



STUDY THE VARIOUS NORMAL PHYSIOLOGICAL VALUES IN HUMAN BODY

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I. ABSTRACT:

The physiological characteristics of human life depends upon the intake, metabolism and excretion of stable elements from food, water and air. The physiological behaviour of varies by gender, recent activities, food and fluid consumption, time of day, and in women the stages of menstrual cycle. These values also vary with countries and the continent. The physiological parameters, such as heart rate, blood pressure, body temperature, serum levels of various stress hormones (e.g. cortisol) and immunological functions (e.g. suppression of lymphocyte activity) can be used to assess the welfare.

II. KEY WORDS: Normal values, Creatinine, Pyruvate, Vitamins, Monocytes, Prediabetic, Albumin.

III. INTRODUCTION:

Physiology is the study of animal functions and can be investigated at the level of cells, tissue, organ system and whole body. The normal physiological values provides through understanding of normal functions, enabling more effective treatment of abnormal or disease state. The physiological parameters, such as heart rate, blood pressure, body temperature, serum levels of various stress hormones (e.g. cortisol) and immunological functions (e.g. suppression of lymphocyte activity) can be used to assess the welfare. Measurement of many of these parameters requires invasive monitoring techniques.

IV. AIM AND OBJECTIVES:

Aim:

1) To study the different physiological value

Objectives:

- 1) To study the vital signs and their use in clinical practice.
- 2) To study the various laboratory tests and their use in clinical practice.
- 3) To assess the various glands, liver, kidney function.
- 4) To diagnose the disease by comparing physiological and pathological values.
- 5) Discuss the normal values and test interpretation.

Various Normal Physiological Values:**Table 4.1: Complete Blood Count**

Sr. No.	Cell/content	Normal values	Function
1	RBC	Female: 3.8-5.1 mill/mm ³ Male: 4.3-5.7 mill/mm ³ Infant: 6-7 mill/mm ³	Transport oxygen from lungs to tissue.
	MCH	27-32 pg	
	MCV	77-93 fl	
	MCHC	30-35 g/dl	
2	Haemoglobin	Female: 12-14 gm/100ml Male: 14-16 gm/100ml Infant: 18-20 gm/100ml	Transport oxygen from lungs to tissue.
3	WBC	Adult: 6000-11000/mm ³ Infant: 10000-25000/mm ³	
A	Neutrophil	3000-6000/mm ³ (60-70%)	Phagocytic
B	Eosinophil	150-400/mm ³ (1-4%)	Phagocytic and damage to larval stage of parasite
C	Basophil	100/mm ³ (0.5-1%)	Storage of histamine and involves in allergic reaction
D	Monocyte	350-800/mm ³ (5-10%)	Phagocytic,

			Wandering macrophages
E	Lymphocyte	1500-2700/mm ³ (20-30%)	Involve in immune responsive reaction
4	Platelets	1.5-4.5 lac/mm ³	Haemostasis
5	Bleeding time	2-5 min	
6	Clotting time	5-8 min	
7	Thrombin time	Less than 20 sec	
8	Prothrombin time	11-15 sec	
9	ESR	By Wintrob's method: Male: 0-9 mm/hr Female: 0-20 mm/hr By Westergren's method: Male: 3-7 mm/hr Female: 5-9 mm/hr	

Table 4.2: Electrolyte

Sr. No.	Electrolyte	Normal values
1	Ammonia	15-50 $\mu\text{mol/L}$
2	Chloride	95-105 mmol/L
3	Copper	70-150 $\mu\text{g/dl}$
4	Creatinine	0.8-1.3 mg/dl
5	Blood urea nitrogen	8-21 mg/dl
6	Ferritin	12-300 ng/mL
7	Glucose	65-110 mg/dl
8	Inorganic phosphorous	1-1.5 mmol/L
9	Ionized calcium	1.03-1.23 mmol/L
10	Magnesium	1.5-2 mEq/L
11	Phosphate	0.8-1.5 mmol/L
12	Potassium	3.5-5 mmol/L
13	Pyruvate	300-900 $\mu\text{g/dl}$
14	Sodium	135-145 mmol/L
15	Total calcium	8.5-10.2 mg/dl
16	Total iron binding capacity	45-85 $\mu\text{mol/L}$
17	Total serum iron	65-180 $\mu\text{g/dl}$
18	Transferrin	200-350 mg/dl
19	Urea	1.2-3 mmol/L
20	Uric acid	0.18-0.48 mmol/L
21	Zinc	70-100 $\mu\text{mol/L}$
22	Ceruloplasmin	15-60 mg/dl



