

NUTRITIONAL ASSESSMENT TECHNIQUES

PRACTICAL MANUAL- I

M.Sc., FOODS AND NUTRITIONAL SCIENCES (Second Year)

SPECIALIZATION - I: CLINICAL NUTRITION AND DIETETICS

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M.Sc. (Foods & Nutritional Science), SECOND YEAR**SPECIALIZATION - I: CLINICAL NUTRITION AND DIETETICS
PRACTICAL - I: NUTRITIONAL ASSESSMENT TECHNIQUES
SYLLABUS****Direct methods****Dietary assessments**

- Standardization of vessels for 24 hours recall method.
- Development of skill in conducting a dietary survey using 24 hours recall method for University women students.
- Development skill in conducting a dietary survey using 24 hours recall method for pre-school children.
- Developing skill in conducting Institutional diet survey and household diet survey.

Anthropometric assessment

- Developing skill in assessing body mass index for University Students
- Developing skill in measurement of Anthropometry for pre school children.
- Developing in conducting a Nutritional survey in terms of physical activity and energy consumption

Clinical assessment

- Assessment of iron nutritional status (Clinical of pregnant women in community)
- Assessment of clinical sign in pre school children and school aging.
Biochemical assessment.
- Blood drawing technique
- Estimation of Hemoglobin
- Estimation of Hemoglobin levels in pregnant in the community.

NUTRITIONAL ASSESSMENT TECHNIQUES

INTRODUCTION

Nutritional assessment can be defined as the interpretation of information obtained from anthropometric, dietary, biochemical and clinical studies. The information obtained is used to determine the health status of individual or population groups as influenced by their intake and utilization of nutrients. Nutritional assessment is done for Nutritional survey, Nutritional surveillance, Nutritional Screening, and Nutritional monitoring.

AIM

To understand the methods commonly used to assess nutritional status in children and adults

OBJECTIVE

- To describe patterns of child growth and identify critical periods.
- To elicit the indicators used to describe nutritional status in terms of growth and micronutrient status
- To compare different methods of dietary assessment and discuss the advantages and disadvantages of each
- Identify individuals or population groups at risk of becoming malnourished
- Identify individuals or population groups who are malnourished
- To develop health care programs that meet the community needs which are defined by the assessment
- To measure the effectiveness of the nutritional programs & intervention once initiated

Nutrition is assessed by two types of methods-

1. Direct methods
2. Indirect methods

The direct methods deal with the individual and measure objective criteria, while indirect methods use community health indices that reflect nutritional influences

DIRECT METHODS:

These include-

- Anthropometric assessment
- Biochemical assessment
- Clinical assessment
- Dietary assessment

They are popularly known as ABCD. They are not invasive technique, quite simple, less time consuming and do not require sophisticated instruments.

INDIRECT METHODS:

These include three categories:

- Ecological variables including crop production
- Economic factors e.g. per capita income, population density & social habits
- Vital health statistics particularly infant & under 5 mortality & fertility index

I DIETARY ASSESSMENTS

INTRODUCTION:

The assessment of dietary intake is the final method that is commonly used to assess nutritional adequacies in individuals and populations. From a national Food and Nutrition planning perspective, dietary intake information can be used to

- Assess the adequacy of food supply
- Improve nutritional quality of food supply
- Set targets for food production
- Monitor progress towards production targets
- Assess how food is distributed within population
- Use as a basis for developing food regulations
- Develop guidelines for use in nutrition education

Various classifications have been devised and suggested for collection of dietary data. This is determined by record or recall of foods consumed over a specified period of time. This is the most commonly used method for the field survey.

METHODS OF DIETARY INTAKE ASSESSMENT

1. Group method
 - a. food balance sheet
 - b. individual dietary intake
2. Interview method
 - a. diet recall
 - b. diet history
3. Food frequency method
4. Questionnaire method

1. STANDARDIZATION OF VESSELS FOR 24 HOURS RECALL METHOD

Aim: To know the method of standardization of vessels for 24 hours recall method.

This is a frequently used method to obtain current dietary intake information from individuals. This is on the principle that, food consumption for a specified period of time prior to the survey can be recalled as accurately as possible. It is often referred to as the **24 hours recall method**. The respondent recalls what and how much food was consumed and when it was consumed. The ingredients recalled are recorded in house hold standardized volumetric measures. The volume of

the cooked food is also recorded. Standardized vessels are used mainly to aid in recapitulating the amount of food stuffs used and distribution of food to family members. From the raw weight of foodstuffs, their nutritive value is calculated.

PROCEDURE:

1. Standardization procedures of preparation and edible portion of foods, which help estimating the precise intake of each individual in the household-

Example: Take 500g of raw rice and cook it with known amount of water. Weight the net cooked amount by subtracting the weight of empty vessels and calculate the conversion factor as follows:

Raw rice(g)	water used (ml)vessel(g)	total cooked weight with vessel(g)	weight if empty	Net weight of cooked amount(g)	conversion factor(C.F)
500	1500	2600	600	2000	$500/2000 = 0.250$

2.STANDARDIZATION OF CUPS FOR VOLUMES:

Take a set of 12 diet survey cups and mark the edges of all cups to a particular level. Fill each of the cups with water and measure the water in each cup with a glass cylinder of 100ml or 200ml capacity to know the volume of the cups.

Cup Nos.	Volume (ml)
1	1400
2	1033
3	750
4	520
5	350
6	235
7	200
8	140
9	105
10	82
11	65
12	30

3. STANDARDIZATION OF EDIBLE PORTION OF FOODS:

Recording of edible portion of foods in preparation made by the housewife is necessary to estimate the intake as accurately as possible. However, quite often during the survey the housewife reports use of bundle of green leafy vegetables (4 bundles of spinach) or other foods, but not weight. It therefore necessary to standardize edible portion of commonly used foods like GLV, leafy foods etc.

Example: spinach 3 bundles= weight 90g, waste 20g, so edible portion is 70g

SELF ASSESSMENT QUESTIONS :

1. Standardize given set of vessels for 24 hours recall method
2. Standardize edible portion in the given foods.

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2. (<http://www.measuredhs.com/publications/publication-FR257-DHS-Final-Reports.cfm>)
3. B.Sri Lakshmi, M.Sc.,Dietetics, New Age International Pvt.Ltd
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2. DEVELOPMENT OF SKILL IN CONDUCTING A DIETARY SURVEY USING 24 HOUR RECALL METHOD FOR UNIVERSITY WOMEN STUDENTS

AIM:

To develop skill in conducting diet survey for University Women Students, using 24 hour recall method.

24 hour recall method is also known as Oral Questionnaire method.

INTRODUCTION

For the 24-hour dietary recall, the respondent is asked to remember and report all the foods and beverages consumed in the preceding 24 hours or in the preceding day. The recall typically is conducted by interview, in person or by telephone, either computer assisted or using a paper-and-pencil form. Well-trained interviewers are crucial in administering a 24-hour recall because much of the dietary information is collected by asking probing questions. All interviewers should be knowledgeable about foods available in the marketplace and about preparation practices, including prevalent regional or ethnic foods.

