

To Study the Biochemical and Hematological Parameters of Adult Female Employees of ESICMCH, Bihta

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Abstract

Aim: To determine the various vital biochemical parameters of level of Random blood sugar, vitamin D, TSH, FT3, FT4, serum iron and haemoglobin and assess the health status of female employee working at a tertiary care centre ESICMCH, Bihta, Patna.

Methodology: A cross-sectional study was conducted by the department of Biochemistry in collaboration with the department of pathology at a tertiary care centre, on the 150 samples of plasma, serum and whole blood samples received in the central lab on the occasion of Women Day. The subjects were the asymptomatic female employee without known co-morbidities. The parameters estimated were haemoglobin, random blood sugar, vitamin D, TSH, FT3, FT4, and Serum iron. The blood pressure was measured before taking the sample.

Results: The mean age of 150 participants was 33.5 ± 14.5 years. Mean height was 150.33 ± 7.67 cm and mean weight was 53.33 ± 11.67 Kg. Out of 150 participants, 40.7% had normal systolic B.P. and 72% had normal diastolic B.P. 59.3% and 28% had isolated elevated systolic and diastolic blood pressure respectively. Mean RBS levels were 96.87 ± 21.13 mg/dl. Mean TSH levels were 2.91 ± 2.59 mU/l. FT3 and FT4 had mean values of 4.67 ± 0.87 pmol/L and 15.7 ± 9.5 pmol/L, respectively. Mean haemoglobin level was 9.58 ± 1.88 g/dl. (normal: 11.6-15g/dl) Mean vitamin D and serum iron levels were 23.40 ± 21.5 ng/ml (normal: 20-40ng/ml) and 39.48 ± 23.52 (normal: 60-170mcg/dl) mcg/dl, respectively.

Conclusion: It was found in the study that majority of female employees had isolated systolic hypertension and moderate iron deficiency anaemia. Although the vitamin D and thyroid profile were found to be within normal range they were nearer the lower limit. Both the conditions may have detrimental effect on the health of the subjects in long run if not detected and treated on time. Routine haematological and Biochemical examination of employees should be done biannually to diagnose these conditions in asymptomatic employees to prevent not only the detrimental effect on the health status of the employee but also the work days loss which may happen in future if these conditions go undiagnosed and untreated.

Keywords: Biochemical, Haematology, examination, diastolic, systolic.

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Introduction

Females beyond household are the pivot of a family and now work beyond the household, hand in hand with the males in all aspects of life but when it comes to their health it is most often considered secondary and neglected.

Locally relevant reference ranges for commonly used biochemical and haematological parameters are essential for screening and safety follow up of trial participants as well as for routine clinical management of patients. Blood, the special vital circulatory tissue is composed of cells suspended in a fluid intercellular substance (plasma) plays major role in maintaining homeostasis [1]. The haematological components consisting of leucocytes and erythrocytes and platelets. Erythrocytes (Red blood cells) contain haemoglobin that serves as carrier for oxygen in the form of oxy-haemoglobin throughout the body [3].

Haematology refers to the study of the numbers and morphology of the cellular elements of the blood – the red cells (erythrocytes), white cells (leucocytes), and the platelets (thrombocytes) and the use of these results in the diagnosis and monitoring of disease [4]. Haematological studies are useful in the diagnosis of many diseases as well as investigation of the extent of damage to blood. These studies are of ecological and physiological interest in helping to understand the relationship of blood characteristics to the environment and so could be useful in the selection of animals that are genetically resistant to certain diseases and environmental conditions [1, 5]. Haematological parameters are those parameters that are related to the blood and blood forming organs [6, 7]. Laboratory tests on the blood are vital tools that help detect any deviation from normal in the animal or human body [8]. The examination of blood gives the opportunity to investigate the presence of several metabolites and other constituents in the body of humans and it plays a vital role in the physiological,

nutrition and pathological status of an organism [9].

Previous studies have shown that the change in routine blood parameters has certain clinical application value in predicting the progression of infectious diseases [10]. Indeed, many abnormalities have been reported in the peripheral blood of some infected patients [11]. Mild patients have milder symptoms and a good prognosis, but severe and critically ill patients are difficult to treat and have a high mortality rate [12]. However, information on the early predictive indicators for particularly severe and fatal cases is relatively limited and further research is needed [13]. In addition, the rapid spread of the disease raises concerns about the need for intensive care that can overwhelm health care system resources [14].