Table 4.3: Height and weight:

Sr. No.	Age	Weight (in kg)		Height (in cms)	
		Male	Female	Male	Female
1	At birth	2.6	2.6	47.1	46.7
2	3 months	5.3	5	59.1	58.4
3	6 months	6.7	6.2	64.7	63.7
4	9 months	7.4	6.9	68.2	67.0
5	1 years	8.4	7.8	73.9	72.5
6	2 years	10.1	9.6	81.6	80.1
7	3 years	11.8	11.2	88.9	87.2
8	4 years	13.5	12.9	96	94.5
9	5 years	14.8	14.5	102.1	101.4
10	6 years	16.3	16	108.5	107.4
11	7 years	18	17.6	113.9	112.8
12	8 years	19.7	19.4	119.3	118.2
13	9 years	21.5	21.3	123.7	122.9
14	10 years	23.5	23.3	124.7	123.9

Table 4.4: BMI: (Body mass index)

BMI= weight (kg) / Height ² (m)

Sr. No.	Category	BMI ranges
1	Starvation	< 14.9
2	Underweight	15-18.4
3	Normal	18.5-22.9
4	Overweight	25-30
5	Obese	>30

Table 4.5: pH values

Sr. No.	Organ /fluid	pH value
1	Brain	7.1
2	Heart	7-7.4
3	Skeletal muscle	6.9-7.2
4	Upper stomach	4-6.5
5	Lower stomach	1.5-4
6	Duodenum	7-8.5
7	Small intestine	4-7
8	Large intestine	4-7
9	Liver	7.2
10	Bone	7.4
11	Saliva	6.8
12	Bile	7.7
13	Blood	7.4
14	Arterial blood	7.4-7.45
15	Venous blood	7.3-7.35
16	Capillary blood	7.35-7.4
17	Gastric juice	1.5-3.5
18	Pancreatic juice	7.5-8.3
19	Intestinal juice	7.5-8
20	Urine	4.5-8
21	CSF	7.34
22	Ileum, distal	8
23	Lacrimal	7.4
24	Breast milk	7
25	Aqueous humour	7.2
26	Faeces	7.2
27	Nasal secretion	6
28	Prostatic fluid	6.5
29	Semen	7.7-8

30	Sweat	5.4
31	Vagina- pre menses	7
32	Vagina- post menses	4.5
33	Lysosomes	4.5

Table 4.6: Hormones

Sr. No.	Name of gland	Name of hormone	Normal value
1	Anterior Pituitary gland	GH (Growth hormone)	Male: < 2 ng/ml (<60 yr.) < 10 ng/ml (>60 yr.) Female: < 10 ng/ml (<60 yr.) < 14 ng/ml (>60 yr.)
		FSH (Follicle stimulating hormone)	Follicular: 1-9 mU/ml Ovulation: 6-26 mU/ml Luteal: 1-9 mU/ml Menopause: 30-118 mU/ml
		LH (Luteinizing hormone)	Follicular: 1-12 mU/ml Mid-cycle: 16-104 mU/ml Luteal: 1-12 mU/ml Menopause: 16-66 mU/ml
		Prolactin	2-15 ng/ml
		ACTH (Adreno corticotropic hormone)	6-76 pg/ml
		TSH (Thyroid stimulating hormone)	< 10 μ U/ml Male: 2-7.3 μ U/ml (>60 yr.) Female: 2-16.8 μ U/ml (>60 yr.)
		MSH (Melanocyte stimulating hormone)	35-81 pg/dl
	Posterior Pituitary gland	ADH or vasopressin	1-5 pg/ml
		Oxytocin	Random ovulatory: 1.25-5 pg/ml

