Overview of Severe Acute Malnutrition

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Definition

- **Severe Acute Malnutrition:** Refers to weight-for-height/length <-3 z-score or MUAC <11.5cm or the presence of bilateral pitting edema.

Introduction

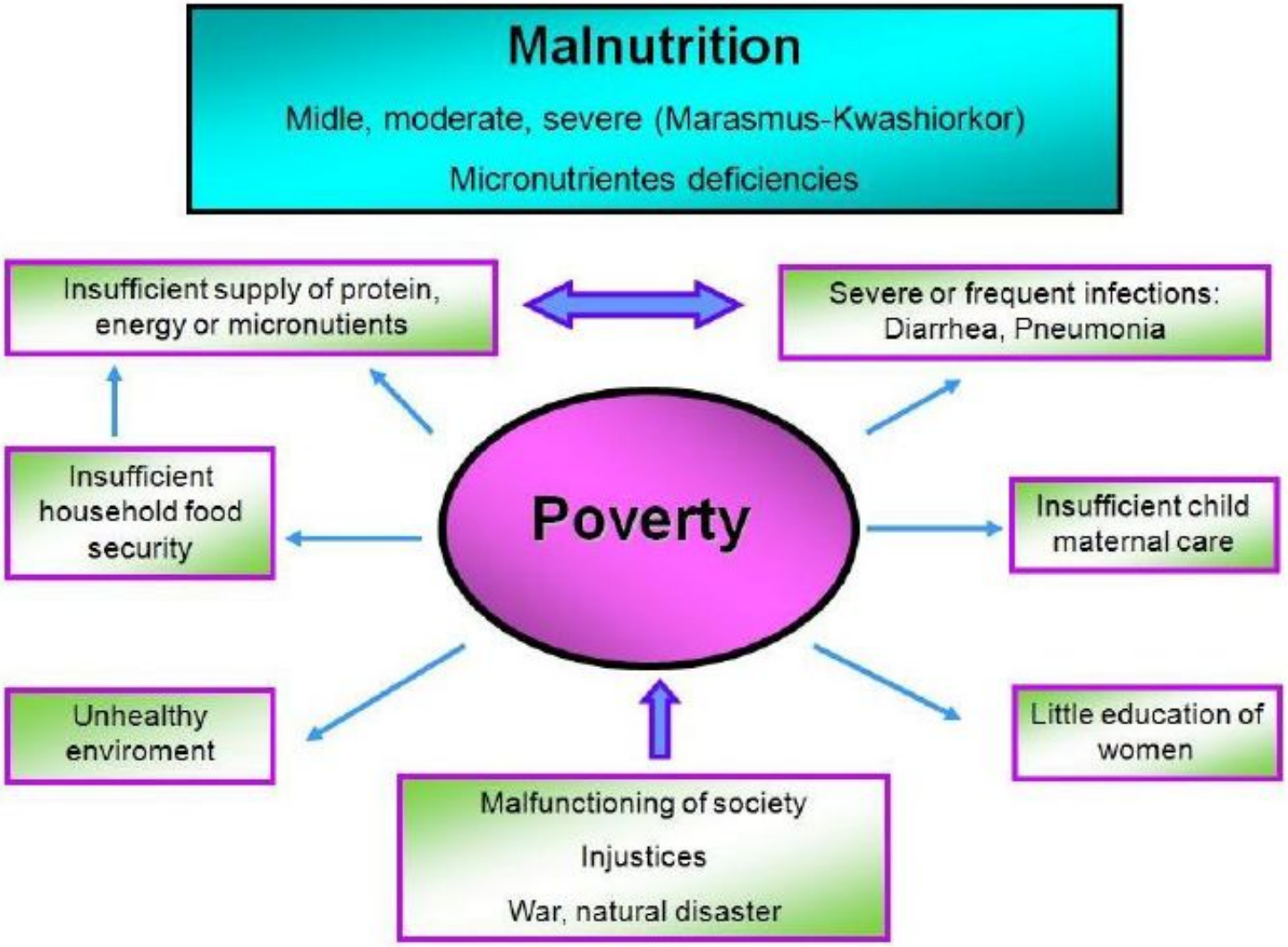
- Globally, SAM affects about 20 million children <5 years and is associated with 1-2 million preventable deaths each year. (Steve Collins 2007).

