Session One
Nutrition and body weight
Homeostasis

In order to stay alive, we require fuels in our diet to supply the energy that drives the chemical reactions of our bodies. These reactions enable us to carry out such diverse functions as growing, developing, moving, thinking, defending ourselves from infection, recovering from trauma, and reproducing. The fuels in our diet also provide some of the precursors from which the body's structural and functional components are derived. The diet also provides essential cell components such as vitamins, minerals and water. In addition, our diet should contain indigestible material (fiber) for the normal functioning of the gastrointestinal tract. We obtain our fuel mainly from the carbohydrates, fats and proteins that we consume in our diet.

Energy

Energy is defined as the capacity to do work.

Living cells require energy for :

Biosynthetic work-synthesis of cellular components .
Transport work across cell membranes- .
Mechanical work-
Electrical work-
Osmotic work-kidney
.

The Joule (J) is the unit of energy now widely used in countries other than the USA. However, the term calorie (1 cal = 4.184 Joules) is still used in the medical literature and is more generally understood by patients. In metabolism energy changes are often expressed in terms of kJ or kcal where 1 kJ = 1,000 Joules and 1 kcal=1000 calories. Energy exists in many forms: thermal, light, mechanical, electrical ،osmotic and chemical,

Daily Energy Expenditure

. This daily energy expenditure has three components：

i)energy to support our basal metabolism-Basal Metabolic Rate (BMR)

ii)energy for voluntary physical activities .

iii)energy required to process the food we eat (diet-induced thermo genesis

i) Basal Metabolic Rate (BMR)

The BMR is a measure of the basal energy required to maintain life-the functioning of the various tissues of the body at physical, digestive and emotional rest. The major tissues contributing to the BMR are：

skeletal muscles，
central nervous system，
liver
heart .

A very rough estimate of BMR (in kJ/24hr), in individuals who are not obese, may be obtained by multiplying the body weight in kg by 100 (BMR = 100 × weight in kg). In an adult, the BMR is 7,000kJ for men (70kg) and 5,800kJ for women (58kg).

Although an individual's BMR is related mainly to body weight many other factors affect it. BMR is mainly controlled by the thyroid hormones. The BMR is lower for women than men of the same weight as women have more adipose tissue that is less metabolically active than lean tissue .

The BMR increases by ~10% for every 1C increase in body temperature. Excessive secretion of thyroid hormones increases the BMR as do pregnancy and lactation.

ii) Voluntary Physical Activity

In addition to the BMR, the energy required by skeletal muscle for voluntary physical activity contributes to our daily energy expenditure.
very rough estimate of the total daily energy required for physical activity can be made using the following values :

BMR + 30% of the BMR for a sedentary person
BMR + 60-70% of BMR for person who engages in ~2hr of moderate exercise a day .
BMR + 100% of the BMR for person who dose several hrs of heavy exercise a day

iii) Diet-Induced Thermo genesis DIT

Our daily energy expenditure includes a component related to processing the food we eat. Following the ingestion of food, our metabolic rate increases because energy is required to digest, absorb, distribute and store nutrients. The energy required to process the food is equal to 10% of the energy content of the ingested food .

Calculations of Daily Energy Expenditure

The total daily energy expenditure is usually calculated as the sum of the BMR plus the energy required for the amount of time spent in each of the various types of physical activity plus 10% of these values to reflect diet induced thermogenesis.

Nutritional Requirements

An adequate diet is one which contains sufficient fat (lipid) and carbohydrate to satisfy the body's energy requirement, and which provides the minimal amounts of protein, vitamins, minerals and water to prevent deficiency. To maintain our body weight we must stay in energy balance i.e. the energy in the food we eat must match our energy consumption over time. Nutrients, such as carbohydrate, fat and protein, required in relatively large amounts are sometimes called macronutrients while vitamins and minerals are micronutrients.

Energy Requirement

Fat (energy content 37 kJ/g) and carbohydrate (energy content 17 kJ/g) are the major energy containing components of the diet. We can, however, derive energy from the metabolism of proteins (~17kJ/g) and from alcohol (~29kJ/g)..

However, there is no absolute requirement for glucose in the diet, provided adequate protein is ingested, as the body can make glucose from certain amino acids by the process of gluconeogenesis In addition, glucose can be synthesized from dietary sugars such as galactose and fructose. There is no absolute requirement for fat as an energy source,

- Fat is necessary for the absorption of the fat-soluble vitamins (A, D, E & K) from the gut. Thus, a fat free diet may lead to a deficiency of these vitamins.