			Peak: 5-10 ng/ml
2	Thyroid gland	Thyroxine	4.6-12 ug/dl
		Free thyroxine	0.7-1.9 ng/dl
		T3 (triiodothyronine)	80-180 ng/dl
		Free triiodothyronine	230-619 pg/dl
		Thyroglobulin 1	0-30 ng/ml
		Thyrotropin	0.5-6 uU/ml
		Calcitonin / anti parathormone	< 10 pg/ml
3	Parathyroid gland	Parathormone or Collips hormone	10-55 pg/ml
4	Adrenal medulla	Adrenalin	< 50 pg/ml
		Nor- Adrenalin	<110-410 pg/ml
		Dopamine	< 87 pg/ml
	Adrenal cortex	Aldosterone	Standing position: 7-30 ng/dl Lying down: 3-16 ng/dl
		Corticosterone	4.5-7.4 µgm/dl
5	Thymus gland	Thymosin α 1	Male: 163-670 pg/ml Female: 162-652 pg/ml
		Thymosin β 4	Male: 400-974 pg/ml Female: 345-889 pg/ml
6	Pineal body	Melatonin	
7	Testes	Androgen	Male:300-1200 ng/dl Female: 20-70 ng/dl
		Testosterone	Male:300-1200 ng/dl Female: 20-70 ng/dl
8	Ovary	Oestrogen	Male: 10-30 pg/ml Female: Luteal:160-400 pg/ml Follicular: 60-200 pg/ml Post-menopausal: < 130 pg/ml
		Progesterone	Luteal: 0.15-0.7 ng/ml Follicular: 2.0-2.5ng/ml
		Relaxin	Male: 3.01 pg/ml Female: 3.60 pg/ml
9	Placenta	HCG (Human chorionic gonadotropin)	Non-pregnant: < 5 mIU/ml Pregnant: 3 weeks:5-50 mIU/ml 4 weeks: 5-426 mIU/ml 5 weeks: 18-7340 mIU/ml 6 weeks: 1080-56500

			mIU/ml 7-8 weeks: 7650-229000 mIU/ml 9-12 weeks: 25700-288000 mIU/ml 13-16 weeks: 13300-254000 mIU/ml 17-24 weeks: 4060-165400 mIU/ml 25-40 weeks: 3640-117000 mIU/ml Post-menopausal: < 9.5 mIU/ml
10	Prostate gland	PSA (prostate specific antigen)	4.0 ng/ml
11	Kidney	Renin	0.6-4.3 ng/ml/hour
12	Pancreatic gland	Insulin	Fasting: < 100 mg/dl
		Glucagon	50-100 pg/ml
		Somatostatin	10-22 pg/ml

Table 4.7: Kidney Functioning Test

Sr. No.	Content	Normal value
1	Blood urea nitrogen	5-25 mg/dl
2	Creatinine	0.3-1.4 mg/dl
3	Uric acid	2.5-7 mg/dl
4	Albumin: globulin	1-1.8
5	Creatinine clearance/hr	Male: 71-135 ml/min Female: 78-116 ml/min
6	Renin	0.15-3.95 pg/ml/hr
7	Creatinine urine	60-250 mg/dl
8	Na (Sodium)	135-145 meq/L
9	K (Potassium)	3.4-4.5 meq/L
10	Ca (Calcium)	8.4-10.6 mg/dl
11	IP (Phosphorous)	2.1-4.7 mg/dl
12	Alkaline phosphatase	10 U/L

Table 4.8: Liver functioning Test

Sr. No.	Liver functioning test	Normal range
1	Bilirubin	Total: 0.1-1.0 mg Conjugate: < 0.2 mg
2	Alkaline phosphate	25-112 IU/L
3	Aspartate transaminase (AST/SGOT)	5-31 IU/L
4	Alanine transaminase (ALT/SGPT)	5-35 IU/L
5	Albumin	3.5-5.0 g/dl
6	Prothrombin time	12-16 sec

Table 4.9: Creatinine kinase- CK:

Sr. No.	Content	Importance	Normal values
1	Creatinine kinase- CK: CK1-BB-brain tissue CK2 -MB- cardiac muscles CK3 -MM- skeletal muscle	It is isoenzyme that is release into the blood when skeletal, brain or cardiac muscle is injured.	22-198 U/L

Table 4.10: Lipid profile

Sr. No.	Content	Desirable	Borderline	High risk
1	Cholesterol	<200 mg/dl	200-239 mg/dl	240 mg/dl
2	Triglycerides	<150 mg/dl	150-199 mg/dl	200-499 mg/dl
3	HDL cholesterol	60 mg/dl	35-45 mg/dl	<35 mg/dl
4	LDL cholesterol	60-130 mg/dl	130-159 mg/dl	160-189 mg/dl
5	Cholesterol: ratio	4:0	5:0	6:0

Table 4.11: Various Normal values

Sr. No.	Organ/content	Normal values
1	Blood pressure	Infant: 60/40 mmHg Adults:120/80 mmHg At 70 yrs:140/80 mmHg
2	Respiratory rate	Infant: 30-60/min Adults:12-18/min
3	Heart rate	In foetus: 140/min In new born: 120/min Adult: 60-75/min
4	Pulse rate	72/min
5	GFR	120 ml/min
6	Total blood volume	5 L
7	Semen volume	2-5 ml
8	Total number of bones	206
9	Total number of joints	360

10	Total number of muscles	639
11	Total number of vertebrae	33
12	CSF volume	150 ml
13	Cardiac output	5 L
14	Cardiac index	2.5-4.5 L/min/m ²
15	Stroke volume index	40 ml/min/m ²
16	Stroke volume	70 ml
17	Urine output	800-2000 ml/day
18	Oxygen value	95-100%
19	Bone density	1 SD
20	Energy requirement (calorie/day)	1-6 years: 1000-1600 7-12 year: 1600-2500 13-20 years: 2500-2800 70 years: Lying on bed without taking diet= 1650 Lying on bed with taking diet= 1850 Sit on chair whole day=2250
21	BMR (Basal metabolic rate)	Male: 40 Kcal/m ² /hr Female: 37 Kcal/m ² /hr

Table 4:12: Body Temperature

Sr. No.	Site/ location	Temperature (°F)
1	Ear	99.6
2	Axilla	97.6
3	Mouth	98.6
4	Rectum	99.6
5	Temporal	99.2

Table 4.13: Glucose Level

Sr. No.	Types	Fasting		Post meal
		Minimum	Maximum	
1	Normal	70 mg/dl	99 mg/dl	< 140 mg/dl
2	Prediabetic	100 mg/dl	125 mg/dl	140-199 mg/dl
3	T2 diabetic	>126 mg/dl		>200 mg/dl

Table 4.14: Nutrition

Sr. No.	Nutrition	Daily dose
1	Carbohydrate	400-500 gm
2	Protein	75-100 gm
3	Fat	75-100 gm
4	Water	2-4 pints
5	Iodine	150 um
6	Magnesium	0.4 gm
7	Potassium	1 gm
8	Calcium	1.5 gm
9	Phosphorous	1.5 gm
10	Sodium	4 gm
11	Chloride	3.5 gm
12	Sodium chloride	13-15 mg
13	Zinc	15 mg
14	Iron	18 mg
15	Copper	105 mg

Table 4.15: Immunoglobins

Sr. No.	Immunoglobins	Normal values
1	Ig G	700-1500 mg/dl
2	Ig A	60-400 mg/dl
3	Ig E	3-423IU/ml
4	Ig M	60-300 mg/dl
5	Ig D	0-14 mg/dl