- Uganda has high prevalence rates of malnutrition with about 26% of children aged 0-59 months stunted, 10.2% underweight and 2.9% wasted. (Uganda DHS 2022)

- Children with SAM are 9X more likely to die from common childhood illnesses.
  - case fatality rates of 20-60% (De Onis 2012) .

Introduction continued-

Causes of Malnutrition



Mechanisms of SAM

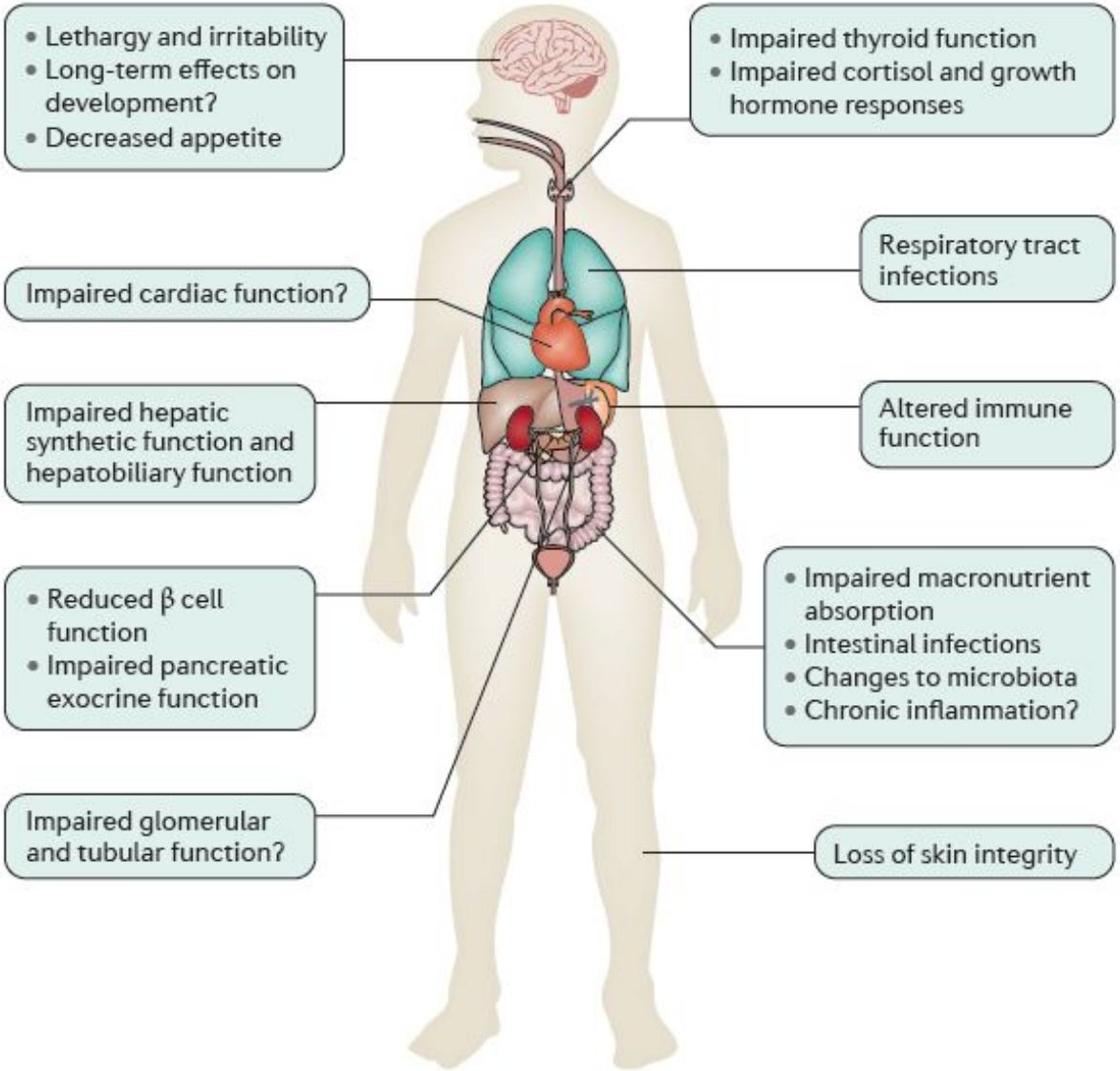
- Wasting

1. Micronutrient oxidation
    - Short-term starvation (a few days)- oxidation of Free fatty acids and ketones from adipose tissue and to a smaller extent myofibrillar proteins
    - Long-term starvation (several days)- extensive myofibrillar protein breakdown to amino acids
2. Cytokine release (TNF, IL-1, IL-6)- cause a reduction in appetite and food intake, and have direct catabolic effects on skeletal muscle and adipose tissue
3. Autophagy