Protein Requirement

Amino acids, the products of the digestion of proteins, are indispensable for the normal structure and function of the body..

The body needs dietary protein to supply specific or essential amino acids), which are not synthesized by the body. Other amino acids (non-essential amino acids) can be synthesized by the body and are not therefore a dietary requirement as long as total protein intake is sufficient. Proteins of animal origin usually contain a high proportion of the essential amino acids unlike proteins of vegetable origin that may be deficient in one or more of the essential amino acids. The protein of wheat for example is low in lysine, and protein deficiency disease may follow a vegetarian diet based solely upon cereals.

Other Dietary Requirements

In addition to the nutrients required to supply energy and to replace structural and other components, a number of other substances are necessary:

Water

Dietary fibre: Non-digestible plant material such as cellulose is necessary for normal bowel function.

Minerals and vitamins Vitamines are classified as water-soluble or lipid-soluble. You should be aware of the important deficiency diseases associated with the absence (& excess) of these in the diet.

Body Mass Index

A simple way to estimate desirable weight is to derive the Body Mass Index (BMI)

where the BMI = weight (kg) /height2 (m).

Underweight = <18.5 (men and women)

Desirable ranges = 18.5 - 24.9 (men and women)

Overweight = 25 - 29.9 (men and women)

Obese = 30-34.9 (men and women)

Severely Obese = >35

Malnutrition

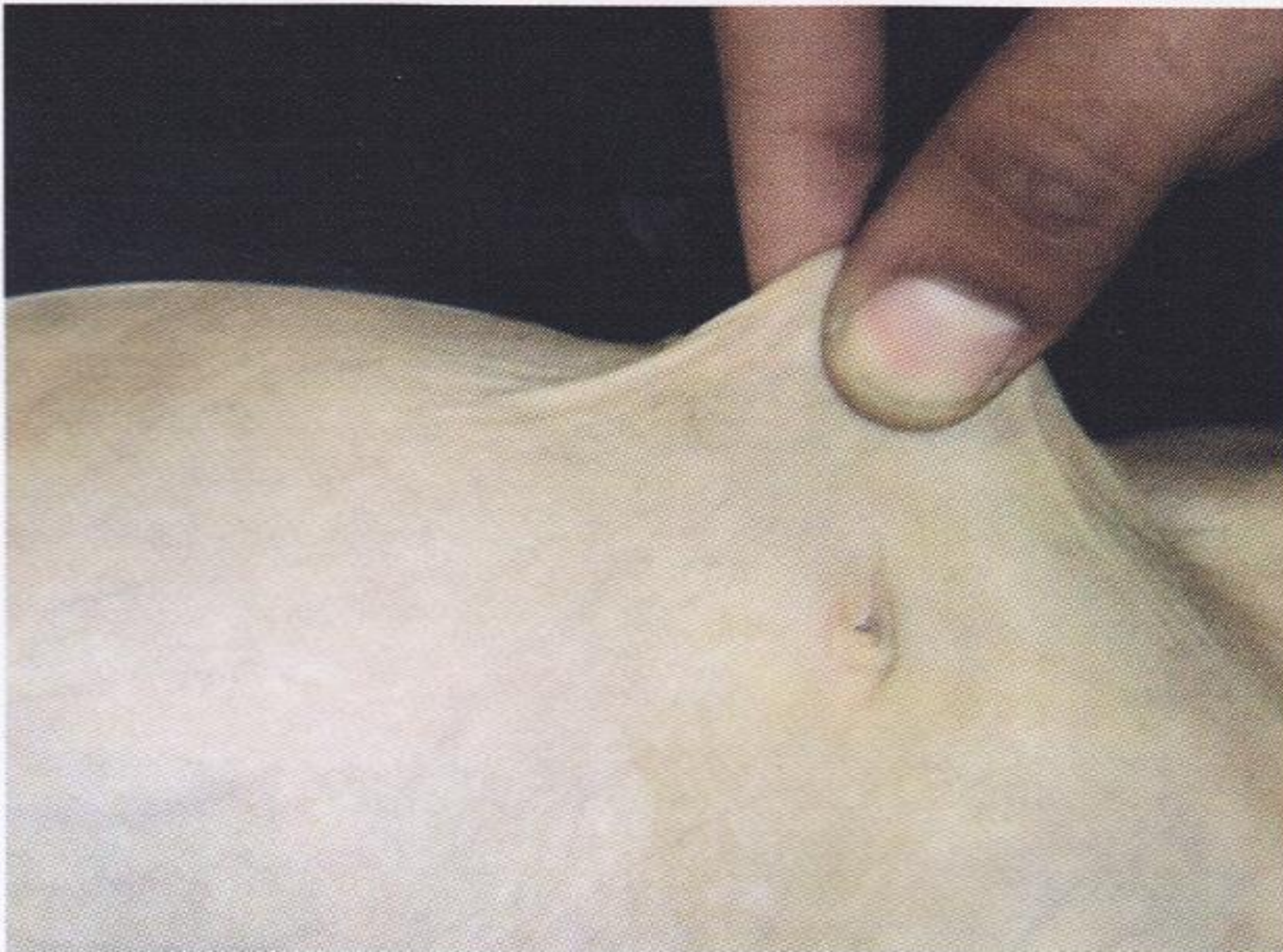
Malabsorption conditions (e.g. Coeliac disease and Crohn's disease) are caused by a failure to digest and/or absorb ingested nutrients. Under-nutrition may result from eating disorders such as anorexia nervosa and or more commonly from reduced availability of food such as occurs in many developing countries producing the condition known as protein-energy malnutrition.

