Serum cholesterol levels in a Nigerian population sample

I. C. Ononogbu[1]

Department of Biochemistry University of Nigeria, Nsukka (Nigeria), 7 February 1979

Summary. Serum cholesterol was determined in 104 healthy Nigerians (57 males and 47 females). The average cholesterol concentration was 187 ± 72.8 mg/100 ml (mean ± SD) with a range of 60–480 mg/100 ml. Cholesterol levels were higher in males than in females and increased with age. Distribution of cholesterol level was generally skew to the left.

Many sources of variation make it difficult to define generally applicable normal values of plasma lipids and lipoproteins. Because lipid levels in normal subjects vary in relation to age, environment, season, race, and even diet, the establishment of normal lipid values in any environment becomes necessary. Establishment of normal lipid levels ensures comparison of values between any 2 environments or races. The incidence of hyperlipidaemia can also be correlated effectively. Serum cholesterol levels tend to be low in countries such as Japan[2], Kenya[3] and India[4] where unrefined carbohydrate intake is high and fat intake low, and incidence of ischaemic heart disease is rare[5]. Serum cholesterol levels are high in countries such as the United States of America[6], Sweden[7], New Zealand[8] and Britain[9] where fat intake is high, unrefined carbohydrate intake is low and incidence of ischaemic heart disease is high. The association of hypercholesterolaemia with atherosclerosis[10–12] appears to make investigation of cholesterol levels in different communities a necessity. A global picture of serum lipids and lipoproteins has been presented by Keys[13]. Most of the studies on lipids in Africa have, however, been concentrated in the Eastern[14,15], and Southern[16,17] parts of the continent. Values obtained from these African countries have often been extrapolated to other African countries. Apart from the publication by Edozien[18] in which the cholesterol range in a Nigerian population was mentioned, and a comparative study by Taylor[19] there was no detailed study on the cholesterol levels in the Nigerian population at the time when this study was made.

This investigation is therefore aimed at providing a relatively detailed account of cholesterol levels in a Nigerian population sample.

Subjects and method. 104 healthy adult subjects (57 males and 47 females) were selected from the environs of Nsukka. Nsukka is a semi-urban community in the Anambra state of Nigeria. Subjects were invited orally to participate in the study. A total of 110 subjects volunteered to take part, but 6 subjects failed to show up. The subjects ranged between the ages of 20 and 50 years. They were judged healthy from medical records and from physical appearance. None was on any drugs or suffering from any ailment known to affect lipid metabolism. The subjects were not put on any dietary control but were allowed to eat their normal Nigerian diets, which generally consist of the following:

Breakfast: Pap (porridge made from corn flour or maize flour) and akara balls (made from ground black-eyed beans) or fried yam and plantains. Lunch: Garri (cassava flour) or pounded yam eaten with different types of soup, for example egusi (melon) soup and okra soup. Supper: Rice and plantain or rice and beans, beans alone or rice alone. The subjects reported in the morning after an overnight fast.

A 5-ml blood sample was obtained by venipuncture and the serum was separated by low speed centrifugation. The serum was inspected for lactescence to check on the non-fasting condition. Cholesterol was determined by the method of Anderson and Keys[20].

Results. The mean cholesterol concentration was 187 mg/100 ml, and distribution was skew to the left (figure). Cholesterol concentration was lower in females than in males (table 1). On the average, cholesterol concentration increased with age (table 2).

Discussion. In order to define abornmal or normal lipid transport, certain upper limits or cut-off points of lipid

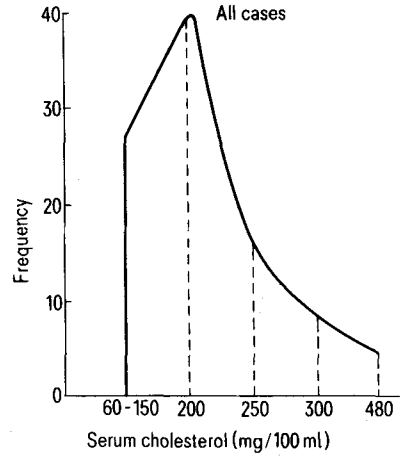

Table 1. Serum cholesterol concentration (mg/100 ml) in the 2 sexes

Subject	Number of subjects	Mean	Standard deviation	Standard error	Range
All	104	187	72.8	7.7	420 (60-480)
Male	57	191.6	78.3	10.4	420 (60-480)
Female	47	179.3	62.0	11.0	293 (91-384)

Table 2. Serum cholesterol concentration (mg/100 ml) in the different age groups

Age group	Number of subjects	Mean	Standard deviation	Standard error	Range
20–29 years	38	180.5	61.5	10.4	304 (80-384)
30–39 years	50	178.8	57.1	8.2	351 (60-411)
40–49 years	16	202.6	61.1	29.8	343 (136-480)

concentration need to be established. These cut-off points have been provided in this study. Although cut-off points are arbitrary, they provide a necessary basis for defining normal or abnormal lipid concentrations. The role of lipids and lipoproteins in the aetiology of coronary heart disease is incompletely defined. There are numerous risk factors for coronary heart disease. Abnormal lipid transport is, at any rate, closely associated with coronary heart disease. Abnormality in transport of cholesterol is particularly associated with ischaemic heart disease[10,12].

The present study therefore provides a basis for the definition of hyperlipidaemia of a hypercholesterolaemic nature in this Nigerian population. Although total serum cholesterol determination alone does not indicate whether there is increased low density lipoprotein cholesterol concentration, it is the index that determines whether lipoprotein phenotyping is necessary or not. In children high density lipoprotein cholesterol concentration is high[21]. In children, and in adults also, increased serum cholesterol may be due to increased cholesterol concentration in the high density lipoprotein particles. For such situations, therefore, total serum cholesterol determination is followed by lipoprotein phenotyping.

