PRACTICAL 7  ASSESSMENT OF GROWTH AND DEVELOPMENT

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7.0 OBJECTIVES

After completing this practical, you should be able to:
- measure the physical parameters for assessment of growth in children i.e. weight, height, mid-arm circumference, head circumference, chest circumference, fontanelles and dentition;
- assess the developmental milestones, gross motor, fine motor, adaptive, personal-social from birth to 12 years of age;
- record the physical parameters on the growth chart and interpret the findings;
- identify the deviation in growth parameters in children from birth to 12 years of age;
- record the developmental assessment of children on the performa; and
- identify the developmental deviations in children from birth till 12 years of age.

7.1 INTRODUCTION

As you know that growth and development is the basic science of child health. The goal of paediatric nursing is to foster the growth and development of children and promote an optimum state of health—physically, mentally and socially. So that they may function at peak capacity. Assessment of growth and
development of children is an important facet of paediatric nursing practice. Many children with slow development are not identified until they enter school. It is of utmost importance to identify children with deviations in growth and development as early as possible.

This practical introduces you to the set of activities on the growth and developmental assessment of children from infancy to school age (12 years).

The main focus is on the procedures of monitoring growth and development and how to assess growth and development. At the end growth recording is also discussed.

7.2 PURPOSES OF ASSESSING GROWTH AND DEVELOPMENT IN CHILDREN

Before you assess the growth and development you should be aware of the purpose of monitoring. The purposes are as follows:

- To assess the physical parameters and developmental milestone—tasks of children.
- To identify the deviation in growth and development.
- To suggest appropriate stimuli/activities to parents to promote optimum growth and development in their children.

7.3 TECHNIQUE OF ASSESSMENT OF GROWTH AND DEVELOPMENT

Measurement of physical growth in children is a key element in evaluation of the health status of children. Physical growth parameters include weight, height, head circumference, chest circumference, mid-arm circumference, fontanelle and dentition.

General instructions to be followed during techniques of measurement are:

- Welcome parents and the child to a neat and clean physical environment.
- Sit in front of the child at eye level and explain the reason for carrying out the procedure to parents and child.
- Approach the child in a positive manner.
- Allow the child to handle equipment.
- Allow the older child to participate in certain activities of physical measurement.
- Assure the child that none of the equipment hurts.
- Obtain cooperation of small children by offering toys to them.
- Young child can be allowed to sit in parent’s lap.
- Educate the school age child by informing the findings of physical measurement.
Carry out the measurements skillfully, accurately and quickly.

You can carry out these activities in various settings such as laboratory and field. Let us now see what areas are included in laboratory and field.

**Laboratory**
- Under five clinic of hospital
- Under five clinic of primary health centre
- Child guidance clinic
- School health clinic.

**Field**
- Home, community.

**Equipment:** The equipment required for measurement of growth are as follows:

- Weighing Scale (Fig. 7.1)
- Beam balance/electronic weighing machine
- Adult weighing machine
- Infantometer/Stadiometer
- Tapemeasure
- Shakir’s tape
- Growth chart.

**Fig. 7.1 : Equipment for measurement**

### 7.3.1 Measurement of Weight

Once you have collected all the equipments for assessing the weight and height you have to perform the actual activity. You should remember that, **Weight is a sensitive index of nutritional status.**

The various steps which you have to follow are:

- Select an appropriate sized beam balance which measures weights to the nearest 10 grams for infants and 100 grams for children.
Balance the scale by setting it at zero before checking the weight.

- Measure the weight in a comfortably warm room.
- Weigh the infants and toddlers nude.
- Older children are usually weighed while wearing their under pants or light clothings. However, you should respect the privacy of all children.
- Cover/place a clean sheet of paper on beam balance between each infant's measurement.
- Take reading at eye level.
- Record the weight on the chart and compare the weight with the approximate normal as shown in growth chart (Refer Appendix 1).
- Weigh children at regular intervals.

Accuracy of measurement is essential to the reliable interpretation of growth data.