Aim & Objective:

To determine the haemoglobin, serum iron, Random blood sugar, vitamin D, TSH, FT3, FT4, asymptomatic female employee at a tertiary care centre.

Methodology:

Study design and place of study: A cross-sectional study, conducted in the department of Biochemistry and department of Pathology central lab at ESICMCH, Bihta, Patna, India, a tertiary care centre.

Study setting: 150 samples of plasma, serum and whole blood collected from the volunteer female employee on the occasion of women Day and received at central laboratory at ESICMCH, Bihta to determine the random blood sugar, vitamin D, TSH, FT3, FT4, Serum iron and haemoglobin by the Biochemistry and Pathology departments respectively.

The blood pressure of these subjects was measured before collecting the sample.

Inclusion criteria:

- a) All the samples of adult female above the age 18 years received in the central lab
- b) All samples of female employee of ESIC Bihta, Patna received in biochemistry and pathology central lab on the occasion of woman's Day for Blood sugar, vitamin D, TSH, FT3, FT4, Serum iron and haemoglobin have been done in Biochemistry and for haemoglobin Pathology Central lab were used for study.

Exclusion criteria:

- a) Icteric and haemolysed sample were excluded.

Study duration: The study period on the occasion of women day 8/04/2022

Study tools: VITROS 350 Dry chemistry, ECI VITROS & hematology analyzer (MEK-7300 NIHON KODEN).

1. RBS

The Patients sample was collected in Fluoride vial, after centrifugation plasma was collected. The VITROS GLU Slide method is performed using the VITROS GLU Slides on VITROS 350. The VITROS GLU Slide is a multi-layered, analytical element coated on a polyester support. A drop of patient sample is deposited on the slide and is evenly distributed by the spreading layer to the underlying layers. The oxidation of sample glucose is catalysed by glucose oxidase to form hydrogen peroxide and gluconate. This reaction is followed by an oxidative coupling catalysed by peroxidase in the presence of dye precursors to produce a dye. The intensity of the dye is measured by reflected light. Principles of the Procedure.

2. Vitamin D

The Patients sample was collected in plain vial, after centrifugation serum was collected. A competitive immunoassay technique is used on VITROS ECI which involves the release of the 25-OH Vitamin D in the sample from the binding protein using a low pH denaturant and the

subsequent competition of the free 25-OH Vitamin D with horseradish peroxidase (HRP) labelled 25-OH Vitamin D reagent for monoclonal anti-Vitamin D bound to the wells. Unbound materials are removed by washing.

The bound HRP conjugate is measured by a luminescent reaction. A reagent containing luminogenic substrates (a luminol derivative and a per acid salt) and an electron transfer agent, is added to the wells. The HRP in the bound conjugate catalyses the oxidation of the luminal derivative, producing light. The electron transfer agent (a substituted acetanilide) increases the level of light produced and prolongs its emission. The light signals are read by the system. The amount of HRP conjugate bound is indirectly proportional to the concentration of 25-OH vitamin D present.

3. TSH

An immunometric immunoassay technique is used, which involves the simultaneous reaction of TSH present in the sample with a biotinylated antibody (mouse monoclonal anti-whole TSH) and a horseradish peroxidase (HRP)-labelled antibody conjugate (mouse monoclonal anti-TSH β -subunit). The antigen-antibody complex is captured by streptavidin on the wells. Unbound materials are removed by washing.

The bound HRP conjugate is measured by a luminescent reaction. A reagent containing luminogenic substrates (a luminol derivative and a per acid salt) and an electron transfer agent, is added to the wells. The HRP in the bound conjugate catalyses the oxidation of the luminol derivative, producing light. The electron transfer agent (a substituted acetanilide) increases the level of light produced and prolongs its emission. The light signals are read by the system. The amount of HRP conjugate bound is directly proportional to the concentration of TSH present.

