

BLOOD UREA CLEARANCE IN YOUNG INDONESIAN SUBJECTS

By

S. A. RAHMAN, J. TJAN AND T. PRIADARMODJO.

*Department of Physiology and Biochemistry, Airlangga University, Faculty of Medicine,
Surabaya, Indonesia.*

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Low renal clearance of urea was encountered in African subjects of Kenny (1954). Similar low values were obtained in Indian subjects by Gokhale (1941), by Rahman and Abhyankar (1945) and more recently by Chitre *et al.* (1955). The following work was undertaken to investigate the clearance values in healthy Indonesian subjects.

METHOD

Urea clearance was determined on 25 healthy male medical students at Surabaya, Indonesia. The age of the subjects varied from 20 to 25 years, the average being 23 years. The subjects reported to the laboratory at 8 a.m., when they voided urine and then rapidly drank 500 ml. of iced water. At 9 a.m. they passed urine which was collected and measured, and 5 ml. of blood was withdrawn by venepuncture. At 10 a.m. the urine was passed again, collected and measured.

Urea in blood and urine was estimated by the aeration method of Van Slyke and Cullen as given by Todd *et al.* (1948), using the glycerol extract of urease solution prepared from soya bean according to the method given by Noyons (1952). The blood samples were examined in duplicate which gave almost identical results. A standard solution of urea was also examined as a check on the activity of the urease.

RESULTS

The urea clearance values were calculated according to the usual formula from the values obtained of the concentration of urea in blood and in urine

and from the amount of urine flow per minute during the two hours in which the urine was collected. These values were calculated for the body surface area of 1.73 sq.m.

Out of the 25 subjects, sixteen gave the urine flow more than two ml. per minute for the two hour period. The clearance values in these subjects are given in Table I. The rest of the subjects gave urine flow less than

TABLE I

Subject No.	Blood urea mg. per 100 ml.	Urine flow ml.		Urea clearance ml./min.
		1st. hour	2nd. hour	
1	27.00	168	143	60
2	24.60	250	135	58
3	19.62	126	298	58
4	17.00	142	66	54
5	28.95	250	126	58
6	24.00	292	208	45
7	17.70	37	292	72
8	23.40	270	164	52
9	25.70	220	118	36
10	23.70	320	220	50
11	20.10	156	176	44
12	27.00	140	162	47
13	26.70	182	150	51
14	29.10	204	124	43
15	22.35	155	325	56
16	31.50	340	266	58
Av.	24.27			53
S.D.	4.17			8

two ml. per minute and the "standard" clearance in these subjects is given in Table II. This table gives also the true clearance values,

TABLE II

Subject No.	Blood urea mg. per 100 ml.	Urine flow ml.		Urea clearance ml./min.	Urea clearance ("standard") ml./min.
		1st hour	2nd hour		
1	23.10	57	172	43	32
2	20.40	—	—	45	40
3	18.40	100	48	59	51
4	28.00	45	100	42	39
5	23.70	90	64	43	38
6	24.40	90	124	50	37
7	22.80	35	30	39	53
8	26.70	80	27	43	45
9	28.80	56	90	35	32
Av.	23.94			44	41
S. D.	3.39			7	7

These investigations were carried out in the months of November and December, 1957 and January 1958, when the room temperature varied from 28° to 32° C.

The average blood urea level in both the group of subjects was about 24 mg. per 100 ml. In 19 of the 25 subjects, the blood urea level was within 20 to 28 mg. per 100 ml. of blood. The average urea clearance in the first group, with the rate of urine flow more than two ml. per minute, was 53 ± 8 . The average clearance in the other group, with the rate of urine flow less than two ml. per minute, was only 44 ± 7 and the "standard" clearance in this group of subjects was 41 ± 7 .

DISCUSSION

The average blood urea clearance (urine volume more than two ml. per minute) in "Western" subjects as estimated by Moller, McIntosh and Van Slyke (1928) was 75 ml. per minute. The average "standard" clearance (urine volume less than two ml. per minute) was 54 ml. per minute with extremes of 41 to 65 ml. Similar values in "Western" subjects have been obtained by other workers.

Compared with the values obtained in the "Western" subjects, the results on our subjects are definitely low. Similar low values have been obtained by various workers on subjects in tropical countries. Rahman and Abhyankar

(1945) examined 22 healthy young men at Hyderabad, India. They found that in the case of eleven of the subjects, with urine flow more than two ml. per minute, the average urea clearance value was only 75 per cent of the American standards and in the rest of the subjects, with urine flow less than two ml. per minute, the "standard" clearance values were only 70 per cent of the American standards. Even lower values were obtained by Gokhale (1941) on 110 healthy young subjects from the Bombay province of India. Kenny (1954) examined 10 African subjects and found the plasma urea clearance to be 45 ± 16 ml. These subjects also showed low plasma urea level which averaged 13.9 ± 3.4 mg. per 100 ml. of blood. They also failed to show the "Augmentation" phenomenon; the urea clearance value being nearly identical whether observed at high or low rates of urine flow. Kenny suggested the possibility that there was a real difference between the mode of urea elimination in the Africans as compared with the Europeans. In the case of one hundred normal subjects of Chitre *et al.* (1955), the average clearance was found to be 45.6 ± 3.64 and the "standard" clearance 36.6 ± 28.0 . The blood urea nitrogen in these subjects averaged 10.3 mg. (= 22.0 mg. urea) per 100 ml. of blood. The dietary protein content of these subjects was found to be low. In twenty of the subjects, when protein consumption was raised to a level comparable with the consumption in American subjects, the urea clearance was also raised to a level comparable with the American standards. Strangely enough, there was hardly any rise of blood urea level with increase in protein consumption. Generally the blood urea level is stated to rise markedly when the dietary protein is raised from a low level of 0.5 g. per kg. of body weight to 1.5g. per kg. of body weight (Addis *et al.*, 1947).

All of our subjects took mixed diet including eggs and meat. They appeared well-nourished. However, from the imperfect dietary history, it was not possible to arrive with any degree of accuracy as to the daily protein consumption of these subjects. The mean blood urea level in these subjects was about 24 mg. per cent. The mean value for blood urea in English subjects given by Barnicot and Sai (1954) was 27.97 mg. per cent. The average blood urea value (unpublished) in the 22 subjects of Rahman and Abhyankar (1945) was 28.5 mg. per 100 ml. of blood and yet the urea clearance values were markedly lower than the "Western" standards. Judging from the work of Chitre *et al.*, (1955), the blood urea level may not give any indication of the dietary protein content of the subject.

The low urea clearance values given by our subjects are likely to be due to low intake of protein in the diet, a habit usually inherent in the life in the tropics. It follows that in this country, in common with most of the tropical countries, a urea clearance level lower than the figures given for American or European subjects is to be taken as normal standard.

SUMMARY

Blood urea clearance values were obtained on 25 healthy young male subjects at Surabaya, Indonesia. The average clearance values on 16 of these subjects, with urine flow more than two ml. per minute, was 55 ± 8 ml., and the blood urea level averaged 24.27 ± 4.17 mg. per 100 ml. of blood. In the case of the other 9 subjects, with urine flow less than two ml. per minute, the average "standard" clearance was 41 ± 7 , and the blood urea level averaged 23.94 ± 3.39 mg. per 100 ml. of blood.

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