- When weighing infants, place the head slightly above the body to prevent them from accidentally falling on the scale.
- If the child is wearing some types of special device such as splint or prosthesis, you must note this when recording weight.
- If weighing scale indicates weight in pounds you can convert it into kilogram by dividing it by 2.2 as 1kg = 2.2 Pounds
- Record the weight on appropriate chart.

Fig. 7.2: Measurement of weight of an infant

7.3.2 Measurement of Length/Height

- Length refers to measurements taken when children are supine. For children up to the age of 36 months or below 80 cm if age is not known you should measure recumbent length.
- Crown heel length is recorded on infantometer i.e. a horizontal board with a fixed head and moving foot end.
- The heel board should be vertical and knees should be held straight.
• While measuring length on infantometer, place the head firmly at the top of the board and the heels against the foot board.

**Measurement of length (horizontal stature) is preferred to height (vertical stature) before the age of three years to avoid postural errors.**

**Height**

• Height refers to measurement taken when children are standing upright, i.e. in vertical position. (see Fig. 7.3)

• Height is recorded on an instrument called as stadiometer.

• Measure height by having the child stand as tall and straight as possible with the head in midline.

• Be sure that child’s back is towards the vertical flat surface with the heels, buttocks and back of the shoulders touching the flat surface. (See Fig. 7.4.a,b)

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Fig. 7.3: Measurement of height

Fig. 7.4(a): Measurement of crown heel length

Fig. 7.4(b): Measurement of crown rump length

• A horizontal head board is lowered into the head while subject inhales and reading is taken at eye level.

• Record the length/height on the growth chart and compare the length/height with approximate normal for the age.
7.3.3 Measurement of Head and Chest Circumference

Head circumference is measured by placing the measuring tape above the eye-brows and pinna of the ears and around the occipital prominence at the back of the skull and recording is done in cms (Fig. 7.5a).

Similarly measure chest circumference by passing the tape around the chest at the level of nipples. The reading is recorded midway between inspiration and expiration. (See Fig. 7.5b)

Caution: Don’t press the measuring tape on the chest wall, it would compress the soft tissue underneath.

Fig. 7.5(a): Measuring head circumference  Fig. 7.5(b): Measuring chest circumference

7.3.4 Measurement of Mid-arm Circumference

Mid-arm circumference is an age independent parameter. It is an indirect measure of muscle mass. Shakir’s tape is used for mid-arm circumference; This is a plastic tape with coloured zones; green (more than 13.5 cm) yellow (between 12.5 and 13.5 cm) borderline and red (less than 12.5 cm). (Fig 7.6)

- Keep the left arm of infant at right angles.
- Make a mark vertical to olecranon process and mid way between the tip of the olecranon and the acromian process.
- Measure the arm circumference with the arm hanging relaxed and tape held snugly around the arm.

Growth measurements focus on length, height, weight, head circumference, chest circumference and mid-arm circumference. Assessment of growth is measured against standard growth charts to determine a child’s status in comparison with other children of the same age.

Fig. 7.6: Measuring mid-arm circumference

7.3.5 Examination of Fontanelles

Wide gap in the suture line is called fontanelle. There are six fontanelles, of these two are of significance (i) anterior fontanelle or bregma; and (ii) posterior fontanelle or lambda.
Anterior Fontanelle: Its shape is like a diamond and measures 3 cm x 3 cm. It becomes ossified in 18 months after birth. It becomes pathological, if it fails to ossify even after 24 months.

Posterior Fontanelle: It is triangular in shape and measures about 1.2 x 1.2 cm. It ossifies by 6 weeks of age.