- Edematous malnutrition -maladaptive metabolic response

Mechanisms of SAM continued-

Organ System involvement in SAM



Direct methods of nutritional assessment (ABCD)

1. Dietary evaluation methods
    - 24hour dietary recall.
    - Dietary history since early life.
    - Food frequency questionnaires.
    - Food dairy technique.
    - Observed food consumption.
2. Anthropometry
3. Clinical methods
4. Biochemical, laboratory methods.

Anthropometry

- This refers to the physical measurement of body parts in comparison to reference standards.

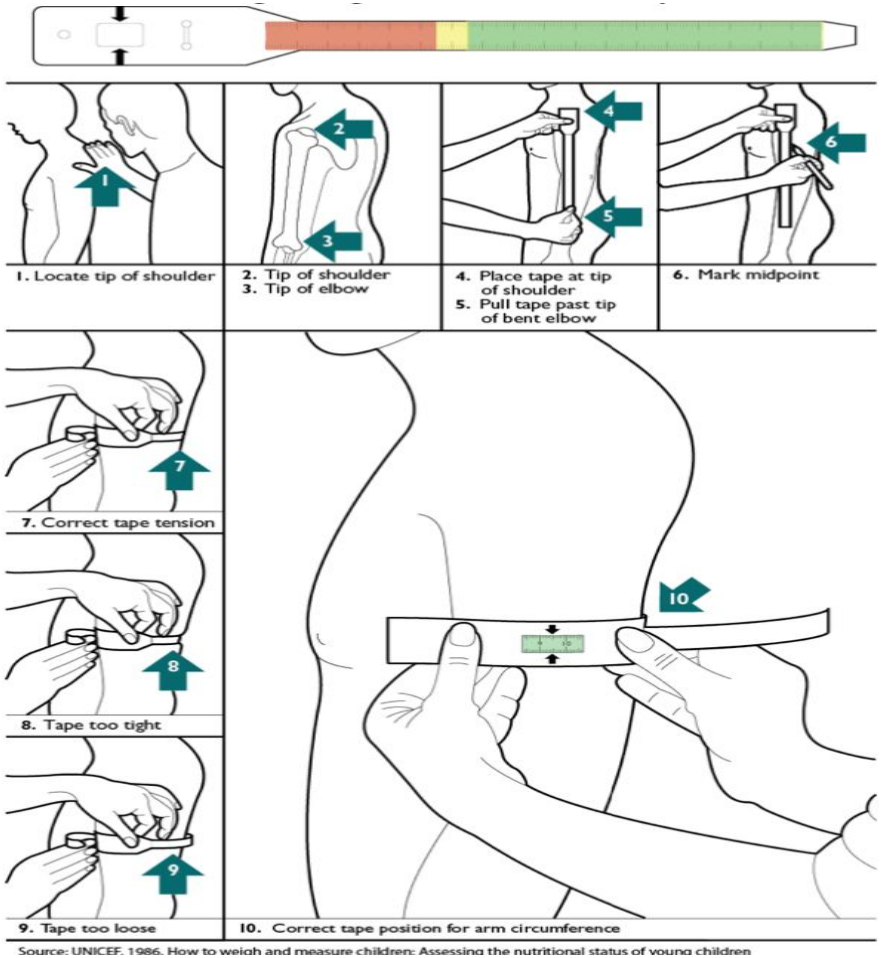
- Includes; weight, height or length, MUAC, skin fold thickness, head/chest ratio and hip/waist ratio.
    - Mid-Upper-Arm Circumference (MUAC) in cm;
    - **Body Weight** in Kg and rounding off to the nearest 0.1kg (100g);
    - **Length** (children < 2years or < 87.0 cm) or **height** (children > 2years, **or 87.0 cm or more, &** adolescents) in cm rounding off to the nearest 0.1 cm

Anthropometry continued

Malnutrition indices commonly calculated:

- *Weight-for-height* (WFH) – a measure of *wasting* or *acute malnutrition.*
- *Height-for-age* (HFA) – a measure of *stunting* or chronic under nutrition.
- *Weight-for-age* (WFA) – a measure of *underweight* or wasting and stunting combined.
- MUAC – a measure of wasting or acute malnutrition.

