weight. The USDA guidelines had given five food groups in the lower three sections of the Pyramid. Now each of these groups provide some part, if not all the nutrients a man needs. However, foods in one group cannot replace those in the others. As it is, no one group can be considered to be more important or superior than the other ones; you need them all.

TABLE 1.3: CLINICAL SIGNS OF HEALTH

	Features	*Good*	*Poor*
1.	General Appearance	Alert, responsive	Listless, apathetic, cachexia
2.	Hair	Shiny, lustrous; healthy scalp	Stringy, dull, brittle, dry, depigmented
3.	Neck Glands	No enlargement	Thyroid enlarged
4.	Skin, Face and Neck	Smooth, slightly moist; good color, pink-red mucous membranes	Greasy, discolored, scaly
5.	Eyes	Bright, clear; no fatigue circles	Dryness, signs of infection; increased vascularity, glassiness, thickened conjunctivae
6.	Lips	Good color, moist	Dry, scaly, swollen; angular lesions (stomatitis)
7.	Tongue	Good pink color, no lesions, surface papillae present	Papillary atrophy, smooth appearance, swollen red, beefy (glossitis)
8.	Gums	Good pink color, no swelling no bleeding, firm	Slight red, swelling, receding, spongy
9.	Teeth	Straight, no crowding, well-shaped jaws, no discoloration	Unfilled cavities, missing teeth, worn surfaces, mottled, malpositioned
10.	Skin, general	Smooth, slightly moist, good color	Rough, dry, scaly, pale, pigmented, irritated, petechiae, bruises
11.	Abdomen	Flat	Swollen
12.	Legs and Feet	No tenderness/weakness, no swelling; good color	Edema, tender calf, tingling; weakness
13.	Skeleton	No malformation	Bowed legs, knock knees, chest deformity, beaded ribs, prominent scapulae
14.	Weight	Normal for age and height	Overweight or underweight
15.	Posture	Erect arms and legs straight, abdomen in and chest out	Sagging shoulders, sunken chest, humped back
16.	Muscles	Well developed, firm	Flaccid, poor tone, undeveloped, tender
17.	Nervous Control	Quite attentive, not prone to cry, not irritable or restless	Inattentive, irritable
18.	Gastrointestinal Functions	Appetite and digestion good, regular bowel movements	Anorexia, indigestion, constipation or diarrhoea
19.	General Vitality	Endurance, energetic, sleeps well at night; vigorous	Easily fatigues, no energy, falls asleep in office, looks tired, apathetic

Source: Adapted from *Essentials of Nutrition and Diet Therapy,* Pub. Mosby.

SUPPLEMENT IV

MALNUTRITION

FAO Reports

Depending upon the extent and magnitude of this problem, one observes two types, viz., the prononced malnutrition and negative spiral, as under:

A: Pronounced Deterioration

Afghanistan	Angola	Burundi	Central African Rep.
Congo Dom. Rep.	Eriteria	Ethiopia	Haiti
Kenya	Korea DPR	Liberia	Madagascar
Mongolia	Mozambique	Niger	Rwanda
Tanzania	Zambia		

B: The Negative Spiral

Bangladesh	Cuba
Nicaragua	Yemen
Zimbabwe	

UNICEF–2001

Since undernutrition manifests more openly in the low birth weight (LBW, less than 2500 g) and under-5 mortality of the infants, the UNICEF Report:

The State of the World's Children 2001

portrays a more dismal picture of some of the poorer countries (listed here in alphabetic order), as under:

	% of LBW Infants	*Under-5 Mortality Rank*
Afghanistan	20	4
Bangladesh	30	53
Burkina Faso	21	13
Guinea Bissau	20	12
India	33	49
Malawi	20	7
Myanmar	24	39
Pakistan	25	39
Papua New Guinea	23	39
Solomon Islands	20	112
Togo	20	28

(*iii*) Lactic acid and Pyruvic acid, the products of intermediary carbohydrate metabolism.