Protein-energy malnutrition

This covers a spectrum of clinical conditions seen in starving adults and children. Starvation in adults leads to loss of weight due to loss of subcutaneous fat and muscle wasting. They complain of cold and weakness. Infections of the GI tract and lungs are common.

Marasmus is the type of protein-energy malnutrition most commonly seen in children under the age of 2. The child looks emaciated with obvious signs of muscle wasting and loss of body fat although there is no edema. The hair is thin and dry, diarrhea is common and anemia may be present.

Kwashiorkor occurs typically in a young child displaced from breastfeeding by a new baby and fed a diet with a very low protein content, such as cassava. The child is apathetic, lethargic and anorexic (loss of appetite). There is generalized edema. The abdomen is distended owing to hepatomegaly (enlarged liver) and/or ascites (accumulation of fluid in peritoneal cavity). The serum albumin is always low and anemia is common



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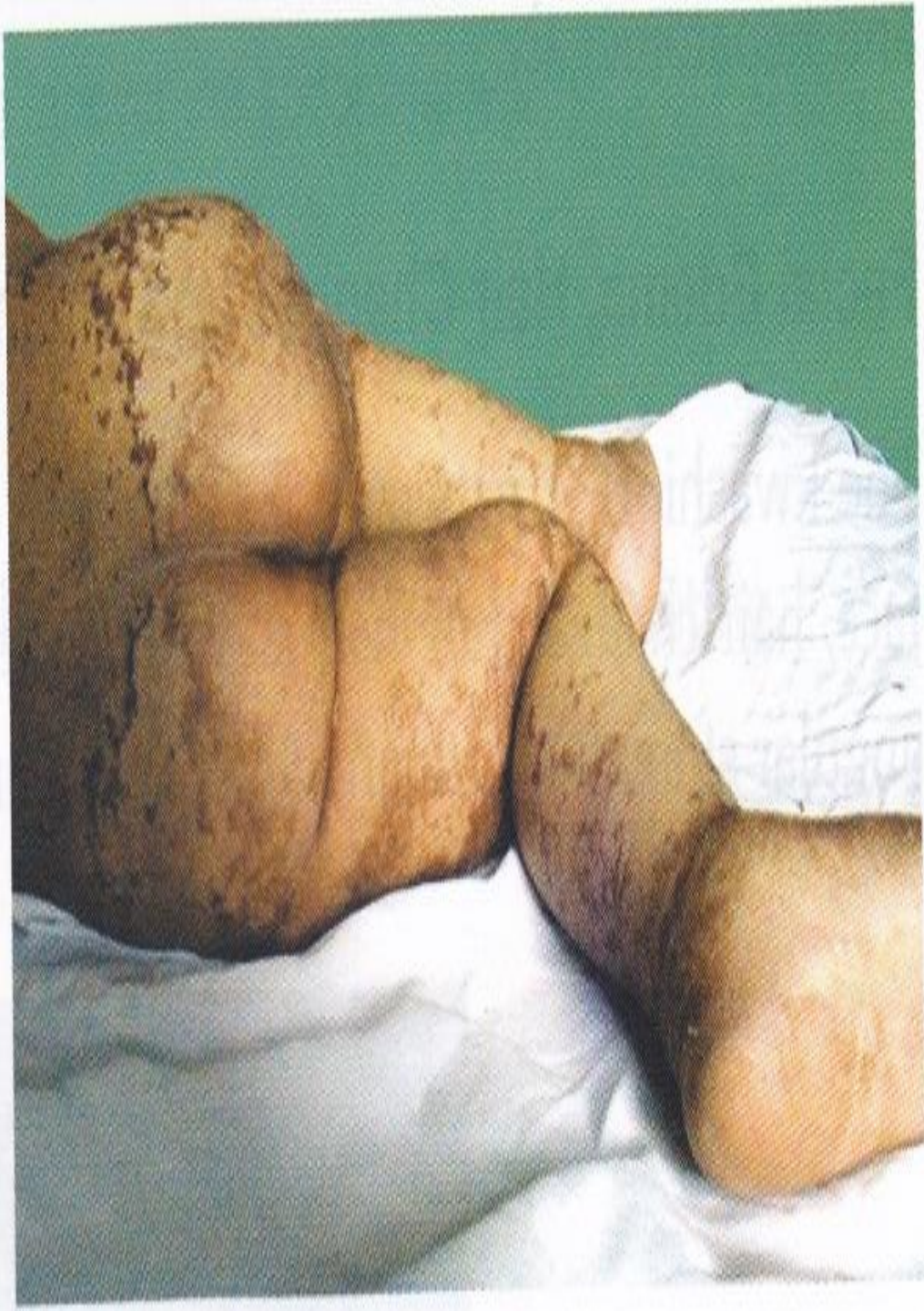