RECORD OF FOOD ENERGY INTAKE

List of meals and snacks per1 day:

FOOD(DESCRIPTION & AMOUNT)	CHO(G)	FAT(G)	PROTEINS(G)	CALORIES(K)
Breakfast				
lunch				
snacks				
dinner				
Bed time				
total				

In this session the survey shall be conducted in the campus itself. So by using the above 24 hour recall method, a questionnaire is prepared as-

1. LIKES AND DISLIKE OF FOODS :

FOOD ITEM	LIKE	DISLIKE	FAVORITE
fruits			
Non-veg			
vegetables			
fast foods			

2. ASK THEM TO FILL NECESSARY COLUMNS AND COLLECT 24RECALL DIET i.e., DAY BEFORE DIET THAT IS WHAT THEY HAVE TAKEN IN PAST 24HOURS IS NOTED AND NUTRITIVE VALUE IS CALCULATED

For example;

Name of individual	
Age	
area coming from	
study/ class/year	
weight	
height	
diet history	
diet recall- lunch, snacks, dinner, bed time	

Note: Find out whether the food is prepared at home or purchased.

This method involves the following steps.

1. Collection of data
2. Nutritive value calculations

3. Comparison with nutrient adequacies.
4. Determining the nutritional status.

QUESTIONS:

1. Conduct a diet survey using 24 hour recall method, for University women students.

REFERENCES:

1. Mahtab S. Bamji .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd...
2. (<http://www.measuredhs.com/publications/publication-FR257-DHS-Final-Reports.cfm>)
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3. DEVELOPMENT OF SKILL IN CONDUCTING A DIETARY SURVEY USING 24- RECALLS METHODS FOR PRE-SCHOOL CHILDREN.

AIM:

To develop skill in conducting diet survey for pre-school children, using 24 hour recall method.

INTRODUCTION:

Younger children are less able to recall, estimate, and cooperate in usual dietary assessment procedures; so much information by necessity has to be obtained by surrogate reporters. Many factors make assessing intake in this age group very difficult because preschool children eat small amounts of food at frequent intervals and they are not able to complete questionnaires on their own and have a limited cognitive ability to recall, estimate, and otherwise cooperate; they often spend time under the care of several individuals; and their food habits and nutrient intakes may change rapidly.

In order to assess the adequacy of a child's nutritional intake, dietitians require detailed information about all food and drink consumed. Rapid change characterizes the diet of young children. Early on, most infants consume small quantities of milk at frequent intervals; older infants and toddlers consume larger quantities of milk and weaning foods or table foods. By age 2–3 years, most children consume foods eaten by the rest of the family. Assessment of dietary intake is also affected by social factors, such as day care, which can limit a parent's ability to report what a child actually consumed.

Techniques commonly used to assess the diets of preschool-aged children include respondent-based methods, such as-

1. 24-hour dietary recall. - Same as in the previous session
2. Dietary records-These involve maintenance of records of weighed quantities of foods consumed.
3. Food frequency questionnaires (FFQs)-These are used to assess habitual diet by asking about the frequency with which food items or specific food groups are consumed over a reference period.

QUESTIONS:

1. Conduct a diet survey for pre-school children by using appropriate technique.

REFERENCES:

1. Mahtab S. Bamji .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd...

2. (<http://www.measuredhs.com/publications/publication-FR257-DHS-Final-Reports.cfm>)
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4. DEVELOPING SKILL IN CONDUCTING INSTITUTIONAL DIET SURVEY AND HOUSE HOLD DIET SURVEY

AIM:

To develop skill for conducting diet survey at both institutional level and household level.

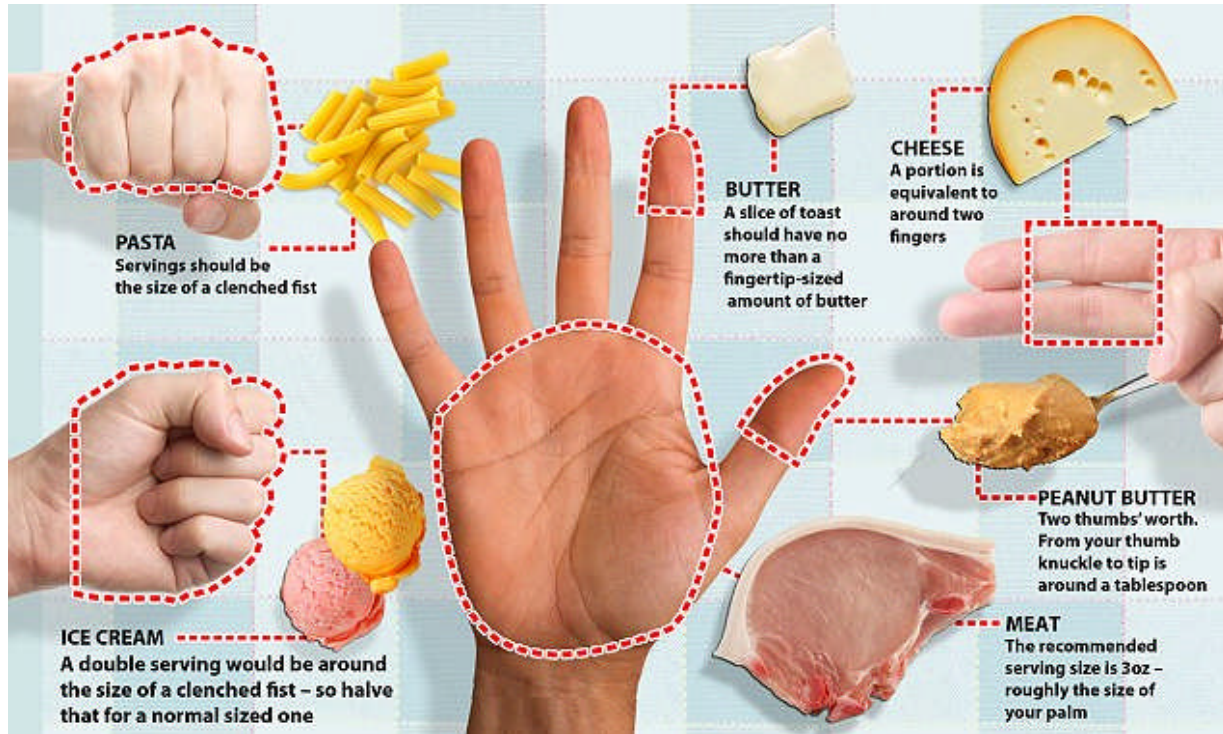
A. INSTITUTIONAL DIET SURVEY: INVENTORY METHOD (FOOD LIST METHOD) is used to carry out institutional dietary survey. This method is often employed where homogenous groups of people take their meals from a common kitchen. In this method the amounts of foodstuffs issued to kitchen as per the records maintained by the warden, are taken into consideration for computation of consumption. No direct measurement or weighing is done. A reference period of one week is desirable. Stocks of foods, if any, purchased or discarded during the week are also taken into account. The average intake per person per day is calculated as follows:

$$\frac{\text{Stocks at the beginning of the week} - \text{Stocks at the end of the week}}{\text{Total No. of inmates partaking the meal} \times \text{No. of days of survey}}$$

B. HOUSE HOLD DIET SURVEY

Many people may be more used to using household's measures like cup/katori/tumbler/plate in their kitchen. If any one may not want to bother herself using the standard measures in her day-to-day cooking, in such a situation, she can work out a relationship between measures and household measures, so that if she cooks a katori of dal for her family, she knows how much dal (grams) it contains.