4. FT3

A direct, labeled antibody, competitive immunoassay technique is used. FT3 present in the sample competes with ligand on the modified well surface for a limited number of binding sites on a horseradish peroxidase (HRP)-labeled antibody conjugate (sheep anti-T3). The well surface has been modified to act as a ligand for uncombined conjugate. Unbound material is removed by washing. The test design, with optimal reagent concentrations, ensures that disturbance of the T3/ binding protein equilibrium is so small as to be negligible.

The bound HRP conjugate is measured by a luminescent reaction. A reagent containing luminogenic substrates (a luminol derivative and a peracid salt) and an electron transfer agent is added to the wells. The HRP in the bound conjugate catalyzes the oxidation of the luminol derivative, producing light. The electron transfer agent (a substituted acetanilide) increases the level of light produced and prolongs its emission. The light signals are read by the system. The amount of HRP conjugate bound is indirectly proportional to the concentration of FT3 present.

5. FT4

A direct, labeled antibody, competitive immunoassay technique is used. FT4 present in the sample competes with ligand on the modified well surface for a limited number of binding sites on a horseradish peroxidase (HRP)-labeled antibody conjugate (sheep anti-T4). The well surface has been modified to act as a ligand for uncombined conjugate. Unbound materials are removed by washing. The test design, with optimal reagent concentrations, ensures that disturbance of the T4/binding protein equilibrium is so small as to be negligible.

The bound HRP conjugate is measured by a luminescent reaction. A reagent containing luminogenic substrates (a

luminol derivative and a peracid salt) and an electron transfer agent, is added to the wells. The HRP in the bound conjugate catalyzes the oxidation of the luminol derivative, producing light. The electron transfer agent (a substituted acetanilide) increases the level of light produced and prolongs its emission. The light signals are read by the system. The amount of HRP conjugate bound is indirectly proportional to the concentration of FT4 present.

6. Serum Iron

Sample is collected in plain vial, measured by Vitros 350 analyzer

7. Haemoglobin

5 ml blood was collected in EDTA vial and measured by spectrophotometry. Spectrophotometric measurement is based on principle that different material absorbed different of different wavelengths of light. In this hematology analyzer (MEK-7300 NIHON KODEN). It is measured in measurement bath. An LED shines one wavelength of light through the sample solution. A photodiode receives the light which is not absorbed by the solution. The amount of received light is converted to an electric signal which is amplified by the preamplifier. The amplified signal is sent to the A/D converter.

Statistical analysis: Data has been entered in Microsoft excel and analysed using SPSS. Distribution of age and sex have expressed as mean (\pm SD). The association between qualitative variables have been analysed using Chi-square and that between quantitative variables will be calculated using t-test. The p-value of <0.5 is significant.

Results:

Demography and anthropometric measurement: The mean age of 150 participants was 33.5 ± 14.5 years. Mean height was 150.33 ± 7.67 cm and mean weight was 53.33 ± 11.67 Kg. (Table 1)

Table 1: Demographic details

Variables	
Mean age (in years)	33.5 ± 14.5
Mean height (cm)	150.33 ± 7.67
Mean weight (in Kg)	53.33 ± 11.67

Out of 150 participants, 40.7% had normal systolic B.P. and 72% had normal diastolic B.P. 59.3% and 28% had elevated systolic and diastolic blood pressure. (Table 2)

Table 2: Systolic and diastolic Blood pressure of employees.

Variables		Number of subjects	%
Systolic BP	70-90	0	0.0
	90-120	61	40.7
	>120	89	59.3
Diastolic BP	40-60	0	0.0
	60-80	108	72.0
	>80	42	28.0

Biochemical and hematological parameters (table 3). Mean RBS levels were 96.87 ± 21.13 mg/dl. Mean TSH levels were 2.91 ± 2.59 mU/l. FT₃ and FT₄ had mean values of 4.67 ± 0.87 pmol/L and 15.7 ± 9.5 pmol/L, respectively. Mean haemoglobin level was 9.58 ± 1.88 g/dl. Mean vitamin D and serum iron levels were 23.40 ± 21.5 ng/ml and 39.48 ± 23.52 mcg/dl, respectively.

Table 3: Mean values of Random blood sugar, vitamin D, TSH, FT₃, FT₄, serum iron and haemoglobin.