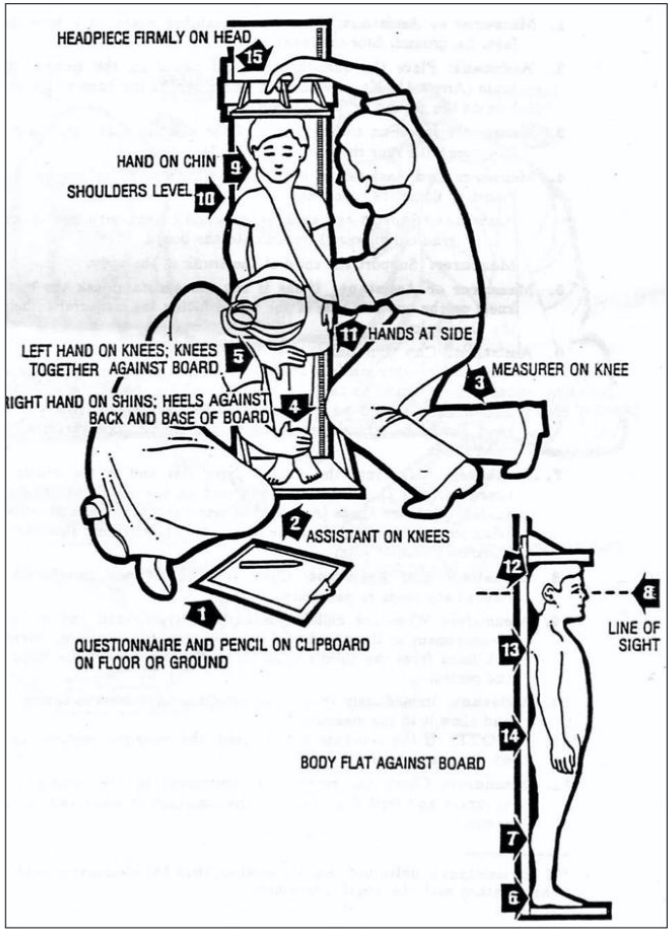
MUAC measurement

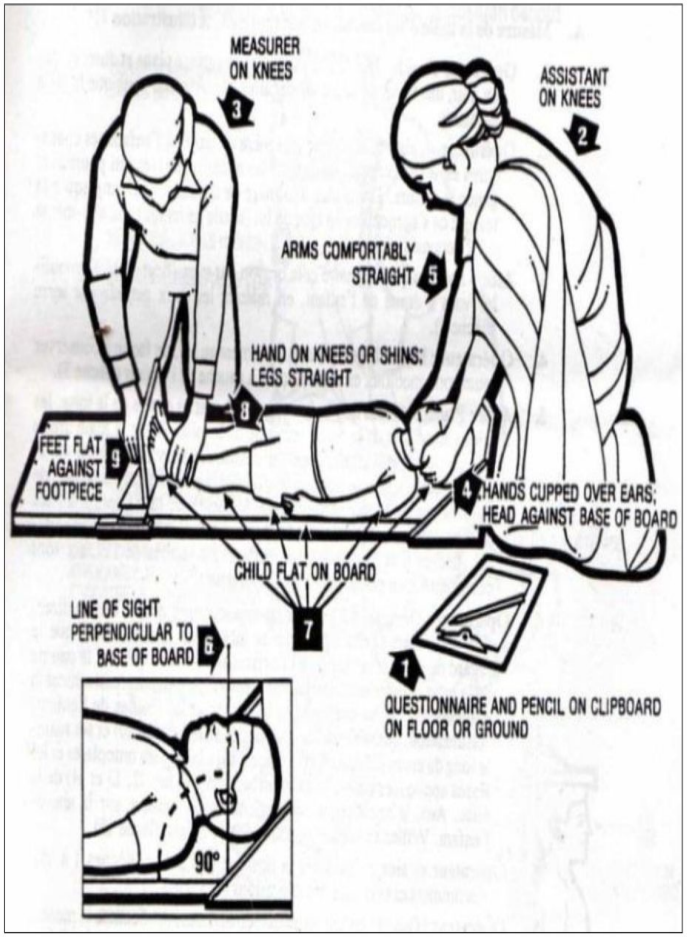


Measuring weight in different circumstances

Photo on right: Source: Guidelines for the management of the severely malnourished: version January 2007 by Pr. Michael Golden and Yvonne Grellety, ACF. Photos on left courtesy of ACF Liberia