Survey is conducted by asking the food measurements as shown in figure



QUESTIONS:

1. Conduct a diet survey both at institutional level and household levels.

REFERENCES:

- 1 Mahtab S. Bamji .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd.
- 2 (<http://www.measuredhs.com/publications/publication-FR257-DHS-Final-Reports.cfm>)
- 3 M.Shakuntala Manay and M.S Swaminadhan. Facts and Principles of Foods. Vol. No.1, New Age International Publishers, New Delhi, 2000.
- 4 B.Sri Lakshmi, M.Sc.,Dietetics, New Age International Pvt.Ltd.
- 5 Dietary Assessment Methodology.ed.by FRANCES E. THOMPSON AND AMY F. SUBARNational Cancer Institute, Bethesda, Maryland
- 6 What Are Preschool Children Eating? A Review of Dietary Assessment¹ Annual Review of Nutrition Vol. 21: 475-498 (Volume publication date July 2001)
- 7 Community Nutritional Assessment – Derrick B.Jellief & E.F.Patric Jelliffe, Oxford University Press, 1985

II ANTHROPOMETRIC ASSESSMENT

Anthropometry is used for the purpose of nutrition surveillance along with secondary data on indicators which directly or indirectly affect the nutritional status.

1. DEVELOPING SKILL IN ASSESSING BODY MASS INDEX FOR UNIVERSITY STUDENTS

AIM: To develop skill to assess body mass index for University students.

It provides a reasonable indication of the nutritional status. The BMI has good correlation with fatness. It may also be used as indicator of health risk. Weights and Heights of University students shall be taken accurately to assess BMI.

The ratio of weight (in kgs)/Height² (m) is referred to as **Body Mass Index (BMI)**.

$$\text{BMI (kg/m}^2\text{)} = \frac{\text{weight in kilograms}}{\text{height in meters}^2}$$

With the help of above equation BMI is calculated and nutritional status is assessed with the following cut-off points. This has been suggested by James et al.(1988) and Luizz et al. (1992)

BMI class	Presumptive diagnosis
<16.0	Chronic energy deficiency-grade III severe underweight
16.0 – 17.0	Chronic energy deficiency-grade II Moderate underweight
17.0 - 18.5	Chronic energy deficiency-grade I Mild underweight
18.5 - 20.0	Low weight -Normal
20.0 - 25.0	Normal
25.0-30.0	Obese grade I
>30.0	Obese grade II

In other words, BMI <18.5 indicates under nutrition, while more than 25.0 is considered as an indicator of obesity.

FOR EXAMPLE:

For measuring body weight and height the commonly used bathroom weighing scales are used but some errors may appear in using bathroom scale weights.

The following precautions should be taken to measure body weight.

1. The zero error of the weighing scale should be checked before taking the weight and corrected as and when required.

2. The individual should wear minimum clothing, and be without shoes.
3. The individual should not lean against or hold anything, while the weight is recorded.
4. The measurements should preferably be taken under basal conditions in early mornings.
5. While recording the height the individual should stand straight and without shoes and the person should look straight.

For example-

Weight = 50kg

Height = 153cm if height in feet is recorded then it is converted into cm by 1 inch = 2.5cm

BMI = WT in kg / ht in m²

$$= 50 / (1.53)^2 = 50 / 2.34 = 21.36 \text{ kg/m}^2$$

QUESTIONS:

1. Conduct a diet survey both at institutional level and household levels.

REFERENCES:

1. Mahtab S. Bamji .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd..
2. (<http://www.measuredhs.com/publications/publication-FR257-DHS-Final-Reports.cfm>)
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4. Waterlow, J.C., A. Tomkins, and S.M. Grantham-McGregor, *Protein-energy malnutrition*. 1992: Edward Arnold, Hodder and Stoughton.
5. Van Loon, H., et al., *Local versus universal growth standards: the effect of using NCHS as universal reference*. Ann Hum Biol, 1986. **13**(4): p. 347-357.
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2. DEVELOPING SKILL IN MEASUREMENT OF ANTHROPOMETRY FOR PRE-SCHOOL CHILDREN

Aim: To develop skills in taking anthropometric measurements of Pre- school children

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. The most common anthropometric measurements in children are:

- Weight
- Height
- Mid Upper Arm Circumference (MUAC, most commonly in children under 5 years of age)
- Head Circumference
- Skin folds

Weight is the anthropometric measurement most in use. In developing regions, the prevalence of protein-calorie malnutrition appears to be best indicated by weight deficiency in all age-groups and by growth failure in children. Weighing is the key anthropometric measurement. Obtaining height/stature and weight measurement values is the most practical method available for assessing children's growth. Growth charts can be used to evaluate a child's individual growth pattern; also to screen large groups of children to determine prevalence of overweight, underweight, and short stature.

Height-for-age is a measure of long-term or chronic nutritional status in children. Children who suffer from chronic under nutrition grow poorly and have low height for their age i.e. they are short. Children who grow poorly in height are termed stunted. There are multiple causes of stunting which include chronic consumption of diets of poor nutritional quality, repeated infectious disease, as well as deficiencies in specific nutrients such as zinc and calcium. Stunting is also a visible manifestation of poverty and as such is the result of the basic, underlying and immediate causes of under nutrition. Stunting is associated with many negative outcomes: increased mortality and susceptibility to infections in childhood, and other outcomes in adulthood such as decreased work productivity and lower incomes.

Weight-for-age has historically been the most commonly used index of childhood under nutrition and is still widely used for growth monitoring. Extremely low weight-for-age is known as underweight.

EQUIPMENT: WEIGHT

Use a properly calibrated balance beam or electronic/digital scale to weigh children and adolescents. The scale should have the following qualities:

- Weights in 0.1 kg (100 gm) or 1/4 lb increments

- Has a stable weighing platform that can be easily set at zero
- Can be calibrated through professional service or by standard known weight.

HEIGHT

A portable or wall-mounted stadiometer should be used. The tool should:

- Measure in 0.1 cm or 1/8 inch increments.
- Be stable with a large base.
- Have a horizontal headpiece at least 3 inches wide that can be brought into contact with the most superior part of the head.
- Do not use cloth tapes, yardsticks, or graphics attached to wall.
- Do not use metal measuring rod attached to a scale.

WEIGHT MEASURING PROCEDURES

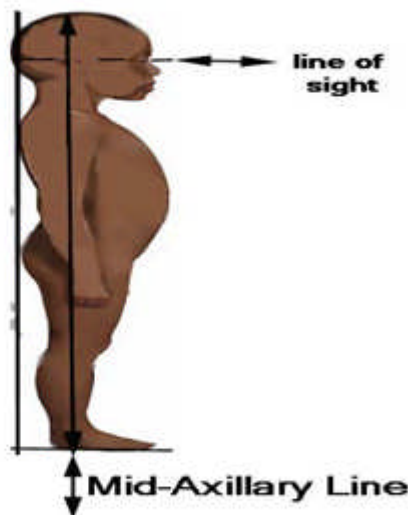
- Scale is set at zero reading.
- Scale is set on firm surface, preferably uncarpeted floor. Student removes shoes and heavy outer clothing such as sweater, jacket, vest and empties pockets.
- Student steps on center of the platform, with back toward the scale, both feet on platform, and stands still.
- Read weight value to nearest $\frac{1}{4}$ pound or 0.1 (1/10) kilogram
- Student should not be provided with the results of the screening*.
- Record weight immediately on data from before child gets off scale
- If using a balance beam scale, return weights to zero position before subsequent student is weighed.

