



## Standardization of the Standards: A Novel Idea in Clinical Biochemistry Review with Special Reference to Developing Countries

\*Prof (Dr) Biswajit Majumdar<sup>1</sup>, Dr. Tapan K Debnath<sup>2</sup>

<sup>1</sup>Professor and, Department of Biochemistry Gandaki Medical College, Tribhuvan University, Nepal

<sup>2</sup>Assistant Professor of Biochemistry, Tripura Medical College and Dr. BRAM Hospital, Tripura University, Nepal

### ABSTRACT

**Objective:** The principle of Physical Chemistry applies equally to the metabolic reactions or activities. The proportionality of the law of mass action of reactants and products indicates a linear decrease in the values, if low doses of reactants are used, as in developing countries. The main aim of the present study is to evaluate and redefine the standard normal values of biochemical parameters in context of developing countries.

**Methods:** Standard evaluation procedures were used for detection of common biochemical parameters in normal healthy individuals. The results are compared with the standard normal values of existing/established biochemical normal values.

**Results:** The results showed marked variation in normal values and after evaluation and comparison of the ranges it was found to be different in the study.

**Conclusion:** Normal biochemical values are markedly different in cases of samples from developing countries and the comparison and detection and diagnosis will have to be evaluated based on the newly developed normal values for better and appropriate diagnosis, in developing countries.

### INTRODUCTION:

The different biochemical parameters and their standard values visibly Glucose (PP), Glucose (F), Urea, Creatinine, Uric Acid, SGPT, SGOT, Alkaline Phosphatase, that are estimated for the determination of diseases and acceleration and confirmation of treatment, should be reviewed grossly, specially with reference to the developing countries. The standard values that are generally / normally used, are mainly derivatives of developed countries characterized by high body mass index, higher input of protein and /or calorie and lower stress and psychological strain.

The biochemical parameters, specially those which follow direct physical chemistry, linear laws of mass action points, to the basic rule of  $A \text{ [Reactant]} \propto B \text{ [Product]}$ . The law of mass action authenticates the proportionality of the biochemical parameters, specially those following uncomplicated catabolic processes. So, in presence of low intake of protein diet, comparatively lower BMI, studies were conducted mainly on Hemoglobin, Urea, Creatinine and Uric Acid, their reactions in metabolic scenario are relatively uncomplicated and follow linear law of mass action of direct proportionality of concentration of reactants and products.

The principal methods and preparations used in biochemical laboratories for separating and purifying biomolecules and methods for determining bimolecular structures include uv, visible and infrared and NMR spectroscopy and mass spectroscopy. For routine

biochemical investigations, specially to cater the huge population of underdeveloped countries in a regular, regimented and cost effective method manner, spectrophotometric /Semi auto analyser or auto analyser method is still the procedure of choice. Normal biochemical processes are the basis of health-The world health organization (WHO) defines health as a state of complete physical, mental and social wellbeing and not merely the absence of disease and infirmity.

From a strictly biochemical standpoint/viewpoint, health may be considered that situation in which all the many thousands of intra and extracellular reactions that occur in the body are proceedings at rates commensurate with the organization's maximum survival in the physiologic state. However, this is extremely reductionist view and it should be apparent that caring for the health of patients requires not only a wide knowledge of biological principles but also of physiological and social principles. Standardization of the standards are important in the aspect of policy making for health and and the biochemical parameter's normal /standard values should be reevaluated based on the scenario and standards of developing countries

### MATERIALS AND METHODS:

Experimentally, normal persons mainly from Nepal, from the eastern and southeastern parts from other parts were screened and divided into the following age groups of 0-8 years, 9-15 years, 16-30 years, 30-40 years, 40-55

Years , 56-65 years , 66-80 years , Above 80 years. The persons were screened and those with no disease or with mild disease or diseases in which the above biochemical parameters will not be effected were taken and blood samples collected and their biological parameters were estimated and the average or mean value± SEM were calculated for each group. Separate Male / Female Values were estimated. The numbers of persons of different age groups who are normal and healthy, with the above parameters as mentioned above are estimated according to the table below.