Variables	Mean ± S.D.
RBS (mg/dl)	96.87 ± 21.13
TSH (mU/L)	2.91 ± 2.59
FT ₃ (pmol/L)	4.67 ± 0.87
FT ₄ (pmol/L)	15.7 ± 9.5
Vitamin D (ng/ml)	23.40 ± 21.5
HB (g/dl)	9.58 ± 1.88
Serum iron (mcg/dl)	39.48 ± 23.52

Discussion:

Red blood cell is involved in the transport of gases (oxygen and carbon dioxide) in the body [1]. Thus, a reduced red blood cell count implies a reduction in the level of oxygen that would be carried to the tissues as well as the level of carbon dioxide returned to the lungs [1, 15]. The major functions of the white blood cell and its differentials are to fight infections. Defend the body by phagocytosis against invasion by foreign organisms and to produce or at least transport and distribute antibodies in immune response. Thus, humans with low white blood cells are

exposed to high risk of disease infection, while those with high counts are capable of generating antibodies in the process of phagocytosis and have high degree of resistance to diseases [16] and enhance adaptability to local environmental and disease prevalent conditions [1,17].

Currently, developing countries like India are facing serious public health challenges like obesity, cardiovascular disease, diabetes and infectious diseases. In this arena, clinical laboratory plays a major role for early diagnosis of life threatening disease and also provide valuable information about health of an

individual. Many studies reported that Indians are more susceptible to metabolic complications especially to diabetes, cardiovascular disease, dyslipidemia and other lipid abnormalities. Recent studies from different geographical locations of India have established reference intervals for certain biochemical parameters and also identified significant changes in liver markers and lipid levels in healthy Indian population [18-20]. Study conducted to assess thyroid disorders in India have shown that subclinical hypothyroidism was high (9.4%) and the prevalence was higher in females when compared to males (11.4% vs 6.2%) which increased with age. Indian journal of endocrinology and metabolism: thyroid disorder in India. It was found that 89% haematological and pathological readings were in normal range. One female employee was found which had very high RBS levels and BP. A recent cross-sectional study from Africa has also found that significant changes in hematological markers (such as hemoglobin, platelet count and total white blood count) and biochemical parameters like alanine transaminases and creatinine values compared with currently used reference ranges. Detailed survey of literature revealed that many population based studies have been carried out in developed countries especially from Caucasians, while limited studies are available on RI in resource limited settings as well as in Indian ethnic origin. In addition, these studies have been carried out with small sample size in a specific region with limited laboratory analytes. Therefore, it becomes indispensable to establish region-specific reference intervals for our settings.

A simple blood test may have an important role in the diagnosis & monitoring of disease condition, as the test provides the information of the inflammatory process including leukocyte count and other characteristics such as neutrophil- or lymphocyte-dominance, neutrophil - lymphocyte ratio (N/L ratio) C-reactive

protein (CRP) as inflammation marker, collateral organ damage (acute renal failure, acute liver failure) and the disease severity. An analysis of blood test results may provide information in terms of the nature of pneumonia, where the physician can determine the etiology of the disease [21]. As a marker of an inflammatory process, complete blood count (CBC) including platelet count (PLT), neutrophils, lymphocyte, and monocyte count. Neutrophils and lymphocytes are an important component of the immune system. In India most common causes of anaemia in females are nutritional deficiency anaemia, which includes iron, vitamin B12 and folic acid deficiency. [22]

The cause of 59.3% and 28% of subjects having isolated systolic and diastolic hypertension respectively may be multi-factorial like age, work stress, food habits and lifestyle leading to arterial stiffness, an overactive or underactive thyroid function, subclinical diabetes, heart disease and obesity. These subjects must go for further testing and evaluation to rule out the causes.

Conclusion:

It was found in the study that majority of female employees had isolated systolic hypertension along with iron deficiency anaemia with borderline values of other biochemical parameters. Confirmatory and elaborate testing should be carried out in these subjects and Routine assessment of the health status of the employee based on blood pressure and routine haematological and biochemical examination of should be done in every office biannually to diagnose the disorders in subclinical and asymptomatic workers to prevent the deleterious effect and workdays loss that might occur in future if left undiagnosed and untreated on time.

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