

OBSERVATIONS ON SERUM SODIUM LEVEL IN ADULT HUMAN SUBJECTS IN MALWA.

By

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Meneely and Ball (1958) have made a study in rats of the effects of chronic ingestion of large amounts of sodium chloride, on an otherwise standardised diet. Significant hypertension was uniformly observed at all levels of sodium chloride (varying from 2.8% to 9.8%) and there was a tendency for the degree of elevation in blood pressure to parallel the amount of salt in the diet. In human subjects, Albert *et al.* (1958) compared serum sodium concentrations of essential hypertensives with normals (147.7 ± 5.0 as compared to $142 \pm 3.0\%$). Serum sodium was claimed to be significantly higher in hypertensives. From this, they argued in favour of an excessive adrenal cortical activity.

Friedman (1954) observed that the urinary excretion of 17-ketosteroids in normal south and north Indian males, living in south India was lower than in healthy European males. Barnicot and Wolffson (1952) reported that the mean 24 hour urinary 17-ketosteroid output in African negroes, was lower than in Europeans, living under the same conditions.

The results of Das Gupta and Singh (1956), however, differed from those of Friedman, with regard to 17-ketosteroid values in North Indians residing in Punjab; the values were in conformity with western figures.

The adreno-cortical activity of adult human subjects residing in Malwa was investigated and was found to compare well with western figures, using eosinophil count, as an index (Mathur and Sachdev, 1958). Excretion of 17-ketosteroid in Malwa population was, however, found to be slightly lower than western figures (Sachdev, 1958).

Estimation of serum electrolytes has been used as an indication of adrenal cortical activity (Heard *et al.*, 1946; Wig *et al.*, 1954; Peterson and Murray, 1952).

It was decided, therefore, to correlate the findings of Mathur and Sachdev (1958), based on eosinophil count with investigations on serum sodium level in the same Malwa population group, as an index of adrenocor-

tical activity. Attempt is also made to correlate the serum sodium level with blood pressure and voluntary salt intake in the diet in each case ; as Fregly (1955) has reported a relationship in experimental rats of sodium aversion and height of blood pressure.

MATERIAL AND METHODS

Serum sodium levels were estimated in 50 normal apparently healthy adults, with their ages ranging between 18 to 32 years, living in the temperate Indore climate. Post absorptive specimens of blood were collected in all the cases for analysis and estimations carried out with fresh serum. Age, height, diet, blood pressure, salt aversion if any, seasonal and climatic conditions were recorded in each case, along with the time of last meal. The blood was centrifuged, the serum separated and analysed for sodium by an Eel flame photometer. Sera were diluted in order to provide concentrations within the range of maximum accuracy of the photometer. Dilutions were made with sodium free distilled water, in 100 ml volumetric flasks at 22°C. Each serum sample was bracketed with at least 2 standard solutions, with one sodium concentration above and one below the unknown.