Measuring Height/length





Summary of Classification of Severe Acute Malnutrition

Age category	Nutritional indicator	Severe Acute Malnutrition (SAM)
Infants less than 6 months	- Weight for Length (WFL) - Bilateral pitting edema	Less than -3 z-score (<-3SD) - Presence of bilateral pitting edema
Children from 6 to 59 months	- Weight for Length/Height (WFL/H) - MUAC cut off - Bilateral pitting edema	Less than -3 z-score (<-3SD) - Less than 11.5cm (<11.5cm) - Presence of bilateral pitting edema
Children and adolescents from 5years to 19 years	 Bilateral Pitting edema	- 5 to less than 10 years- Less than 13.5cm (<13.5cm) - 10 to less than 15 years- Less than 16.0cm (<16.0cm) - 15 to less than 18 years- Less than 18.5cm (<18.5cm) - Presence of bilateral pitting edema

ANNEX 4.2: UNISEX CHARTS STANDARDIZED TO WHO 2006 TABLES

Use for both boys and girls (highest for either gender)													
Length	Weight Kg – Z-score						Length	Weight Kg – Z-score					
cm	-4.0	-3	-2	-1.5	-1	0	cm	-4.0	-3	-2	-1.5	-1	0
Use Length for less than 87 cm													
45	1.75	1.90	2.07	2.16	2.25	2.46	66	5.5	5.92	6.4	6.65	6.92	7.50
45.5	1.81	1.97	2.14	2.23	2.33	2.55	66.5	5.6	6.02	6.5	6.75	7.03	7.62
46	1.88	2.03	2.21	2.30	2.41	2.63	67	5.7	6.11	6.6	6.86	7.14	7.74
46.5	1.94	2.10	2.28	2.38	2.48	2.72	67.5	5.8	6.2	6.69	6.96	7.24	7.85
47	2.00	2.16	2.35	2.45	2.56	2.80	68	5.8	6.29	6.79	7.06	7.35	7.97
47.5	2.06	2.23	2.42	2.53	2.64	2.89	68.5	5.9	6.38	6.89	7.16	7.45	8.1
48	2.12	2.30	2.50	2.61	2.72	2.97	69	6.0	6.47	6.99	7.26	7.56	8.2
48.5	2.18	2.37	2.57	2.68	2.80	3.06	69.5	6.1	6.56	7.08	7.36	7.66	8.3
49	2.25	2.44	2.65	2.76	2.89	3.16	70	6.2	6.65	7.18	7.46	7.77	8.4
49.5	2.32	2.51	2.73	2.85	2.97	3.25	70.5	6.3	6.74	7.27	7.56	7.87	8.5
50	2.39	2.59	2.81	2.94	3.07	3.35	71	6.3	6.82	7.37	7.66	7.97	8.6
50.5	2.46	2.67	2.90	3.03	3.16	3.46	71.5	6.4	6.91	7.46	7.76	8.1	8.8
51	2.54	2.75	2.99	3.12	3.26	3.56	72	6.5	7.00	7.55	7.86	8.2	8.9
51.5	2.62	2.84	3.08	3.22	3.36	3.68	72.5	6.6	7.08	7.65	7.95	8.3	9.0
52	2.70	2.93	3.18	3.32	3.47	3.79	73	6.7	7.16	7.74	8.0	8.4	9.1
52.5	2.79	3.02	3.28	3.42	3.58	3.91	73.5	6.7	7.25	7.83	8.1	8.5	9.2
53	2.88	3.12	3.38	3.53	3.69	4.03	74	6.8	7.33	7.91	8.2	8.6	9.3
53.5	2.98	3.22	3.49	3.64	3.80	4.16	74.5	6.9	7.41	8.0	8.3	8.7	9.4
54	3.08	3.33	3.61	3.76	3.92	4.29	75	6.9	7.49	8.1	8.4	8.8	9.5
54.5	3.18	3.44	3.73	3.88	4.05	4.42	75.5	7.0	7.56	8.2	8.5	8.8	9.6
55	3.29	3.55	3.85	4.01	4.18	4.55	76	7.1	7.64	8.3	8.6	8.9	9.7