B: Non-Carbohydrate Sources:
Proteins and fat provide the additional sources of glucose. Glycerol from the breakdown of fats, is converted to glycogen in the liver, which is then made available for glucose formation. The production of glucose from the non-carbohydrate sources is called gluconeogenesis.

Uses of Blood Glucose: Blood sugar within a range of 70-120 ml/dl offers three main uses:

(*i*) Energy production to meet the constant demand of body.
(*ii*) Energy storage as glycogen in liver muscles and fat in adipose tissue.
(*iii*) Glucose products like galactose, select amino acids, besides DNA and RNA

Hormonal Control: Some hormones influences the glucose metabolism and so help regulate the blood sugar levels in the body.

1. **Sugar-lowering Hormones:** Insulin, produced by the β cells in pancreas, acts to lower blood glucose level. This is done through:

(a) Glycogensis or conversion of glucose to glycogen in liver to provide for energy reserve.
(b) Lipogenesis or conversion of glucose to fat for storage in adipose tissue.
(c) Cells permeability to glucose is increased, thus allowing it to pass into the cells and supply energy by oxidation.

2. **Sugar-raising Hormones:**

(a) Glucagon acts opposite to insulin and increases breakdown of liver glycogen to glucose.
(b) Somatostatin suppresses insulin and glucagon.
(c) Steroid hormones release glucose-forming carbon units from proteins and act as insulin antagonists.
(d) Epinephrine stimulates breakdown of liver glycogen and instant release of glucose.
(e) Growth hormone and Adreno-corticotropic hormone (ACTH) act as insulin antagonists.
(e) Thyroxine influences the breakdown rate of insulin.

B: Lipid (Fat) Metabolism

Fat Synthesis and Breakdown

Liver and adipose tissue help in fat synthesis and breakdown. Fatty acids released from fat are used by body cells as a concentrated fuel for producing energy.

As stated earlier, the amino acids have a *'Buffer'* capacity, since they ionize in solution to behave either as an acid or as a base, depending upon the pH of the solution.

Table 4.3 gives the requirements of essential amino acids for different age groups.

TABLE 4.3: ESSENTIAL AMINO ACID REQUIREMENTS FOR CHILDREN AND ADULTS

Amino Acid	*Children (2-5 years) mg/kg/day*	*Children (10-12 years) mg/kg/day*	*Adults (18 years and over) mg/kg/day*	*Adults (Revised estimates) mg/kg/day*
Isoleucine	31.0	28.0	10.0	23.0
Leucine	73.0	44.0	14.0	39.0
Lysine	64.0	44.0	12.0	30.0
Methionine/Cystine	27.0	22.0	13.0	15.0
Phenylalanine/Tyrosine	69.0	22.0	14.0	39.0
Threonine	37.0	28.0	7.0	15.0
Tryptophan	12.5	3.3	3.5	6.0
Valine	38.0	25.0	10.0	20.0
TOTAL	**351.5**	**216.3**	**83.5**	**187.0**

TYPES OF PROTEINS

From the nutrition angle, proteins may be divided into two groups *viz.*, complete proteins and incomplete proteins.

Complete Proteins

This group of proteins contains all the essential amino acids in sufficient quantity and in a proper ratio to meet all the needs of human body. Even if they happen to be the exclusive source of proteins, they can fully sustain life processes. These complete proteins are, *prima facie*, of animal origin. i.e. milk, meat, fish and poultry products. Qualitatively, these proteins are far more superior than the incomplete proteins.

Incomplete Proteins

These proteins are usually deficient in one or more of the essential amino acids. The deficiency on this count in the vegetable proteins is shown hereunder:

Foodstuffs	*Limiting Amino Acids*
Cereals	Lysine and Threonine
Maize	Lysine and Tryptophan
Pulses	Methionine and Tryptophan
Groundnut	Lysine, Methionine and Threonine
Soyabean	Methionine
Coconut	Lysine and Methionine.