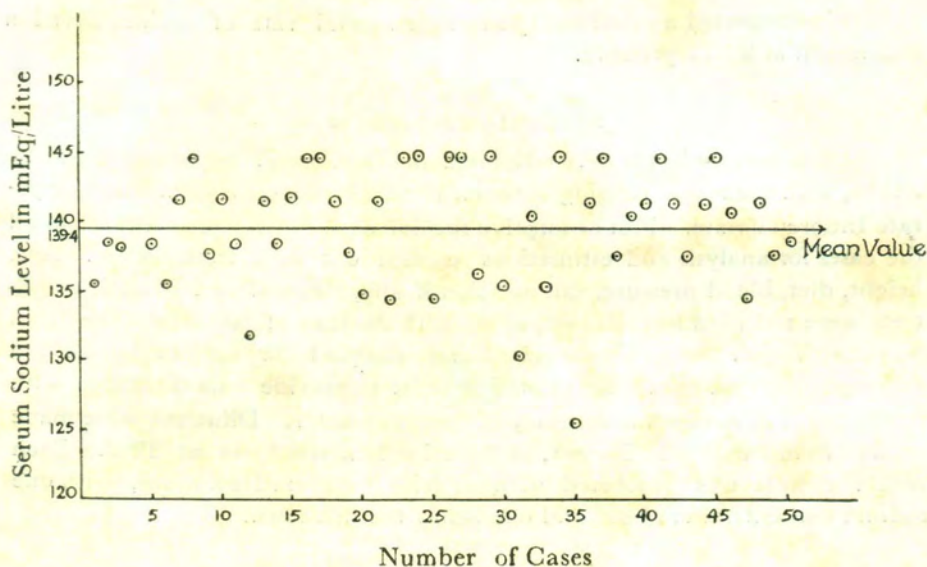
RESULTS AND DISCUSSION

Normal values for serum sodium, determined by chemical methods, have been presented by Hald and Eisenman in 1937, in the case of western subjects and by Das Gupta *et al.* in 1956 in cases of Indians (Punjabis). A new series has since been determined using both the flame photometer technique and the chemical methods simultaneously (Hald, 1944). In the determination of sodium, the difference between the measurements by the two procedures is not at all significant. The serum sodium, determined by both the methods, ranged between 130.5 to 144.2 with a mean of 138.1 mEq/L for the western subjects, as reported by Hald (1944).

Das Gupta and Singh (*loc cit*) reported the mean values as 141.8 for the Indian Punjaby males and 140.6 mEq/L for Indian females, determined by the chemical methods. No significant difference was found by them between males and females. In the present study, in the Malwa population, the range was from 125.47 to 144.78. Out of this only one case showed a figure of 125.47. No other case showed a figure below 130 mEq/L. In 42 cases out of 50, i.e. in 84% of cases the range was from 135 to 145 mEq/L. This is in conformity with Das Gupta and Singh's figures of the range in Punjabis, found to be from 139 to 145 mEq/L.

In the present study the mean value of Malwa population was 139.40 (Graph I). It compares well with the values of subjects from the west, as

determined by the flame photometer. No significant difference was found between males and females.



Graph I

The range in 7 females is from 134.67 mEq/L to 144.78 mEq/L with mean of 140.37 mEq/L as compared to the range in males, varying from 125.47 to 144.78, with a mean of 139.33 mEq/L. The slightly higher figures for females may be due to the extra saltish preparations (like pickles, of which women are notoriously fond of) in their diet. The diet was recorded in each case and the dietetic habits revealed that all the 7 females took more salt in their diet than the males (Graph II).

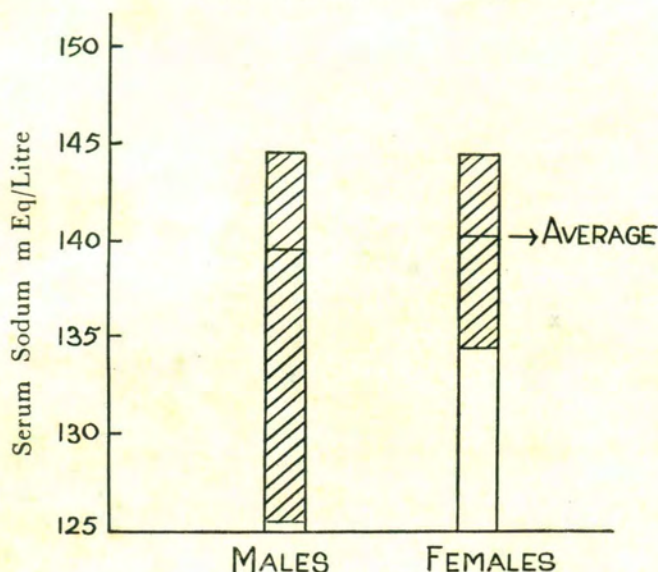
Out of the 50 cases, 32 showed a preference for saltish preparations. Their intake of saltish preparations, like pickles and chatni was also marked. The mean sodium level in these cases was 139.69 mEq/L.

6 cases showed a preference for sweet preparations and aversion to salt. The intake of salt in their diet was also not marked. The mean value in these cases was 138.07 mEq/L. 12 cases expressed neither an inclination nor aversion to salt. The salt intake in their diet was not marked. The mean value of sodium in these cases was 140.72 mEq/L.

The mean value of serum sodium in 23 vegetarian cases was 136.81 mEq/L: in 27 nonvegetarian cases, 140.13 mEq/L. Three cases were investigated on an empty stomach, early in the morning. The mean value

in these cases was 139.28 mEq/L. Apparently serum sodium level seems to be regulated by factors besides the dietetic intake.

