worse of in having abnormal values than females; while every subject would suffer either SH, DH or both in males, only five would suffer both in females as well as two for DH and two would be free completely. The highest SBP and DBP were recorded for the oldest woman (74 years) (185/100 mmHg) and also for the oldest man (65 years) (152/93 mmHg) showing that BP could be influenced by age. It has been shown that cardiovascular risks increase with increasing diastolic or systolic pressure at all ages. The incidence of stroke in the elderly is very high and reduction of high BP in younger subjects undoubtedly reduces this risk [14]. A high SP with a normal DP (e.g. serial number 3 and 7 in Table 1a) is said to be characteristic of exercise, and is often seen in aortic value incompetence or in any high cardiac output state such as thyrotoxicosis [14]. The cardiac irregularities may be a prominent feature in older subjects and it is much commoner in women than in men [1]. Isolated SH, arbitrarily defined as a SP in excess of 160 mmHg with a DP of less than 95 mmHg, may also be caused by a loss of elasticity of larger arteries, which is a normal ageing process, none of such is in Table 1a and 2a.

The measurement of PCV, otherwise known as the haematocrit, is so useful in any haematologic workup that its presence in haemotology test panels is taken for granted. It is also a linchpin of quality control programmes in the haematologic laboratory.

The normal range of PCV % for females ranged from 36-47. This meant that all the women were within the range with normal PCV % level in their bodies and might not likely give birth to anaemic children, they would be sure of adequate blood supply during childbirth. However, the only woman (11.1 %) with PCV % of 37.2 was just 3.33 % above the minimum of 36.0 %; hence she might be at risk of inadequate blood supply during childbirth.

The TC values were slightly higher than the value reported (178±43.0 mg/100 ml) by Sowunmi *et al*. [12] but within the range (70-250 mg/dl) reported by Edozien [15].

HDL-C levels in the males were close to the standard of 37.0 mg/dl and better than the levels in the females; the HDL-C levels in the females were also far from the standard of 47.0 mg/dl. All the current HDL-C levels were lower than the level reported by Sowunmi *et al*. [12] (54.0 ±9.4 mg/100ml).

Excess cholesterol in the blood has been correlated with cardiovascular diseases. LDL-C is some times referred to as "bad cholesterol" because the elevated levels of LDL-C correlate most directly with coronary heart disease or stroke. A healthy LDL-C level is one that falls in the optimal or near-optimal range. Optimal: <100 mg/dl; near optimal: <100 -129 mg/dl; boarderline high: 130-159 mg/dl; high: 160-189 mg/dl; very high: 190 mg/dl and higher. This meant all the current LDL-C may be associated with increased risk of atherosclerotic heart disease and familial hyperlipiproteinemia. HDL-C is also used in an evaluation of coronary risk factors. Higher levels of HDL-C is said to be protective against coronary artery disease, thus HDL-C is sometimes referred to as "good cholesterol". Women tend to have better HDL-C than men (this is contrary to the current report). In general, an increased risk for heart disease, including heart attack, occurs when the HDL-C level is less than 40 mg/dl. More specifically, men are at particular risk if their HDL-C is below 37 mg/dl and women if their HDL-C is below 47 mg/dl meaning only one subject or 5.6 % of the 18 subjects would not suffer HDL-C risk. Low levels of HDL-C may indicate an increased risk of atherosclerotic heart disease. An HDL-C of 60 mg/dl or above helps protect against heart disease.

By providing an inclusive measure of all atherogenic particles, there is a strong degree of biologic plausibility for the hypothesis that non- HDL-C is a superior predictor of cardiovascular disease (CVD). Not surprisingly, as TG increase, non- HDL-C correlates with apo B much better than LDL-C [16, 17]. Several groups encouraged use of non- HDL-C long before supporting longitudinal epidemiologic data was published [18, 19].

The American standards for VLDL-C range were 13.7-26.8 mg/dl for age range 20-54 years among males. All the present results were within this range, that is, the expected non risk levels [20].

Individuals with a LDL-C/HDL-C of 1.0 or TC/HDL-C of 3.4 are said to have about one half the heart disease risk of the average American [5]. The values of LDL-C/HDL-C were higher than 2.02 ±0.8 as reported by Sowumi *et al*. [12].