**Table 1: Total number of healthy individuals used in the experimental screening divided according to the age and sex. The division sre based keeping in view of the hormonal level's actual non fluctuating scenario**

	Number of Male	Number of Female	Any Specified Diseases	Remarks
0-8 years	217	234	No	-
9-15 years	312	286	-do-	-
16-30 years	159	162	-do-	-
31-40 years	226	195	-do-	-
41-55 years	415	337	-do-	-
55-80 years	216	286	-do-	-
81 years and above	109	127	-do-	-
Total	1734	1627	-do-	-

**THE DIFFERENT BIOCHEMICAL PARAMETERS WERE EVALUATED AS UNDER:**

**ESTIMATION OF HAEMOGLOBIN:**

Hemoglobin in blood is first converted to methemoglobin by potassium ferricyanide .The methemoglobin formed is then converted to cyanomethemoglobin by by potassium cyanide by Dralkins Reagent.The intensity of the brown colour of cyanomethemoglobin is a measure of the amont of Hb present in blood.

**ESTIMATION OF UREA:** Urea is estimated by diacetyl monoxime [DAM] method .Urea reacts with hot acidic diacetylmonoxime in the presence of thiosemicarbazide and produces a rose coloured complex.

**ESTIMATION OF URIC ACID:** Uric acid is estimated by Modified Phosphotungstate End Point Analysis.

**ESTIMATION OF CREATININE:**Estimation of creatinine was done by alkaline picrate method by Bonses RW and Tausky HH.

**RESULTS:**

**Table 2: Values of Haemoglobin, Total Protein, Albumin and Globulin in Normally Healthy Individuals in Underdeveloped countries with variations and distributions according to age group**

Age Group	Haemoglobin (Hb) [g/dl]		Total Protein [g/dl]	
	Male	Female	Male	Female
0-8 years	13.12 ±0.36	12.26 ±0.12	6.20 ± 0.16	6.08 ±0.18
9-15 years	13.22 ± 0.12.	10.28 ±0.16	5.72 ± 0.22	5.94 ± 0.42
16-30 years	12.32 ±1.72	11.02 ±0.46	6.70 ±1.24	6.02 ±0.62
31-40 years	12.42 ±0.56.	10.72 ±1.22	6.12 ±1.62	6.12 ±0.12
41-55 years	12.02 ±1.81	12.12 ±0.12	6.08 ±1.22	6.04 ±0.28
55-80 years	12.08 ±0.12	10.39 ±0.64	6.02 ±0.16	5.82 ±1.96
8 1 years and above	12.02 ±0.28	11.12 ± 1.26	5.92 ± 0.18	5.60 ±1.22

**Note:** All the values indicate mean value ± SEM for the individual age groups. Average is done by adding all the values and dividing by the number of specimens.

**Table 3: Values of Urea, Uric acid and creatinine in Normally Healthy Individuals in Underdeveloped countries with variations and distributions according to age group**

Age Group	Urea [mg/dl]		Uric Acid [mg/dl]		Creatinine[mg/dl]	
	Male	Female	Male	Female	Male	Female
0-8 years	16.21 ± 2.32	15.72 ±2.84	4.12 ± 0.86	4.04 ±0.66	0.51 ±0.02	0.50 ± 0.06
9-15 years	18.72 ±1.56	15.32 ± 2.12	4.22 ±0.68	4.68 ±0.28	0.52 ±0.02	0.52 ±0.07
16-30 years	18.12 ± 2.56	16.42 ± 1.62	4.88 ±0.32	4.82 ± 0.26	0.64 ±0.06	0.58 ±0.82
31-40 years	16.22 ±2.56	14.22 ±2.54	4.56 ±0.28	4.62 ± 0.18	0.75 ±0.08	0.64 ±0. 72
41-55 years	16.24 ±1.72	16.24 ± 2.56	4.12 ±0.12	4.88 ± 0.18	0.72±0.06	0.66 ±0.84
55-80 years	15.86 ±1.74	15.26 ± 2.14	4.28 ±0.18	4.82 ± 0.96	0.76 ±0.08	0.64 ± 0.86
8 1 years and above	15.68 ± 2.58	15.74 ± 1.82	4.26 ± 0.62	4.58 ± 0.64	0.62 ±0.06	0.64 ±0.08

**Note:** All the values indicate mean value ± SEM for the individual age groups. Average is done by adding all the values and dividing by the number of specimens.