This low cholesterol level found in the Nigerian population may contribute to the rare incidence of ischaemic heart disease in Nigeria.

It has been shown that high density lipoprotein can act as an antiatherogenic agent[22]. In another study it has been reported that there is high level of high density lipoprotein cholesterol in the Nigerian population.

1 Acknowledgment. I am grateful to Mr S.O. Oguike and Mr O. Uzoechi for technical assistance. I also thank Dr E.O. Anosike for his help in arranging for the subjects of study.
2 K. Suzuki, H. Watanabe, N. Takahashi, S. Tanaka and S. Koyama, Jap. Heart J. *4*, 323 (1963).
3 A.G. Shaper, J. Jones and J. Kyobe, Lancet *2*, 1324 (1961).
4 M.C. Nath and I. Vaishwanar, Indian J. Physiol. allied Sci. *16*, 93 (1963).
5 A.O. Williams, Br. Heart J. *33*, 95 (1971).
6 D.S. Fredrickson, R.I. Levy and R.A. Lees, N. Engl. J. Med. *276*, 32 (1967).
7 L.A. Carlson, Acta med. scand. *167*, 377 (1960).
8 P.J. Scott, Clin. chim. Acta *15*, 449 (1967).
9 B. Lewis, I.D.P. Wootton, D.M. Krikler, A. February, A. Chait, C.M. Oakley, G. Sigurdsson and B. Maurer Lancet *1*, 141 (1974).
10 D. Aldersberg, Am. J. Med. *11*, 60 (1951).
11 L.A. Carlson and L.E. Bottiger, Lancet *1*, 865 (1972).
12 W.B. Kannel, W.P. Castelli, T. Gordon and P.M. McNamara, Annls int. Med. *74*, 1 (1971).
13 A. Keys, Atherosclerosis *22*, 149 (1975).
14 A.G. Shaper and K.W. Jones, Lancet *2*, 1305 (1962).
15 A.G. Shaper, Br. Med. J. *4*, 32 (1972).
16 J. Higginson and W.J. Pepler, J. clin. Invest *33*, 1366 (1954).
17 B.J.P. Becker, S. Afr. J. med. Sci. *11*, 97 (1946).
18 J.C. Edozien, J.W. Afr. Sci. Ass. *10*, 3 (1965).
19 G.O. Taylor, Trop. geogr. Med. *23*, 158 (1971).
20 J.T. Anderson and A. Keys, Clin. Chem. *2*, 145 (1956).
21 I.C. Ononogbu, Thesis. London University 1976.
22 G.J. Miller and N.E. Miller, Lancet *1*, 16 (1975).

Level of marker enzymes in spermatogenesis on administration of $PGF_{2\alpha}$ in rats

Hari Pal Singh, S.S. Kakar and N.C. Ganguli[1]

National Dairy Research Institute, Karnal 132001, Haryana (India), 14 February 1979

Summary. Intraperitoneal administration of $PGF_{2\alpha}$ in rats significantly increased testicular acid phosphatase ($p < 0.05$), decreased hyaluronidase ($p < 0.05$), whereas the activities of 5′-nucleotidase, N-acetyl-B-glucosaminidase, B-galactosidase and uridine diphosphatase remained unaffected.

Available histological and histochemical data suggest that prostaglandins decreased spermatogenesis, weight of testis and accessory sex gland and the level of plasma testosterone in rats[2,3]. PGE_1 and PGE_2 decreased spermatogenesis with a reduction in the spermatid formation[4,5]. The activities of certain 'marker' enzymes viz. acid phosphatase, hyaluronidase, 5′-nucleotidase, N-acetyl-B-glucosaminidase, B-galactosidase and uridine diphosphatase (UDPase) in the testis have been correlated with the cell differentiation in the germinal epithelium during spermatogenesis[6-11]. The effect of $PGF_{2\alpha}$ on the activities of these enzymes has been investigated and this communication presents the results obtained.

Materials and methods. p-Nitrophenylphosphate was obtained from Patel Chest Institute, Delhi. Substrates for all other enzymes studied were from Sigma Chemical Company, USA. $PGF_{2\alpha}$ (tromethamine salt) was a gift sample from Upjohn Company, USA. Other chemicals used were of analytical grade. Male albino rats, weighing 110–150 g, were from the Institute's Small Animal House.

The rats were randomly allotted to 2 groups and housed individually in separate cages. Prior to treatment they were under uniform feeding for about 15 days on cow milk followed by rat feed and water ad libitum. 1 group received $PGF_{2\alpha}$ (tromethamine salt), 3 mg/kg b.wt in saline, i.p., once daily for 15 days, whereas the other group, serving as

Effect of $PGF_{2\alpha}$ on the activity of marker enzymes in rat testis

Treatment	No. of rats	Specific activity** Acid Phosphatase	Hyaluronidase	5′-nucleotidase	N-acetyl-B-glucosaminidase	B-galactosidase	UDPase
Control	4	971.35 ± 52.8	231.35 ± 11.75	1067.95 ± 54.75	204.57 ± 14.43	81.3 ± 2.56	1169.0 ± 121.0
$PGF_{2\alpha}$	3	1084.7* ± 63.17	210.0 ± 10.82	1062.93 ± 93.24	209.43 ± 024.68	84.63 ± 4.66	1225.0 ± 95.8

* Significant at $p < 0.05$. ** Specific activity was defined as the μmoles product released per μg protein/30 min (15 min for 5′-nucleotidase) at 37 °C.