### 7.3.6 Dentition

The temporary teeth are twenty in number, four incisors, two canines and four molars in each jaw. The permanent set of teeth are thirty-two in number and consist of two incisors, one canine, two premolars and three molars in each half of the jaw. The following table shows the eruption of different types of teeth:

<table>
<thead>
<tr>
<th>Teeth</th>
<th>Deciduous</th>
<th>Permanent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Incisors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>6-8 months</td>
<td>6-8 years</td>
</tr>
<tr>
<td>Upper</td>
<td>7-9 months</td>
<td></td>
</tr>
<tr>
<td>Lateral Incisors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>10-12 months</td>
<td>7-9 years</td>
</tr>
<tr>
<td>Upper</td>
<td>7-8 months</td>
<td></td>
</tr>
<tr>
<td>Canines</td>
<td>1½ years</td>
<td>11-12 years</td>
</tr>
<tr>
<td>Anterior Premolars</td>
<td>absent</td>
<td>9-11 years</td>
</tr>
<tr>
<td>Posterior Premolars</td>
<td>absent</td>
<td>10-12 years</td>
</tr>
<tr>
<td>First Molar</td>
<td>12-14 months</td>
<td>6-7 years</td>
</tr>
<tr>
<td>Second Molar</td>
<td>20-30 months</td>
<td>12-14 years</td>
</tr>
<tr>
<td>Third Molar</td>
<td>Absent</td>
<td>17-25 years</td>
</tr>
</tbody>
</table>

**Fig. 7.7: Eruption of deciduous and permanent teeth**

**Activity 1**

Select an infant and a toddler record all growth parameters.
Outline of Growth Assessment

<table>
<thead>
<tr>
<th>Growth Parameters</th>
<th>Observation findings</th>
<th>Expected range of growth parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head Circumference</td>
<td></td>
<td></td>
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<tr>
<td>Mid-arm Circumference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chest Circumference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fontaneles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dentition</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.3.7 Assessment of Development in Children

The development of a child is studied through various responses which he exhibits following a natural or experimental stimulus. Basically the child development could be studied in two ways.

i) **Through Observations:** Behaviour of children is recorded through observations in relation to natural environment.

ii) **Through Experimental Methods:** Experiments are designed to elicit and record a behaviour response to a particular stimulus.

Developmental assessment can be divided into four areas: gross motor, fine motor, adaptive language and personal social behaviour. You have learnt the developmental milestones of children in various age groups in BNS-107 Block 1 Unit 2.

7.4 THE DENVER DEVELOPMENT SCREENING TEST (DDST)

The Denver Development Screening Test is a standardized test to assess gross motor, fine motor, language and social development during infancy and preschool years. The test relies on observation of the child and report by a parent, who knows the child. Direct observation is used wherever possible. It is used in clinical practice to identify children whose development may need critical study.

General Instructions:

- Explain the purpose to the parents.
- Put the child at ease.
- The younger child may be tested in parent's lap in such a way that the child can comfortably reach the test material on a table.
- As the parent is being queried regarding personal social items the child may be given one or two test materials.
- The child should be assisted in such a way to have first successful experience (proceed from easy to difficult task).
- Child should only be exposed to the test items that is being administered to prevent distractions.
- Test should not be administered to sick child.
DDST is not an intelligence test and does not indicate developmental quotient (DQ) and intelligence quotient (IQ).
Do not give false assurance to the parents.

Apparatus Equipments

- Rattle with a narrow handle
- Red wool (sbein)
- Bottle with narrow opening
- Box of raisins/some sheets
- Small bell
- Tennis ball
- Counting blocks eight (one inch square of red, blue, yellow, and green colour)
- Form board
- Pencil and test form

Setting

A well ventilated quiet room with furniture and comfortable seating arrangement across the table. This can be in any of the following areas:

- Laboratory based
- Under five clinic
- O.P.D. of a hospital
- Child guidance Centre
- School health clinic

Steps in Administering the Test

- Draw a vertical line on the examination chart through the four sectors (gross motor, fine motor, adaptive language and personal social) to represent the child’s chronological age.
- Place the date of examination
- For premature children subtract the premature months from the chronological age.
- The items to be administered are those which the child’s chronological age line permits unless there are obvious deviations.
- If the child prefers to do some of the items take the help of parents to administer the item provided she does so in the prescribed manner.
- If the child passes an item a large letter “P” is written on the bar at the 50 per cent passing pointing, “F” designates a failure and “R” designates a refusal.
- Failure to perform an item by a child should be recorded in colour on right end of the bar. Several such failures in one sector are indicative of developmental deviation.
- Note the date and observation of parents and child behaviour in relation to the examination (attention span, verbal behaviour, self confidence, etc.).
Activity 2

Select a toddler and assess his developmental patterns and record findings.