MEASURING HEIGHT

Children 2 -3 years who cannot/will not stand and/or measure less than 30 inches and/or weigh less than 20 pounds *must* be measured in the recumbent position and plotted on the 0 - 36 month growth chart. Children who are measured standing *must* be plotted on the 2-20 charts. (It does not matter if these children are weighed on the infant or the adult scale.)

PROCEDURE

- Student removes shoes.
- Student removes hair ornaments, buns, braids to extent possible.
- Student stands on footplate portion with back against stadiometer rule (cut out feet can be placed in position to assist the student).
- Bring legs together, contact at some point (whatever touches first).
- Knees not bent arms at sides, shoulders relaxed, feet flat on the floor.
- Back of body touches/has contact with stadiometer at some point.
- Body in straight line (mid-axillary line parallel to stadiometer).
- Head in appropriate position – check Frankfort plane.
- Lower headpiece snugly to crown of head with sufficient pressure to press hair. Read value at eye level.
- Measure to nearest 0.1 (1/10) cm or 1/8 inches (repeat measurements should agree within .1 cm or ¼ inch.)
- Record value immediately on data form.



Middle-Upper Arm Circumference (MUAC)

MUAC is the circumference at the mid-point of the left upper arm, and is a proxy measure of total body fatness. MUAC is relatively constant in children aged 6 months to 5 years and is therefore a useful overall measure of nutritional status. In children MUAC is often measured in situations where equipment such as weighing scales and measuring boards are unavailable. Children with extremely low MUAC have a significantly increased risk of death. The arm circumference is measured on the right arm at the level of the upper arm mid-point mark. The examiner makes this mark on the posterior surface of the arm immediately after measuring the upper arm length

Take the measurement: While measuring stand **facing the right side** of the boy/girl. Do not stand behind the boy/girl for this measurement. Wrap the measuring tape around the arm at the level of the upper arm mid-point mark. Position the tape **perpendicular** to the long axis of the upper arm. Pull the two ends of the overlapping tape together so that the zero ends sits below the measurement value and the result lies on the lateral aspect of the arm (not the posterior surface). Check that the tape fits snug around the arm but does not compress the skin. Take the measurement to the nearest 0.1 cm.

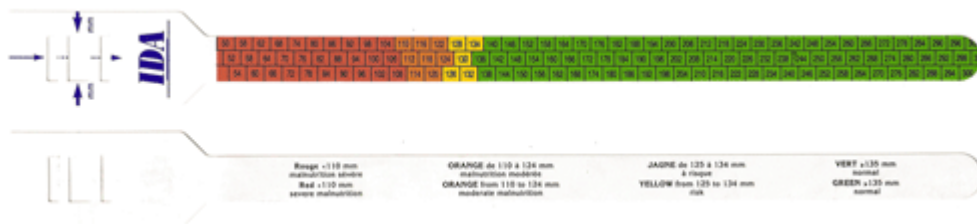


Image: MUAC measuring tape

Source: Courtesy of Wikimedia Commons

The MUAC cut-offs for the identification of undernourished children have been agreed by the WHO and UNICEF

MUAC (cm)	Category
MUAC (cm) > 13.5	Normal/no risk
12.5-13.5	At risk of undernutrition
11.5-12.4	Moderate undernutrition
< 11.5	Severe undernutrition

Source: WHO/UNICEF

WHO cut-offs for under nutrition in children:

The WHO recommends the use of the WHO child growth standards and cut-offs for under nutrition based on z-scores. Z-scores below -2 are markers of under nutrition. Z-scores between -2 and -3 are termed “moderate” while those below -3 are termed “severe”. The following table summarises the recommended cut-offs:

Table: WHO recommended cut-off for weight-for-height, height-for-age, weight-for-age

Indicator	z-score		
	<-3	-3 to -2	<-2
Weight-for-height	Severely wasted	Moderately wasted	Wasted
Height-for-age	Severely stunted	Moderately stunted	Stunted
Weight-for-age	Severely underweight	Moderately underweight	Underweight

Source: WHO (<http://www.who.int/en/>)

Commonly used Anthropometric classifications:

1.The Gomez classification

% expected weight for age	classification	category of nutritional status
>90%	normal	normal
76-90%	mild malnutrition	1 st degree malnutrition
61-75%	moderate malnutrition	2 nd degree malnutrition
<60%	severe malnutrition	3 rd degree malnutrition

Source: Harvard growth standards

WATERLOW'S CLASSIFICATION:

Indicators		Type	Degree of Malnutrition
% weight/Age	% weight/Ht.		
>90	>80	Normal	Normal Nutrition
>90	<80	Wasted	Short duration malnutrition
<90	>80	Stunted	Long duration malnutrition
<90	<80	Stunted & Wasted	Current & Long duration malnutrition

HEAD CIRCUMFERENCE

EQUIPMENT : Flexible, non-stretchable, narrow plastic or paper tape measure.

Deviations from the norm in head circumference are usually related to disease, genetic abnormalities, or prenatal Nutrition. Infants with abnormal measurements should be referred to a health care provider.

PREPARATION

1. Remove hair ornaments.
2. The infant should sit upright in the caregiver's arms.

PROCEDURE

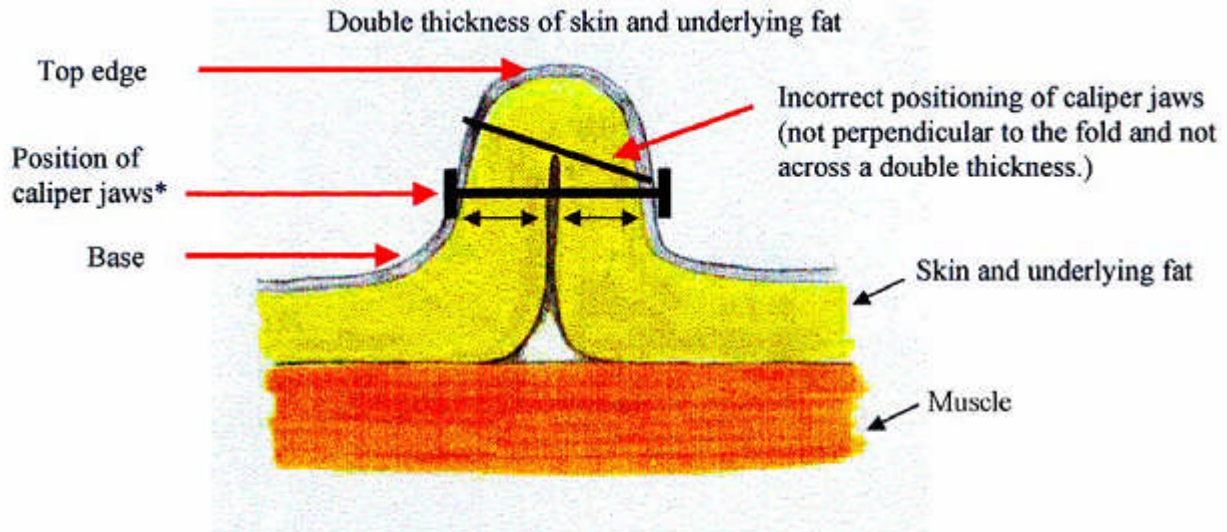
1. Place the tape measure around the largest part of the head.
2. Position the lower edge of the tape just above the eyebrows and ears, and around the biggest part of the back of the head.
3. Pull the tape snug to compress the hair. 13
4. Read the measurement to the nearest 1/8th inch, and jot that figure down.
5. Remove the measuring tape. Repeat the procedure.
6. Compare the two measurements. If they agree within 1/4 inch, record the second reading. If they do not agree, repeat procedure until two measurements agree.
7. Record the second measurement.