Table 4.16: Vitamins

Sr. No.	Vitamin	Scientific name	Function	Requirement
1	A	Retinol	Anti-infective, anti-xerophthalmic vitamin	500 IU/day Child: 500 µg Adult: 750 µg Pregnancy: 1200 µg
2	D	Calciferol	Anti-ricketic vitamin	400 IU/day
3	E	Tocopherol	Anti-sterility vitamin	10-15 IU/day
4	K	Naphthoquinone	Anti-haemorrhagic vitamin	3000 IU/day
5	B1	Thiamine	Anti-neuritis vitamin	1.5 mg/day
6	B2	Riboflavin	Helps in body growth	1.8 mg/day
7	B3	Nicotinic acid	Pellagra preventative factor	10 mg/day
8	B5	Pantothenic acid	Anti-dermatitis, anti-cholestremic factor	18 mg/day
9	B6	Pyridoxin	Essential in treatment of bronchial asthma	2 mg/day
10	B9	Folic acid	Essential in treatment of topical sprue Wills factor	100 mg/day

11	B12	Cyanocobalamin	Erythrocyte maturation factor	6 mg/day
12	C	Ascorbic acid	Essential in treatment of methanoglobinemia and alkaptonuria	40-60 mg/day

Table 4.17: Spirogram

Sr. No.	Pulmonary volumes	Values
1	Tidal volume (V_T)	500ml
2	Inspiratory reserved volume (IRV)	3100ml
3	Inspiratory capacity (IC) $IC = IRV + V_T$	3600ml
4	Residual volume (RV)	1200ml
5	expiratory reserved volume (ERV)	1200ml
6	Functional residual capacity (FRC) $FRC = ERV + RV$	1200ml
7	Vital capacity (VC) $VC = IC + ERV$	4800ml
8	Total lungs capacity (TLC) $TLC = VC + RV$	6000ml

Table 4.18: Distribution of Cardiac Output:

Sr. No.	Organ	Distribution of cardiac output:
1	Liver and GIT	1500 ml/min
2	Kidney	1300 ml/min
3	Brain	1000 ml/min
4	Skeletal muscles	800 ml/min
5	Heart	225 ml/min
6	Muscle	100-200 ml/min
7	Spleen	50 ml/min

Table 4.19: CSF

Sr. No.	Parameters	Normal ranges
1	Normal volume	150 ml
2	Daily production	550 ml
3	Pressure	50-150 mm of H ₂ O
4	Specific gravity	1.005
5	pH	7.34
6	Glucose level	40-80 mg/dl
7	Protein level	20-90 mg/dl
8	Albumin level	6.6-44 mg/dl
9	Chloride level	720-750 mg/dl
10	RBC level	Absent
11	WBC level	New-born: 30/mm ³ Adult: 0-5/mm ³
12	Opening pressure	50-150 mm of H ₂ O
13	Lactase dehydrogenase	< 35 mg/dl

Table 4.20: Seminal fluid

Sr. No.	Parameters	Normal ranges
1	Liquification	Within 20 min
2	Volume	2-5 ml
3	Sperm count	60-150 million/ml
4	Ph	7.7-8
5	Sperm motility	>60%
6	Speed of human sperm in female genital tract	3 mm/min
7	Spermatogenesis process	74 days
8	Spermatozoa in semen	10%
9	Viability	24-48 hrs

Table 4.21: Life span

Sr. No.	Blood cells	Life span
1	RBC	120 days
2	Platelets	9-11 days
3	WBC	1-15 days
4	Basophils	12-15 days
5	Eosinophils	8-12 days
6	Neutrophils	2-4 days
7	Lymphocyte	1-3 days
8	Monocyte	2-8days

Table 4.22: Specific gravity:

Sr. No.	Body fluid	Specific gravity
1	Serum/ plasma	1.025
2	Serous	1.015
3	CSF	1.005
4	Glomerular filtrate	1.010
5	Urine	1.001-1.033
6	Blood	Packed RBC- 1.093 Platelets- 1.035 Plasma- 1.025 Whole blood-1.050
7	Bile	1.020

V. DISCUSSION AND CONCLUSION:

The physiological values will fluctuate within normal limits for any one human. Extreme fluctuations are indicative of changes in welfare state. Changes may occur due to environmental, husbandry or experimental events. In these cases comparing measurements in individual human before and after the event, or between treated and control human, can help to infer whether welfare is affected. Note there is often high variance between human according to their age, sex, dominance status and the stability of the social groups.

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