Serum Sodium in two Sexes



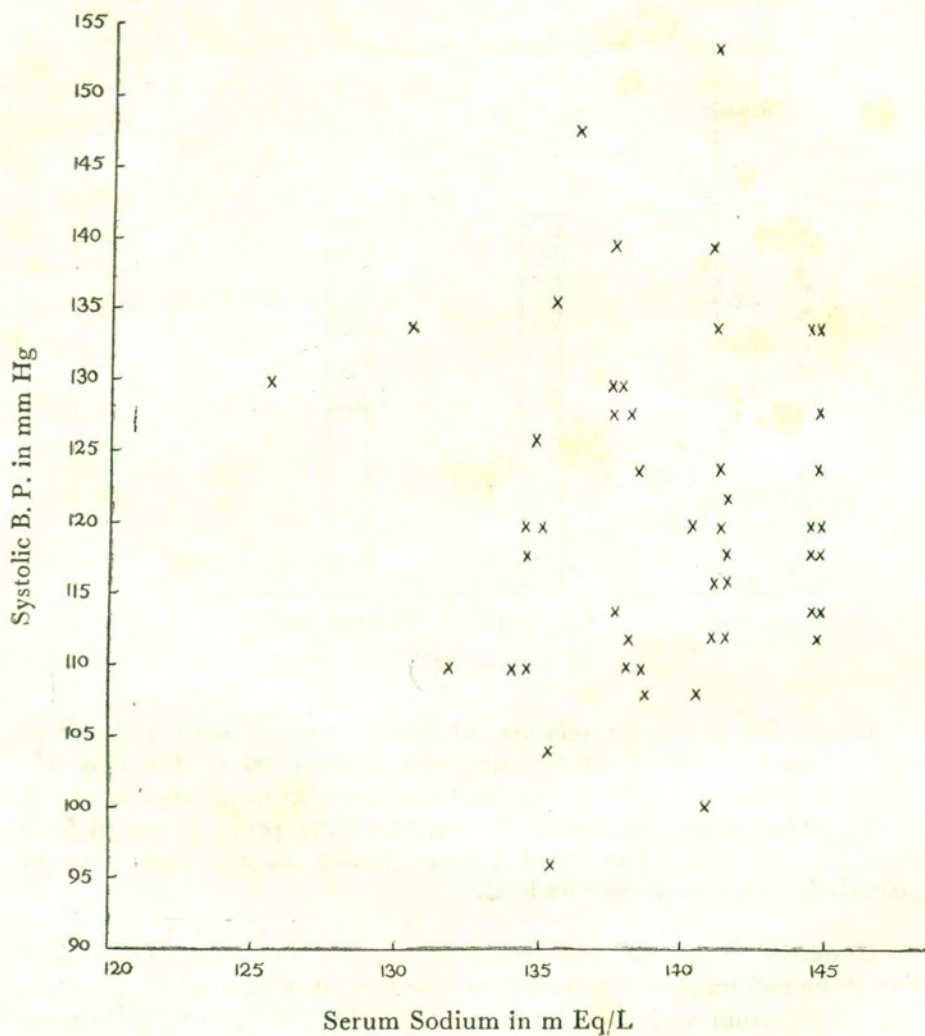
Graph II

Graph III shows the relation of blood pressure levels with serum sodium figures. The blood pressure ranged from 96 to 154 mm Hg systolic and 50 to 98 mm Hg diastolic, with a mean systolic of 120 mm Hg and a mean diastolic of 75 mm Hg. Pulse pressure ranged from 26 to 74 mm Hg. The blood pressure figures do not seem to bear a correlation with serum sodium level.

Graph IV shows the relationship of seasonal and climatic conditions with serum sodium level. 16 cases were investigated in July on bright sunny days. The serum sodium ranged from 125.47 to 144.78 mEq/L in these cases with a mean value of 137.31 mEq/L. The average room temperature on these days was 33°C.

25 cases were investigated on rainy days in August with room temperature of 26-30°C. The serum sodium level ranged from 131.91 to 144.78 mEq/L in these cases, with a mean value of 140.22 mEq/L. In September, 4 cases were investigated on cloudy days with an average room temperature of 29.5°C. The serum sodium ranged from 136.26 to 144.78 mEq/L in these cases with a mean value of 142.65 mEq/L.