SKIN FOLDS

The current anthropometry protocol includes triceps and subscapular skin fold measures for children aged 2 months and older. Both types of skin folds are measured in millimeters using the Holtain skinfold caliper.

The protocol mandates that the skin fold consist of a double thickness of skin and underlying adipose (fat) tissue. Depending on the boy/girl, the examiner may find it easier or more difficult to physically separate a fold of skin from the muscle that lies underneath. This makes skin folds highly prone to measurement error. **Do not take a skin fold measurement reading if you cannot construct a fold that has two thicknesses of skin and underlying fat.**

CORRECT SKINFOLD MEASUREMENT



***Correct positioning of caliper jaws - perpendicular to the skinfold and across two thicknesses of skin and underlying fat.**

T:

1. Prior to measuring the skin fold, carefully mark the appropriate site with a cosmetic pencil. Use the black color unless the boy/girl skin is dark enough to make the black mark indistinguishable. In these cases use the white pencil. Make all marks on the right side of the body.
2. The sight of the caliper may make some children frightened and anxious. In order to make them feel more relaxed, explain the procedure and demonstrate the use of the caliper on the palm of the child and/or the parent.
3. Grasp the skin fold between your thumb and index finger approximately 2.0 cm above the measurement mark. The amount grasped will vary depending on the thickness of the adipose tissue beneath the skin. Pull the skin fold away from the boy/girl body to separate the fat from the underlying muscle. The sides of the fold should be roughly parallel.
4. With your free hand, place the caliper jaws perpendicular to the length of the fold. Continue to hold the skin fold with your thumb and forefinger. Release the handle of the calipers to apply full tension on the fold and hold this position for approximately 3 seconds. It is critical to wait roughly 3 seconds before attempting to read the skin fold Measurement. During this time the needle on the caliper dial will settle into a final Position that represents the true thickness of the fold.
5. Read the caliper dial at eye level to prevent measurement error due to parallax. In other words, take the reading with your line of sight directly in front of the measurement value instead of at an angle. Measure the thickness to the nearest tenth of a millimeter (0.1 mm). Note that the caliper dial shows 0.2 mm increments. The caliper needle will commonly fall onto one of these increments. However, do not ignore the odd tenths. If after 3 seconds you observe that the needle truly lies

between two lines on the dial, e.g., between 10.6 mm and 10.8 mm, take the odd number in between the two, e.g., 10.7, as the measurement.

6. Before releasing the caliper and your fingers from the skin fold, call the measurement to the recorder. The Holtain calipers used are designed to provide accurate measurements up to a maximum of 45.0 mm. Since the face of the caliper dial shows between 0.0 mm and 40.0 mm, in order to measure above 40.0 mm the needle will need to run a full circle and past the 0.0. However, since measurements over 45.0 will be considered invalid, ISIS will not accept entries above this number for quality control purposes. Therefore, record skin fold measurement results greater than 45.0 mm as EC (Exceeds Capacity) beside the appropriate ISIS field.
7. Finally, after calling the measurement result to the recorder, remove the caliper jaws then let go of the fold. Perform all skin fold measures according to the above procedures.

TRICEPS SKIN FOLDS

The triceps skin fold is measured at the upper arm mid-point mark on the posterior surface of the right upper arm. Follow the procedures below to perform the triceps skin fold measure:

1. **Position the boy/girl:** Ask boy/girl to turn so that you stand behind his or her right side. Have the participant stand upright with the weight evenly distributed on both feet, the shoulders relaxed, and the arms hanging loosely at the sides. Flexing or tightening the arm muscles will yield an inaccurate measurement.
2. **Grasp the skin fold:** Using your thumb and index finger, grasp a fold of skin and subcutaneous adipose tissue approximately 2.0 cm above the mid-arm circumference mark. If you have difficulty separating the skin fold from the triceps muscle, start at the elbow where the tissue tends to be looser and work your way up to the mark. Ensure that the skin fold consists of a double thickness and sits **parallel** to the long axis of the arm.
3. **Position the caliper:** Holding the skin fold 2.0 cm above the circumference mark, place the tips of the caliper jaws over the complete skin fold. Ensure that the **mark remains centered between the tips** and that the jaws sit **perpendicular** to the length of the skin fold.
4. **Take the measurement:** Continue to hold the skin fold in place and release the caliper handle to exert full tension on the skin fold. Wait 3 seconds for the needle on the caliper dial to settle on an accurate measurement. Read the thickness to the nearest 0.1 mm.
5. **Record the result:** Call this result to the recorder, who will enter this number on the ISIS screen. Remove the caliper jaws then let go of the skin fold. Proceed to the next measure, the sub scapular skin fold.

SUB SCAPULAR SKIN FOLD

The sub scapular skin fold is measured at the inferior angle of the right scapula. For efficiency make the mark needed for this measure immediately following the upper leg length measure

1. **Position the boy/girl:** Similar to the triceps skin fold measure, turn the **boy/girl** so that you stand **behind** his or her right side. Have the participant stand upright with the weight evenly distributed on both feet, the shoulders relaxed, and the arms hanging loosely at the sides.

2. **Mark the measurement site:** Tell **boy/girl** that you are going open the gown in the back and mark the skin with the cosmetic pencil. Open the back of the gown and palpate for the inferior angle, or triangle portion, of the right scapula. Using the cosmetic pencil, mark a cross (+) **on** the inferior angle. Make the first line at 45 degrees to the spine and cross this with a line that bisects the inferior angle of the scapula.
3. **Grasp the skin fold:** Using your thumb and index finger, grasp a fold so that the index finger remains situated roughly 2.0 cm above and medial to the inferior angle of the scapula. Due to tightness in this area of the back on many boys/girls, obtaining this skin fold measure can be a challenge. In these cases where you experience difficulty separating the sub scapular skin fold from the underlying tissue, begin grasping the fold with the thumb and index finger spread wide.
4. **Position the caliper:** Continue to hold the skin fold in place. With the other hand, set the **top jaw of the caliper on the “+” mark**. This differs from the triceps skin fold procedure in which the mark is centered between the caliper tips. Position the tips of the caliper jaws over the complete skin fold **perpendicular** to the length of the fold and roughly 2.0 cm lateral to the fingers.
5. **Take the measurement:** Continue to hold the skin fold in place and release the caliper handle to exert full tension on the skin fold. Wait 3 seconds for the needle on the caliper dial to settle on an accurate measurement. Read the thickness to the nearest 0.1 mm.
6. **Record the result:** Call this number to the recorder, who will enter this number on the ISIS screen. Remove the caliper jaws then let go of the skin fold. The sub scapular skin fold constitutes the final anthropometric measure for the exam.

QUESTIONS:

1. How do you measure height, weight and MUAC of pre-school children?
2. How do you assess Nutritional status of Pre-School children?
3. Describe about skin fold measurements.
4. Explain technique of measuring head circumference.