55.5	3.39	3.67	3.97	4.14	4.31	4.69	76.5	7.2	7.72	8.3	8.7	9.0	9.8
56	3.50	3.78	4.10	4.26	4.44	4.83	77	7.2	7.79	8.4	8.8	9.1	9.9
56.5	3.61	3.90	4.22	4.40	4.58	4.98	77.5	7.3	7.87	8.5	8.8	9.2	10.0
57	3.7	4.02	4.35	4.53	4.71	5.13	78	7.4	7.94	8.6	8.9	9.3	10.1
57.5	3.8	4.13	4.47	4.66	4.85	5.27	78.5	7.4	8	8.7	9.0	9.4	10.2
58	3.9	4.25	4.6	4.79	4.99	5.42	79	7.5	8.1	8.7	9.1	9.5	10.3
58.5	4.1	4.37	4.72	4.92	5.12	5.56	79.5	7.6	8.2	8.8	9.2	9.5	10.4
59	4.2	4.49	4.85	5.05	5.25	5.71	80	7.6	8.2	8.9	9.2	9.6	10.4
59.5	4.3	4.6	4.97	5.17	5.39	5.85	80.5	7.7	8.3	9.0	9.3	9.7	10.5
60	4.4	4.71	5.09	5.3	5.52	5.99	81	7.8	8.4	9.1	9.4	9.8	10.6
60.5	4.5	4.82	5.21	5.42	5.65	6.13	81.5	7.8	8.5	9.1	9.5	9.9	10.7
61	4.6	4.93	5.33	5.54	5.77	6.26	82	7.9	8.5	9.2	9.6	10.0	10.8
61.5	4.7	5.04	5.44	5.66	5.89	6.40	82.5	8.0	8.6	9.3	9.7	10.1	10.9
62	4.8	5.14	5.56	5.78	6.01	6.53	83	8.1	8.7	9.4	9.8	10.2	11.0
62.5	4.9	5.25	5.67	5.89	6.13	6.65	83.5	8.2	8.8	9.5	9.9	10.3	11.2
63	5.0	5.35	5.77	6.00	6.25	6.78	84	8.3	8.9	9.6	10.0	10.4	11.3
63.5	5.1	5.45	5.88	6.12	6.36	6.9	84.5	8.3	9	9.7	10.1	10.5	11.4
64	5.1	5.54	5.99	6.23	6.48	7.03	85	8.4	9.1	9.8	10.2	10.6	11.5
64.5	5.2	5.64	6.09	6.33	6.59	7.15	85.5	8.5	9.2	9.9	10.3	10.7	11.6
65	5.3	5.74	6.19	6.44	6.7	7.27	86	8.6	9.3	10.0	10.4	10.8	11.7

Clinical assessment

- Simplest and most practical method of ascertaining nutritional status.
- Emphasis on signs of visible severe wasting, bilateral pitting oedema
- General clinical examination- hair, angles of the mouth, gums, nails, skin, eyes, tongue, muscles, bones and thyroid gland.
- Medical complications (hypothermia, hypoglycemia, corneal ulcerations, very severe anaemia, dermatosis, heart failure, dehydration/shock, severe infections).

Children with Clinical signs of Severe Acute Malnutrition

Wasting

Pitting Edema

Eye Changes

Dermatosis

Laboratory Evaluation

- CBC- Hb and red cell indices
- Pre albumin and albumin; these are surrogate markers of the adequacy of short and long term dietary protein intake respectively
- Cellular immunity- Total lymphocyte count of <1000 reveals effect of nutrition disorders on the immunity
- Vitamins- for children with GI malabsorption/ inflammation

Laboratory evaluation ctd

- Minerals; in children with certain chronic illnesses
- Others
  - Hypokalemia and hypophosphatemia in refeeding syndrome
  - Reduced sodium
  - Reduced blood urea nitrogen
  - Reduced concentration of zinc and magnesium in chronic diarrhea

- Thank you