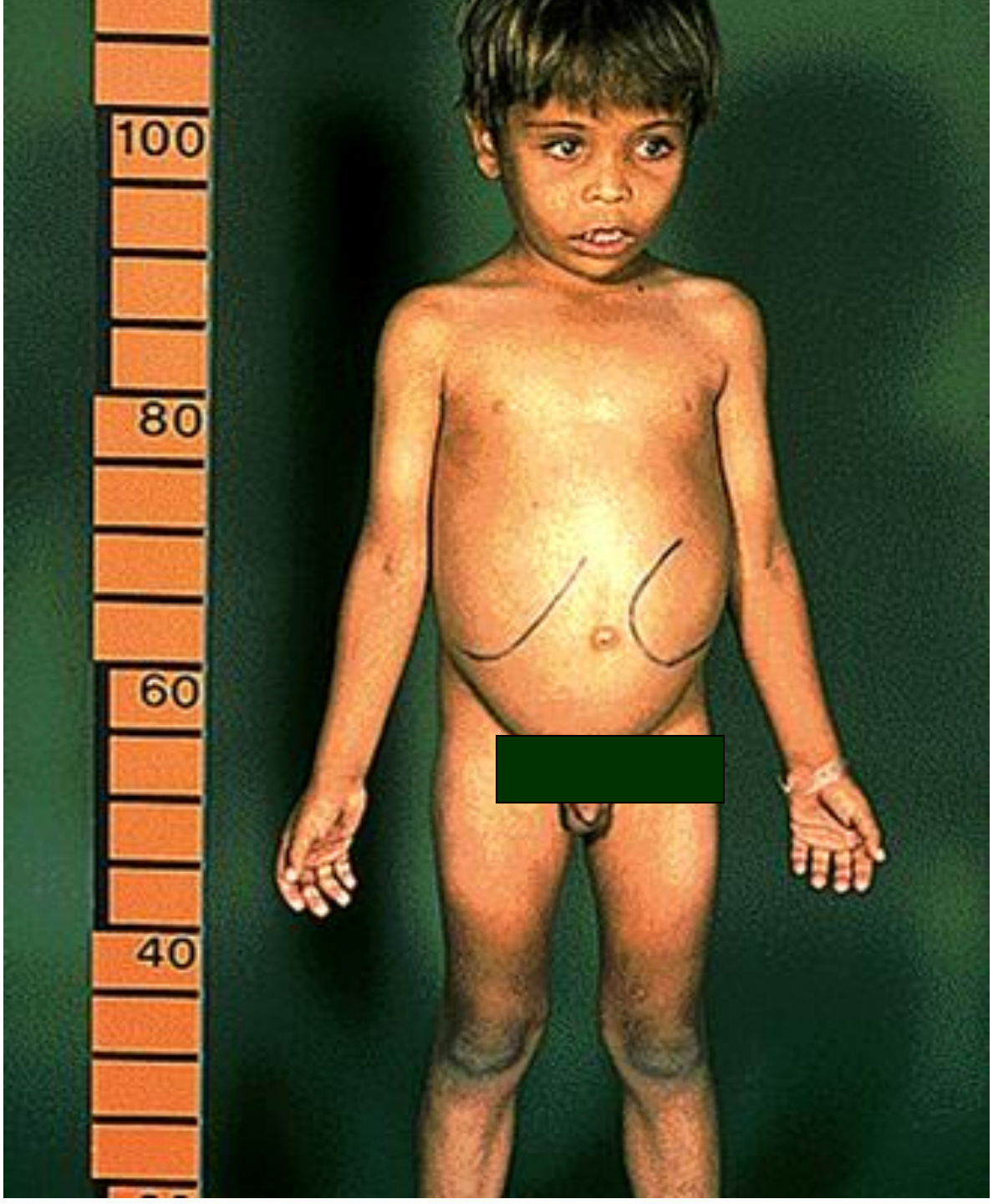
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REASONS FOR SPECIAL CARE