REFERENCES:

- 1 Mahtab S. Bamji .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd..
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- 5 [Anthropometry Procedures Manual January 2007 National Health and Nutrition Examination survey](#)
- 6 Dietary Assessment Methodology.ed.by FRANCES E. THOMPSON AND AMY F. SUBAR National Cancer Institute, Bethesda, Maryland
- 7 What Are Preschool Children Eating? A Review of Dietary Assessment¹Annual Review of Nutrition Vol. 21: 475-498 (Volume publication date July 2001)
- 8 Community Nutritional Assessment – Derrick B.Jellief & E.F.Patric Jelliffe, Oxford University Press, 1985

3. DEVELOPING SKILL IN CONDUCTING A NUTRITIONAL SURVEY IN TERMS OF PHYSICAL ACTIVITY AND ENERGY CONSUMPTION

AIM:

To develop skill in conducting a Nutritional survey based on physical activity and energy consumption.

ENERGY FOR PHYSICAL ACTIVITY

Physical activity is that activity, which we choose to do; so it is also known as voluntary activity. It includes;

1. The work related to one's occupation, profession or job.
2. Activities related to personal necessities, such as bathing, brushing teeth, dressing, eating, washing cloths and utensils, commuting to work, market, etc.
3. Leisure activities such as reading, playing, watching television, playing games, gardening, walking etc.

The energy cost of some common activities in terms of BMR units is given below table (Energy consumption of 60kg person)

Energy cost kcal/m	Example of activities
1.0	Sleeping, resting in bed, relaxing, lying still, awake
1.5	Sitting, eating, listening, writing, light work
2.3	Standing, personal needs, sitting and doing respective tasks, standing.
2.8	Slow walk, caring for children.
3.3	Light manual work, house cleaning activities(floor, doors, windows etc.) fast walk, caring for animals, grading.
4.8	Warm up activities in sports, light play of games, lifting light weights, carrying light weight.
5.6	Manual work at moderate pace, mining, house building, loading, unloading, harvesting.
6.0	Friendly matches with higher intensity, dinning, swimming, speed cycling.
7.8	Intense manual work, high intensity sports, activities or games, tournament matches, carrying heavy loads, running9km/hr, competitions, competitive swimming.

Source: Satyanarayana, K, exercise and physical fitness, nutrition 23, 3, 1989

Physical activity is assessed by noting the type of activity & duration of activity. Based on the above table, energy consumption will be calculated. The following table also gives energy consumption for various activities.

By Activity /Per hour	WEIGHT KGS					
ON THE JOB	50	58	65	75	85	95
Driving	180	204	228	252	276	300
Keyboarding	114	126	138	150	162	174
Managerial (desk)	180	204	228	252	276	300
Managerial (active)	198	222	246	270	294	324
Phoning	174	198	222	246	270	294
Teaching	180	204	228	252	276	300
Writing(sitting)	90	102	120	132	150	168
EXERCISING						
BADMINTON						
Singles	276	312	348	384	420	456
Doubles	234	270	306	342	378	414
DANCING						
Aerobics (medium)	348	396	444	492	540	588
Contemporary (rock)	198	228	258	288	318	348
GOLF						
Driving	198	228	258	288	318	348
Putting	120	138	156	174	192	210
Foursome 9 holes in 2 hr.	204	234	264	294	324	354
Twosome 9 holes in 11/2 hr	276	318	360	402	444	486
HILL CLIMBING						
	468	534	600	666	732	798
RUN IN PLACE						
50-60 steps per min	408	456	510	564	618	672
70-80 steps per min	438	498	558	618	678	738
RUNING						
9 km per hr.	516	594	660	732	804	876
11 km per hr.	552	624	696	768	840	912
12 km per hr.	594	672	756	840	924	1008
SWIMMING						
Slow	234	270	306	342	378	414
Medium	426	480	534	588	642	696
Fast	540	618	696	774	852	930
TENNIS						
Singles	336	378	420	462	504	546
Doubles	234	270	306	342	378	414
WALKING						
3 km per hr.	144	168	192	216	240	264
5 km pr hr.	234	270	306	342	378	414
6.5 km per hr	270	312	354	396	438	480
8 km per hr	438	498	558	618	678	738
YOGA						
	180	204	228	252	276	300

OTHERS

Cooking	142	165	192	216	240	267
Card playing	78	00	102	114	132	144
Eating	78	84	90	96	102	108
Showering and dressing	155	180	204	228	252	276
Sitting quietly	66	72	84	96	108	120
Sitting talking	78	90	102	114	132	144
Sleeping	54	60	66	72	78	84
Waiting in line	78	90	102	114	132	144
Watching tv	56	78	190	96	102	108

QUESTIONS:

1. Conduct a diet survey based on physical activity and energy consumption.

REFERENCES:

1. Mahtab S. Bamji .1999. Textbook of Human Nutrition. Oxford & IBH publishing Co. Pvt.Ltd.
2. (<http://www.measuredhs.com/publications/publication-FR257-DHS-Final-Reports.cfm>)
3. M.Shakuntala Manay and M.S Swaminadhan. Facts and Principles of Foods. Vol. No.1, New age International Publishers, New Delhi, 2000.
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III. CLINICAL ASSESSMENT

1. ASSESSMENT OF IRON NUTRITIONAL STATUS OF PREGNANT WOMEN IN COMMUNITY

AIM: To assess the iron nutritional status of Pregnant women in the community

INTRODUCTION:

Iron has diverse biological functions. It is this diversity that accounts for the wide range in functional impact of iron deficiency anemia. Physiological changes in the blood occur progressively during normal pregnancy. Haemoglobin mass increases, red blood cells volume increases, plasma volume increases and haemoglobin concentration drops. Normal iron requirement of an adult woman is 30mg/day. ICMR requirements during pregnancy is 38mg/day. Infants are generally born with haemoglobin levels of 18-22mg/100ml of blood. Iron is required for growth of foetus and placenta during pregnancy. Iron has metabolic inter relationship with many metals other elements like Co, Zn, Cd, Cu and Mo are competitive absorption inhibitors. The total iron requirement for the entire period of pregnancy is 810mgs. Iron nutritional status of pregnant women is the indicator for health condition of mother as well as foetus, which is estimated by measuring haemoglobin.

HAEMOGLOBIN MEASUREMENT

It is an important tool in diagnosing anaemia. Haemoglobin can be measured from finger prick blood samples by direct colour comparison of acid or alkaline haematin where a colorimeter is not available or colorimetrically a cyanmet haemoglobin or oxyhaemoglobin. The precision of the measurement is important. Methods based on direct colour comparison are not recommended, even from a field area. It is advisable to bring the blood samples on a filter paper and estimate haemoglobin colorimetrically after extraction.

Age/Gender group	Hemoglobin concentration
Children 6 - 59 months	110 g/l
Children 5 - 11 years	115 g/l
Children 12 - 14 years	120 g/l
Non-pregnant women (>15 years)	120 g/l
Pregnant women	110 g/l
Men (>15 years)	130 g/l

Iron nutritional status can also be determined on observation of following signs & symptoms

Dry nails

Weakness

Headache
Chest pain
Weight loss
Unsteady gait
Spasticity (stiffness & tightness in the muscles)
Peripheral neuropathy
Paleness of the skin
Oedema
Depigmentation
Easy pluckability
Sparse hair
Reddish eyes
Black patches around the eyes
Spoon shaped nails
Cold hands and feet
Shortness of breath
Cognitive problems
Abdominal pain
Constipation

QUESTIONS:

How do you assess iron nutritional status of pregnant woman?