Perhaps the most widely used ratios are LDL-C/HDL-C and TC/HDL-C. Retrospective analysis of the Helsinki Heart Study (HHS) revealed that LDL-C/HDL-C values > 5 were associated with increased coronary risk [21], whereas an analysis of 5-year data from the Program on the Surgical Control of the Hyperlipidemias (POSCH) study found that the highest hazard ratios were for LDL-C/HDL-C, with each 1-unit increment associated with a 1.2 – fold increase in CHD risk [22].

The urea results showed that the majority of the subjects have normal functioning of the kidneys. About four or 22.2 % subjects might suffer from ureamia. Normal blood urea nitrogen (BUN) levels are 5-18 mg/dl for children; 7-18 mg/dl for adults and 8-20 mg/dl in the elderly.

A subject with K^+ < 3.5 mmol/l in the plasma might suffer from hypokalemia; this low value might be due to excessive vomiting, prolonged use of diuretics, steroids, etc, nausea and muscle weakness are often present. Five subjects in the males and five in the females have K^+ levels >3.5 mmol/l. That meant 10 or 55.6 % subjects might suffer from severe hyperkalemia. Early signs of hyperkalemia are nausea, diarrhea and muscular weakness [1]. Heart failure can also occur when concentration of K^+ in the blood rises following minor injury that leads to large number of cell rupture, releasing intracellular K^+ (4.0 ±0.3 meq/l) [12] is close to few of the reported results.

Alkaline phosphatase (ALP) test is useful in diagnosing liver disease (jaundice- yellowing of the skin and eyes); the cause of liver disease; parathyroid disease; vitamin D deficiency; the cause of pain in the upper abdomen; bone disease.

Serum ALP (U/L) from literature are: normal infants 99-298; normal adults 57-99; rickets (children) >390; osteomalacia 298; hyperparathyroidism 78-390; osteoporosis 36; Paget's disease 994; neoplasm: osteoblastic 604 [23]. From here, it is seen that the current results were much higher than values for normal adult ALP. Adults have lower levels of ALP than children because children's bones are still growing. During some growth spurts, levels can be as high as 500 IU/L. Usually children are not measured because of the potential for such amounts, so the abnormal results refer to adults.

All the current results in AST and ALT were lower than the minimum. It will appear from these results that tissue damage such as acute damage to hepatic cells and myocardial infarction might have occurred minimally or not at all [1].

The standard ALT/AST is <1.0. In the results six female subjects had ALT/AST < 1.0 while five subjects were in that position in the males. The ALT/AST for male subject number two had a very high level of 19.93.

Table 5 showed the F-test results of variance ratio -5 per cent point for distribution of F between female and male subjects. The values of ALT/AST and TC/HDL-C were each greater than subjects. The values of ALT, ALT/AST, non-HDL-C, LDL-C/HDL-C, non – HDL-C/HDL-C and TC/HDL-C were each greater than the F_{table} value showing them to be significantly different between the sexes. Also Table 6 shows the variance ratio of some parameters within females and within males. Value of TC/HDL-C and LDL-C/HDL-C were significantly different within their groups. Also non-HDL-C/HDL-C was significantly different within the female subjects.

CONCLUSIONS

Males had higher BP than females and BP was age dependent. HDL-C and LDL-C showed males were in lower risk of carchiovascular disease than in females, although high LDL-C in both sexes could lead to increased risk of atherosclerotic heart disease and familial hyperlipoproteinemia. Non- HDL-C shows a signifant correlation with CVD and it has been useful to identify high-risk individuals. Cholesterol ratio is a simple approach for lipid risk assessment. This ratio reflects two powerful components of risk. A high TC, TG and LDL-C are a marker for atherogenic lipoproteins, whereas low HDL-C correlates with the multiple risk factors of the metabolic syndrome and probably imparts some independent risk. A final advantage of non-HDL-C and the various lipid ratios are that it can be readily calculated from the values obtained on a routine lipid profile. All would be susceptible to hyperparathyroidism disease due to high ALP but there was no evidence of damaging leakage of ALT and AST into the blood.

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