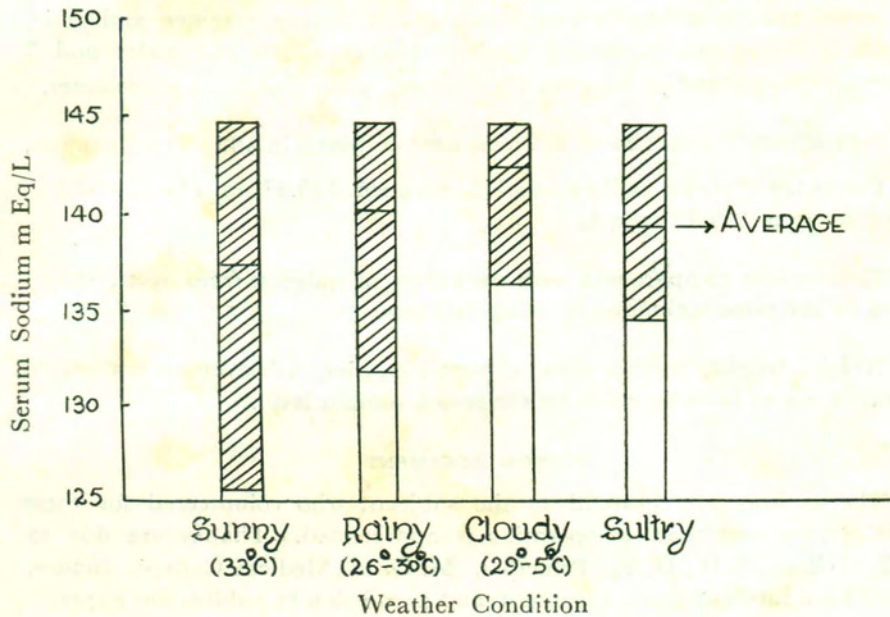
Correlation of Serum Sodium level with B. P. (Systolic)



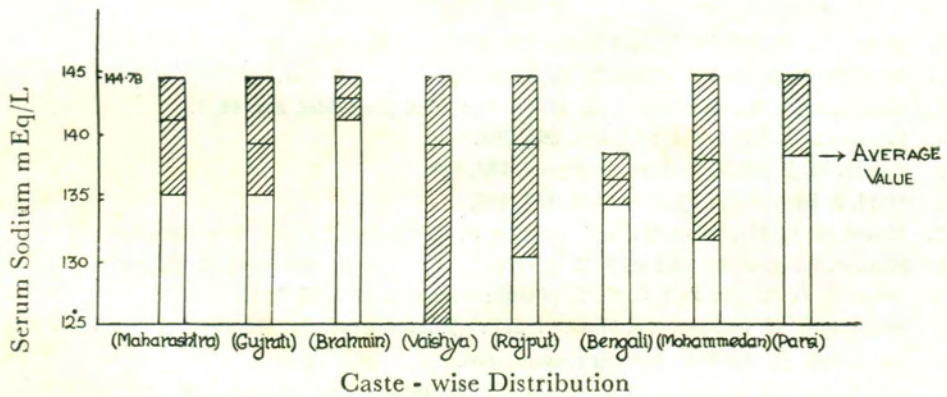
Graph III

3 cases were examined in sultry weather conditions. The humidity was high on these days. The serum sodium ranged from 134.48 to 144.78 in these cases with a mean value of 139.44 mEq/L.

Serum Sodium in Relation to Weather Conditions



Graph IV



Graph V

The estimations have been confined to summer and rainy season. The work is in progress to investigate the effect of low temperature in winter, on serum sodium level, before drawing any conclusion regarding the effect of climate on the same.

SUMMARY

Serum sodium estimations were carried out during summer and rainy months, in 50 apparently normal healthy Malwa adults (43 males and 7 females) with age ranging between 18-32 years, using Eel flame photometer.

Post absorptive specimens of blood were collected in all cases for analysis.

The range of serum sodium, varied between 125.47 to 144.78 mEq/L with a mean of 139.40 mEq/L.

These values compare well with the values of subjects from west, determined by the same technique by other workers.

Weight, height, surface area, community, diet, salt aversion and blood pressure seem to have no effect on the serum sodium level.

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