REFERENCES:

1. Textbook of Human Nutrition ed.by Mahtab S.Bamji, N.Prahlada Rao, Vinodini Reddy.
2. (www.measuredhs.com/publications/publication-FR257-DHS-Final-Reports.cfm).
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2. ASSESSMENT OF CLINICAL SIGNS IN PRESCHOOL CHILDREN AND SCHOOL GOING CHILDREN

AIM:

To assess the clinical signs in pre-school children and school going children:

INTRODUCTION:

Clinical observations, the least sensitive approach lend themselves to use in nutrition surveys of population groups because they involve an assessment of the health of those parts of the body that can be readily observed in a routine physical examination and do not involve obtaining blood, urine or tissue samples. The most commonly observed are, eyes, mucous and lower extremities.

Although clinical observations are of limited value in the early diagnosis of a deficiency state or identifying margins changes that prevail for short periods, they are widely used to confirm biochemical and dietary data. Because, of the subjective nature of the judgement in a clinical evaluation, this method is quite unreliable even when used by highly skilled observers.

CLINICAL SIGNS OF VARIOUS ORGANS:

1. EYES

The most commonly observed symptoms is a dryness of the cornea and conjunctiva (xerosis conjunctiva) usually associated with lack of Vitamin A

2. MEMBRANES

The condition of skin is often a reflection of nutritional state of an individual, although all skin changes are by no means of nutritional origin. Deficiencies of some of the Vitamins manifest themselves in varying forms and degrees of Dermatitis.

3. MOUTH AND TEETH

Cracks at the corners of the mouth, referred to as angular stomatitis, and vertical cracks followed by redness, swelling and ulceration in areas other than the corners of the lips, lack of riboflavin. Loss of the papillae on the tongue and flavin and scarlet and raw appearance of the tongue are associated with a niacin deficiency. Soft, spongy and bleeding gums observed in dentulous person are indicative of a lack of ascorbic acid. The presence of molting on the mouth enamel results from a high intake of fluorine.

4. OTHER TISSUES

One of the clinical observations to be correlated with a nutritional factor was the enlargement of the thyroid gland traditionally associated with the deficiency of iodine or an intake of food goitrogens. Other clinical observations that may be significant are oedema, especially of the lower extremities. Depigmentation, lack of luster, and decreased hair diameter can also be seen during protein deficiency.

The following are the some more clinical signs of various organs in relation with nutritional problems.

Hair	Sparse and thin	Protein, Zinc, Biotin, deficiency
	Easy to pull out	Protein deficiency
	Corkscrew coiled hair	Vitamin C & A Deficiency
Mouth	Glossitis	Riboflavin, Niacin, Folic acid & Niacin.
	Bleeding and spongy gums	Vitamin C, A, K, Folic acid & niacin
	Angular stomatitis, cheilosis & fissured tongue	B 2, 6 & niacin
	leukoplakia	Vitamin A, B12, B complex, folic acid & niacin.
	Sour mouth and tongue	Vitamin B12, 6 C, Niacin, Folic acid & iron.
Eyes	Night blindness, exophthalmia	Vitamin A deficiency
	Photophobia – blurring, conjunctive inflammation	Vitamin B2 & A deficiencies
Nails	Spooning	Iron deficiency
	Transverse lines	Protein deficiency
Skin	Pallor	Folic acid, Iron, B12
	Follicular	Vitamin B & vitamin C
	Flaking dermatitis	PEM, vitamin B2, A, Zinc & Niacin
	Pigmentation, desquamation	Niacin & PEM
	Bruising, purpura	Vitamin K, C & folic acid.
Thyroid gland		In mountainous areas and far from sea places Goiter is a
Joints & bones	Rickets	Vitamin D deficiency
	Scurvy	Vitamin c deficiency

QUESTIONS:

1. How do you assess clinical signs in preschool children due to nutritional problems?
2. Describe about manifestation of clinical signs in school going children with nutritional problems.

REFERENCES:

1. World Health Organization, *Global Prevalence of Vitamin A Deficiency in Populations at Risk 1995-2005: WHO global database on vitamin A deficiency*. WHO, Geneva, 2009: p. 10-11
2. Derrick B. Jellief & E.F. Patric Jelliffe. *Community Nutritional Assessment*, Oxford University Press, 1985

IV. BIOCHEMICAL ASSESSMENT

1. BLOOD DRAWING TECHNIQUES

AIM: To know the technique of drawing blood

MATERIALS

1. Safety Needles, 22g or less
2. Butterfly needles. 21g or less
3. Syringes
4. Blood Collection Tubes. The vacuum tubes are designed to draw a predetermined volume of blood.

Tubes with different additives are used for collecting blood specimens for specific types of tests.

The color of the rubber stopper is used to identify these additives.

5. Tourniquets. Latex-free tourniquets are available
6. Antiseptic. Individually packaged 70% isopropyl alcohol wipes.
7. 2x2 Gauze or cotton balls.
8. Sharps Disposal Container. An OSHA acceptable, puncture proof container marked "Biohazardous".
9. Bandages or tape

PROCEDURE

1. VENIPUNCTURE

1. Identify the patient.
2. Reassure the patient that the minimum amount of blood required for testing will be drawn.
3. Assemble the necessary equipment appropriate to the patient's physical characteristics.
4. Wash hands and put on gloves.
5. Position the patient with the arm extended to form a straight-line from shoulder to wrist.
6. Do not attempt a venipuncture more than twice.

7. Select the appropriate vein for venipuncture.

The larger median cubital, basilic and cephalic veins are most frequently used, but other may be necessary and will become more prominent if the patient closes his fist tightly.

8. Apply the tourniquet 3-4 inches above the collection site. Never leave the tourniquet on for over 1 minute. If a tourniquet is used for preliminary vein selection, release it and reapply after two minutes.

9. Clean the puncture site by making a smooth circular pass over the site with the 70% alcohol pad, moving in an outward spiral from the zone of penetration. Allow the skin to dry before proceeding. Do not touch the puncture site after cleaning.

10. Perform the Venipuncture procedure.

- A. Place a sheathed needle or butterfly on the syringe.
- B. Remove the cap and turn the bevel up.
- C. Pull the skin tight with your thumb or index finger just below the puncture site.
- D. Holding the needle in line with the vein, use a quick, small thrust to penetrate the skin and vein in one motion.
- E. Draw the desired amount of blood by pulling back slowly on the syringe stopper.
- F. Release the tourniquet.
- G. Place a gauze pad over the puncture site and quickly remove the needle.
Immediately apply pressure. Ask the patient to apply pressure to the gauze for at least 2 minutes.
When bleeding stops, apply a fresh bandage, gauze or tape.
- H. Transfer blood drawn into the appropriate tubes as soon as possible using a needleless BD Vacutainer Blood Transfer Device, as a delay could cause improper coagulation. Gently invert tubes containing an additive 5-8 times.
- I. Dispose of the syringe and needle as a unit into an appropriate sharps container.

2.CAPILLARY SAMPLING (FINGER AND HEEL-PRICK)

PREPARE THE SKIN

- Apply alcohol to the entry site and allow to air
- Puncture the skin with one quick, continuous and deliberate stroke, to achieve a good flow of blood and to prevent the need to repeat the puncture.

- Wipe away the first drop of blood because it may be contaminated with tissue fluid or debris (sloughing skin).
- Avoid squeezing the finger or heel too tightly because this dilutes the specimen with tissue fluid (plasma) and increases the probability of haemolysis.
- When the blood collection procedure is complete, apply firm pressure to the site to stop the bleeding.