**Table 4: Values of albumin and globulin in Normally Healthy Individuals in Underdeveloped countries with variations and distributions according to age group**

Age Group	Albumin		Globulin	
	Male	Female	Male	Female
0-8 years	3.60 ± 0.04	3.50±0.12	2.72 ±0.08	2.82 ±0.08
9-15 years	3.8 0±0.08	3.60 ± 0.16	2.68 ±0.12	2.86 ± 0.12
16-30 years	3.42 ±0.05	3.70 ± 0.12	2.56 ± 0.12	2.72 ±0.10
31-40 years	3.46 ± 0.06	3.82 ± 0.12	2.62 ±0.14	2.65 ±0.12
41-55 years	3.68 ± 0.08	3.71 ±0.14	2.72 ±0.18	2.72 ±0.10
55-80 years	3.82 ± 0.04	3.17 ± 0.12	2.61 ±0.10	2.14 ±0.14
8 1 years and above	3.12± 0.10	3.16 ±0.11	2.32 ±0.56	2.12 ±0.12

**DISCUSSION:**

The results show a marked shift from the misinterpretation of diagnosis of diseases for conventional ideas of standard values. A new set of underdeveloped countries. Normally, and approximately standard values, which are different from the standard the following values are grossly used for estimation, values of developed countries have been created and references and diagnosis of diseases based on biochemical recommended for reference to prevent misreading and parameters

Table: 5

	Male	Female	Remarks
Haemoglobin	14-16 g/dl	13-15 g/dl	-
Urea	15-40 mg/dl	15-40mg/dl	-
Uric Acid	4-8mg/dl	3.5-6mg/dl	-
Total Protein	6-8g/dl	6-8 g/dl	-
Albumin	3.5-5g/dl	3.5-5g/dl	-
Globulin	2.5-3.5g/dl	2.5-3.5 g/dl	-
Creatinine	0.5-1.5mg/dl	0.5-1.5 mg/dl	-

The following are the interpretations .The average normal value of Haemoglobin (Hb) is found to be 12.45 g/dl and the same for the female population is 11.13. On standardizing the normal range as by the same way as conventional normal the ranges are 11.50 through 13.50 for males and 10.13 through 13.13 for females. [All values of Hb has the unit g/dl]For urea the range for males is 11.72 through 21.72 mg/dl and for females it ranges from 10.56 through 20.56 mg/dl. For creatinine the normal value ranges from 0.15 through 1.05 for males and 0.10-1.00 for females. The normal range of uric acid in the specified normal healthy population is 4.00 -15, and the average for males is 4.35mg/dl and for females is 4.63mg/dl. The difference in the male and female population may be explained from the different food habits, the hormonal balance and other associated biological equilibrating metabolic factors.

For total protein, the average value for males is 6.10g/dl and for females is 5.95 g/dl. For albumin, for male

population the mean value is 3.56g/dl and for females is 3.52g/dl, and the range for male comes to be 2.8g/dl On the basis of the results we redefine the standards of the different parameters based on the calculation as average of the parameters  $\pm 1$ . This is grossly different from that of the standard values already redefined and used standardly. The parameters follow standard normal linear pathways of law of mass action of physical chemistry and theend products are directly proportional to the amount of reactants , visibly here the reactants of the above parameters. This obviously points to the fact that for development of health in developing countries, nutritional and other factors have to be improved as per the human developmental index, so that the people of developing countries do not suffer from overall lower body mass index and fatigue.

The rectification measures are related to different government policies, economic and social reforms and other political factors that need to be addressed in a more serious way.

Table: 6

	Male	Female	Remarks
Haemoglobin	11.50-13.50 g/dl	10 -13 g/dl	-
Urea	12-22mg/dl	11-21 mg/dl	-
Uric Acid	4-15 mg/dl	4-15 mg/dl	-
Total Protein	5-7g/dl	5-7 g/dl	-
Albumin	2.8-4.3 mg/dl	2.8-4.3 g/dl	-
Globulin	2.1-3.1mg/dl	2.1-3.1 g/dl	-
Creatinine	0.2-1.1 mg/dl	0.1-1.0 mg/dl	-

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