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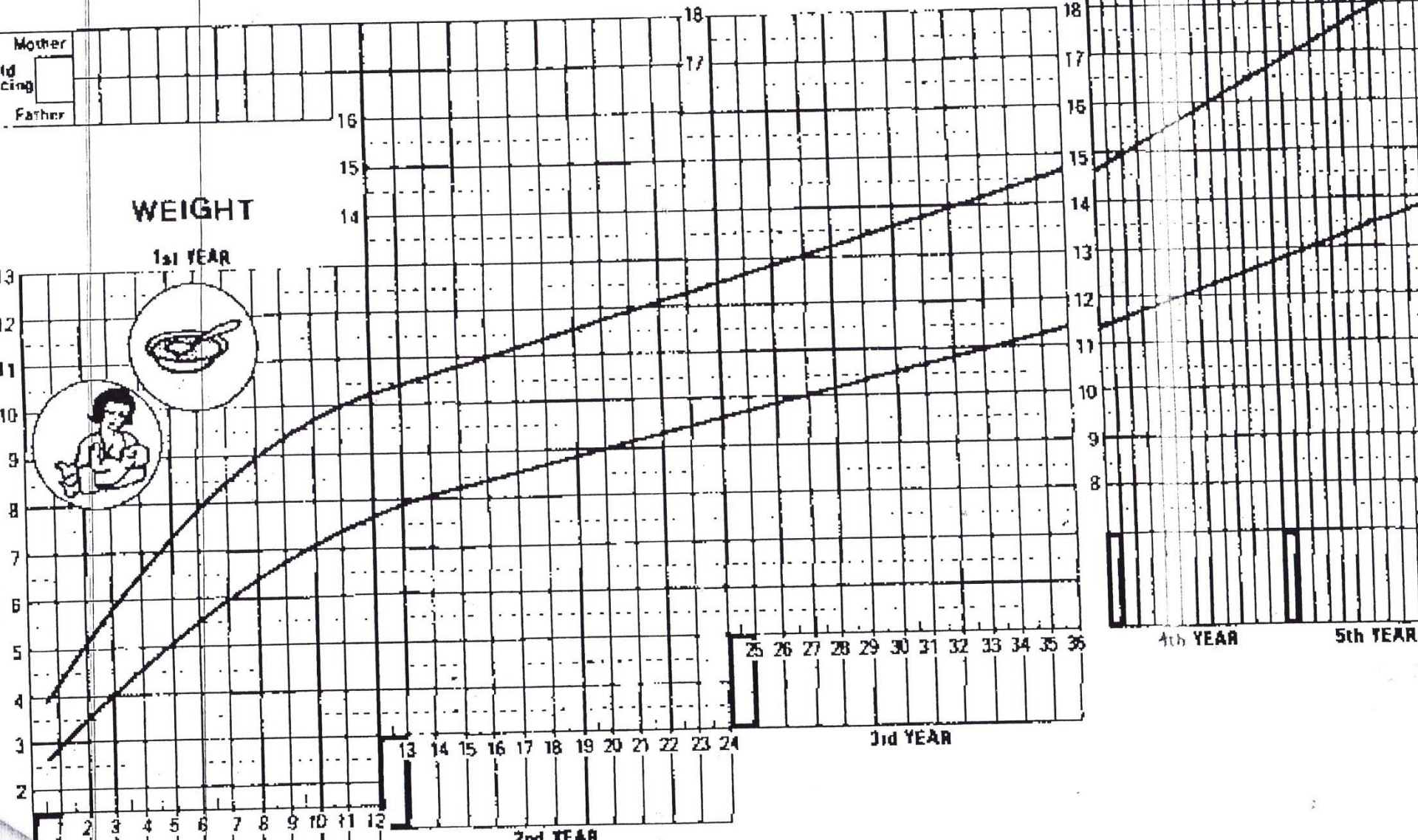
arne .....

rth weight ..... kg

Mother

Father



Thank you
Merry Christmas