QUESTIONS:

1. Write about procedure for drawing blood.
2. Explain about the technique in drawing blood by finger prick method.

REFERENCES

- 1 World Health Organization (WHO). WHO guidelines on drawing blood: best practices in phlebotomy. Geneva (Switzerland): World Health Organization (WHO); 2010. 109 p. [82 references]
- 2 NCCLS: Procedure for the Collection of Diagnostic Blood Specimens by Venipuncture; Approved Standard, Sixth Edition, Vol 27, No 26 (H3-A6), 2007
- 3 Neonatal Procedures: SpecColProc2003.doc
- 4 Nursing Procedure Manual. Lippincott Online with addenda, 2004.
- 5 OSHA Safety and Health Bulletin SHIB 03-10-15: Disposal of Contaminated Needles and Blood Tube Holders Used for Phlebotomy.

2. ESTIMATION OF HEMOGLOBIN BY SAHALI'S METHOD

AIM:

To determine the hemoglobin content by Sahali's method.

PRINCIPLE

Hemoglobin is converted to acid hematin by the action of HCL. The acid hematin solution is further diluted until its colour matches exactly with that of the permanent standard of the comparator block. The hemoglobin concentration is read directly from the calibration tube.

REQUIREMENTS

1. Sahli's hemoglobinometer. It contains a comparator, hemoglobin tube, hemoglobin pipette, and stirrer.

A. Comparator : At the middle there is a slot which accommodates the hemoglobin tube. Non-fading standard brown tinted glass pieces are provided on either side of the slot for colour matching. An opaque white glass is fitted at the back to provide uniform illumination.

B. Hemoglobin tube: It is graduated on one side in gram per cent (g%), from 2-24, and on the other side as percentage (%), from 20-140. This tube is called as Sahli-Adams tube.

C. Hemoglobin Pipette: The pipette bears only one mark indicating 20 cu mm (0.2ml). There is no bulb in this pipette.

D. Stirrer: It is thin glass rod used for stirring the solution.

2. N / 10 HCl
3. Distilled water
4. Dropper
5. Materials for a sterile finger prick

PROCEDURE

1. Clean the hemoglobinometer tube and pipette and ensure that they are dry.
2. Fill the hemoglobinometer tube with N / 10 HCl up to its lowest mark (10 per cent or 2 g%) with the help of a dropper.
3. Prick the finger with all aseptic precautions, and discard the first drop of blood.

Note: The prick should be deep enough to give spontaneous flow of blood. Do not squeeze the finger to make the drop of blood.

4. Allow a large drop of blood to form on the fingertip, and then dip and tip of the hemoglobinometer pipette into the blood-drop and such blood up to 20 cu mm mark of the pipette

Note: While sucking blood into the pipette care should be taken to prevent entry of air bubbles. This is done by not lifting the tip of pipetting. If an air bubble enters, remove and discard the blood and make another drop of blood to repipette. If blood is sucked about the 20 cu mm mark of the pipette, bring down the blood column to the mark by tapping the pipette against the finger, but not by using any absorbent material like cotton wool.

5. Wipe the tip of the pipette. Immediately transfer the 0.02ml of blood from the pipette into the hemoglobinometer tube containing N / 10 HCl by immersing tip of the pipette in the acid solution and blowing out blood from the pipette. Rinse the pipette two to three times by drawing up and blowing out the acid solution. Withdraw the pipette from the tube.

Note: Make sure that no solution remains in the pipette.

6. Leave the solution in the tube in the hemoglobinometer, for about ten minutes (for maximum conversion of hemoglobin to acid hematin, which occurs in the first ten minutes).

7. After ten minutes, dilute the acid hematin by adding distilled water drop by drop. Mix it with the stirrer. Match the colour of the solution in the tube with the standards of the comparator.

Note: After addition of every drop of distilled water, the solution should be mixed and the colour of the solution should be compared with the standard. While matching, take care to hold the stirrer above the level of the solution. But, remember that at no stage should the stirrer be taken out of the tube.

8. If the colour of the test solution is darker, then continue dilution till it matches with that of the standard.

9. Note the reading when the colour of the solution exactly matches with the standard and express the hemoglobin content as g%

Note: The reading of the lower meniscus of the solution should be noted as the result. One more drop of distilled water should be added and the colour should be observed to check the result. The colour will be lighter than the standard if the previous reading was accurate.

QUESTIONS:

1. How do you estimate hemoglobin by Sahali's method?

REFERENCES:

1. Ayub R, Tariq N, Adil MM, Iqbal M, Jaferry T, Rais SRJ Pak Med Assoc. 2009 Feb;59(2):86-9. Low hemoglobin levels, its determinants and associated features among pregnant women in Islamabad and surrounding region.

2. **Dr. Venkatesh's Virtual Classroom.** ESTIMATION OF HEMOGLOBIN PERCENTAGE **Sunday, March 3, 2013**

3. ESTIMATION OF HAEMOGLOBIN LEVELS OF PREGNANT WOMEN IN THE COMMUNITY

AIM:

To estimate haemoglobin level of pregnant women.

INTRODUCTION:

During pregnancy the mother's blood volume increases about 35 percent and her volume of red blood cells increases by 21-26 percent. Additional iron is needed for red blood cells in the foetus, placenta and umbilical cord. Iron is transported to the foetus regardless of the mother's iron status. The total iron need for a single foetus pregnancy is estimated to be 0.8-1.0 gm. During the third trimester, 3-4 milligrams of iron per day is transferred to the foetus. Hence estimation of Haemoglobin level in pregnant woman is very essential to know the need of iron supplements to ensure proper growth and development of the foetus.

PRINCIPLE:

A hemoprotein composed of globin and heme that gives red blood cells their characteristic color; function primarily to transport oxygen from the lungs to the body tissues. The red blood cells are broken down with hydrochloric acid to get the hemoglobin into a solution. The free hemoglobin is exposed for a while to form hemin crystals. The solution is diluted to compare with a standard colour.

MATERIALS:

Hemometer, Single mark pipette, Distilled water, Needle, Spirit, Cotton, HCl.

PROCEDURE:

Take 1/10 HCl in the Hb tube upto the lowest mark '2'.

2. Prick the finger with needle and collect required sample of blood sample with single mark pipette.
3. Place the Hb tube on working table for five minutes for the formation of hemin crystals.
4. Place the Hb tube in the comparator/hemometer and add drop by drop of distilled water into it until the colour of the solution in the Hb tube coincides with the glass plates of the comparator.
5. If the colour coincides with the glass plates of the comparator, observe the reading in the Hb tube. The percentage of Hb can be calculated from the reading.

DATA ANALYSIS:

Hb content in grams $\times 100 / 14.5$

NORMAL VALUES: Males = 14 to 18 grams

Females = 13 to 14 grams

Children = 10 to 13 grams

RESULT: The hemoglobin content present in 20 μ l of blood sample is _____

QUESTIONS:

1.How the estimation of haemoglobin is carried out for pregnant woman?

REFERENCES:

- 1.Raheena Begum.M. A text book of Food, Nutrition & Dietetics, Revised and Enlarged edition.
- 2.Swaminathan M. Essentials of Foods and Nutrition, VOL.II, second edition, The Bangalore Printing and Publishing Co.Ltd.
- 3.Carroll Lutz & Karen Przytulski. Nutrition and Diet Therapy Evidence -Based Applications.4th edition. Jaypee Brothers, Medical Publishers(P) LTD. New Delhi.