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# Serum iron and total iron binding capacity in normal Iranian population

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## Introduction:

There are many reports of the normal serum iron and total iron binding capacity from all over the world in the medical literature, but to date, no report of the normal range of serum iron in the Iranian popolation has been published. In this paper a report is presented of the normal serum iron and total iron binding capacity in apparently normal Iranian, most of whom have been medical or nursing students.

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## Meterials and Methods:

100 individuals, mostly students, were selected with and age range of 18-50. The blood was collected between 8.30 and 9.30 a.m. to exclude any changes related to the time of collection of blood. In order to avoid iron contamination, all glassware used in this study was placed in detergent for 24 hours, then in 6N Hcl for 48 hours and lastly in distilled water for 48 hours.

Polyethylene syringes with stainless steel needless were used to withdraw the necessary samples which were then put in iron-free glass tubes. After about 4-5 hours the serum in the samples collected was separated from the clots. The separated serum was recentrifuged to precipitate any possible remaining red cells. The prepared samples were then kept in deep freeze, and serum iron estimated within two weeks.

Serum iron and total iron binding capacity were measured by the modified Ramsey and Caravay method. This involves the following chemical principles: blood serum is incubated with ascorbic acid 1 % in 0.2 N HCl to liberate protein-bound iron.

Protein was precipitated with 10 % $\frac{W}{V}$ trichlor acetic acid in the presence of chloroform. To an aliquot of clear supernatant was added a solution of tripyridyl triazine and sufficient ammonium acetate to adjust the P.H. between 4 & 5. Absorbance of the blue-pink coloured complex was measured at 590 in spectrophotometer.

Total iron binding capacity was measured by saturation of serum with ferric iron followed by removal of excess iron with magnesium carbonate. Measurement of the total bound iron was completed as above.

Other methods for estimation of serum iron and total iron binding capacity were outlined by the International Committee for Standardisation in Haematology (8) and by Jung et al (9), Sarkar (14), Carter (2), O'Mallay et al (10), Pre-J et al (12), (13), Cook, J.D (4) and others.

The method in our investigation was used mainly because only 2 ml. of serum was necessary, this being easily obtained from about 5 ml of blood.

## Results

In this study, the lower limit of Haemoglobin in Women was 12.8g/100 ml, and in men 14.2g/100 ml.

The upper limit of haemoglobin was 15g/100 ml in women, and 16g/100 ml. in men.

The lower limit of p.c.v. in women was 40 %, and in men 43 %.

The upper limit of p.c.v. in women was 42 % and in men 50 %.

As expected, the serum iron Values were lower in women than in men. The Values being 65-160mg/100 ml in women (with an average of 112.5mg/100 ml) and 84-165 ug/100 ml in men (with an average of 133.4mg/100 ml).

The average values were 291mg/100 ml. and 306mg/100 ml respectively.

Percentage saturation of siderophilin was 25,5-60.6 % in women and 28-51.5 in men with an average of 42.6 % and 44.3 % respectively. This results are tabulated in table I.

*Table I*

*Serum iron and total iron binding capacity*

| | | Serum iron µg/100 ml. | | TIBC µg/100 ml. | | |
|---|---|---|---|---|---|---|
| Subjects | No. | age range | iron mean | renge TIBC | mean TIBC | saturation |
| males | 50 | 22-50 | 84-165 | 133.4 | 230-405 | 306.2 | 44.3% (28-51.5) |
| females | 50 | 19-29 | 65-160 | 112.5 | 210-405 | 291 | 42.6% (25.5.60.6) |

*Table II*

*Serum iron µg/100 ml.*

| Males | | Females | | Anthors | |
|---|---|---|---|---|---|
| **Range** | **Mean** | **Range** | **Mean** | | |
| 112-255 | 171 | 78-170 | 127 | Ramsay | 1958 |
| - | 126.2 | - | 38.5 | Heilmeyer & Plotner | 1937 |
| - | 142 | - | 123 | Vahlquist | 1941 |
| - | 143 | - | 117 | Powell | 1944 |
| 125-238 | 182 | 120-200 | 160 | Kingsley et al | 1956 |
| 94-175 | 122 | 58-142 | 98 | Moor et al | 1939 |
| 56-183 | 119 | 57-194 | 119 | Peters et al | 1956 |
| 59-185 | 106 | 55-174 | 109 | Card et al | 1964 |
| 56-206 | 100 | 43-175 | 98 | Stengle et al | 1957 |
| 20-265 | 112 | 20-226 | 92 | Fowler et al | 1952 |
| 78-229 | 139 | 78-190 | 136.6 | Sinniah R. and Neill D.W. | 1968 |
| 84-165 | 133.4 | 65-160 | 112.5 | Present study | |

## Discussion:

The values in table II show the normal serum iron in men and women reported by various workers in other parts of the world.

It seems that our values agree approximately with those obtained by Powell, Vahlquist, and Sinniah R. et al (15) but they are higher than values reported by Cartwright et al and Card et al (1), Sinniah et al (15) Moore et al and Wintrobe (16).

Serum iron in normal Iranian women is less than in men, the same finding being reported by other workers from other parts of the world (15).

But other workers do not agree with any appreciable difference in serum iron in both sexes and feel that any apparent difference may be due to the in clusion in the series investigated of a large number of women in their early reproductive period of life.

Hagberg and Brendstrup found similar total iron binding capacity figures and Sinniah et al (15) report higher values.

Ramsey and Cohen (3) believe that values between 250-400 for total iron binding capacity are normal, and that individuals with values outside this range cannot be accepted as normal.

Percentage saturation of siderophilin in our figures in women is higher than in men, though Ramsey Peter et al (11) and Card et al (1) do not find any appreciable difference in values between the sexes.

Stengle and Hagberg find values similar to ours.

## Summary

Serum iron and total iron binding capacity and percentage saturation were measured in 100 apparently normal individuals (50 men and 50 women). The ages of the men were from 22-50 and of the women from 19-30.

Average serum iron in men was 133.4mg/100 ml and in women 112.5mg/ 100 ml. The average values for total iron binding capacity were 306.2mg/ for men and 290mg/100 ml. for women.

Percentage siderophilin saturation was 44.3 % for men and 43.6 % for women.

## Resume

La quantite de fer serique, la capacite totale du siderophilin et le pourcentage de saturation du siderophilin ont ete mesures chez 100 sujets apparemment normal (50 femmes et 50 hommes).

L'age des hommes variait entre 22 et 50 and et celui des femmes entre 19-29 ans. La moyenne du fer serique etait chez les hommes 133.4mg par 100 ml. Et chez les femmes 112.5mg par 100 ml. La moyenne de la capacite totale du siderophilin etait 306.2mg par 100 ml. Pour leshommes et 290mg par 100 ml. Pour les femmes le pourcentage de saturation du siderophilin etait 44.3 % pour les hommes et 43.6 % pour les femmes.

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