7.5 GROWTH AND DEVELOPMENT RECORDING

Once you have reviewed how to assess and monitor growth and development of child of various age groups you should be able to record the same accurately so that you can accurately assess the nutritional status of a child. This is done in growth charts. Now we shall see what are these growth charts.

7.5.1 Growth Charts

Management alone without any standard of comparison do not serve useful purpose. A number of standards have been developed to compare the measurement of any child with other children of the same age, sex and race. Also the child's present measurements are compared with former rate of growth and pattern of progress. The standards laid down by the Indian Council of Medical Research are recommended for comparing the Indian children and are available as growth charts.

- Growth charts are used to assess the growth and thus the nutritional status of children.
- Growth charts have reference curves for purpose of comparison.
- Growth charts also provide space for recording information such as identification, date of birth, birth weight, chronological age, immunization, introduction of supplementary food, episodes of sickness, child spacing and reasons for special care.
- It provides a visual record of the health and nutritional status of the child, which is easily understood by mother as well as the health workers.

Growth Chart Developed by WHO

The Growth chart developed by WHO is also called the “road to health”. (See Fig. 7.8)
The zone under the curve represents the weights of 95 per cent of normal healthy children.

It is the direction of growth that is more important than the position of dots on the line. Flattening or falling of child's weight curve signals growth failure. The objective of child care is to keep a child in the zone that represents weight of 95 per cent of normal healthy children i.e. parallel to "road to health" curve.

**Growth Charts Used in India**

The growth chart recommended by the Government of India is shown in Fig. 7.9. It has four reference curves.

- The top most curve represents the level of optimum growth.
- The lower lines i.e. II, III & IV represent 80 per cent, 70 per cent and 60 per cent of the standard respectively.
- The purpose of these lines is to indicate the degree of malnutrition as recommended by Indian academy of Paediatrics (Grade I, II, III) for details refer Fig. 7.9.

**Guideline: Assessment of Growth and Development**

**Identification Data**

Name of the Child:
Date of Birth:
Sex of the Child:
Name of Father:
Name of Mother:
Educational Status of Mother:
Educational Status of Father:
Annual Income:
Occupational Status of Mother:
Occupational Status of Father:  
Immunisation Status:  
**Dietary History**  
Breast fed up to the age of:  
Weaning started at:  
Daily intake:

### Growth Parameters

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Present</th>
<th>Expected</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td></td>
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<tr>
<td>Height</td>
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<tr>
<td>Midarm Circumference</td>
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<tr>
<td>Chest Circumference</td>
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<tr>
<td>Dentition</td>
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<tr>
<td>Fontanelle</td>
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</table>

**Activity 3**

Collect the various growth charts used in your hospital. Fill up one record each for infant toddler and a preschooler.

### 7.6 LET US SUM UP

In this practical we have discussed and reviewed the various techniques of growth and development monitoring. Measurement of growth and development is a crucial activity which will help you to identify various deviations. This will also help you to assess the nutritional status of the children. We have also discussed about the recording of growth in various charts.

### 7.7 KEY WORDS

**Fine Motor and Adaptive:** It includes grasping and manipulation of objects, sensory motor adjustments to objects and coordination of eyes and hands to adjust the simple problem situations.

**Gross Motor:** It involves control of child over his body. Development of child is observed during ventral suspension, supine, prone, sitting, standing and walking.

**Language:** This includes all visible and audible forms of communications whether by facial expression, gestures, postural movements, vocalization of words, phrases or sentences and mimicry.

**Social:** It includes bladder and bowel control, feeding abilities, sense of priority, self dependence in play, cooperativeness and emotional responsiveness to various stimuli.