
UNIT 12 PHYSICAL AND MOTOR DEVELOPMENT :- INCREASE IN MOBILITY AND CONTROL

Structure

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- 12.2 Physical Growth
- 12.3 Gross Motor Skills
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12.1 INTRODUCTION

The twelve month old infant, as you would recall from your reading of Block 2, was able to pull herself to a standing position and walk a few steps holding on to a support. She could reach for objects and pick them up. Let us meet Anne who will be three years old in a month's time. She can run, climb stairs alternating her feet and can also walk backwards. She has better balance now. One of the things she loves to do is to fill the pages of her brother's notebook with scribbles whenever she finds it lying around, much to the annoyance of her brother! Playing with water, splashing it and pouring it from one container to another is her favourite game.

What are the developments between the stages of trying to walk by holding on to a support and being able to run, from trying to pick up small objects to scribbling untiringly with a crayon? Let us trace the development of gross and fine motor skills during toddlerhood and also read about the physical growth that takes place during this period.

Objectives

After reading this unit, you will be able to

- describe the physical growth in the period of 13-36 months, i.e. during toddlerhood
- trace the development of gross and fine motor skills during toddlerhood
- know about adequate health care and nutrition for the toddler

12.2 PHYSICAL GROWTH

Growth during toddlerhood, though not as fast as in the first year of life, is still fast compared to the later years of childhood. By the time of the second birthday, toddlers are half as tall as they will be as adults and weigh one-fifth of what they will weigh at 18 years. Table 12.1 gives the average height and weight of normal healthy children between one and three years of age. However, as you know by now there are individual differences in the rate of growth and there may be considerable variation among children of the same age with regard to their height and weight.

Age	Weight (kgs)		Height (cms)	
	Boys	Girls	Boys	Girls
1 Year	9.5	9.0	75.0	72.5
2 Years	11.5	11.0	85.0	83.0
3 Years	14.0	13.5	94.0	92.0

Table 12.1 Average weights and heights of Indian children

Source : Ghosh, Shanti; *You and Your Child*; Voluntary Health Association of India, 1989.

With the increase in height and weight, the body proportions of the toddler also change. The head increases in size and accounts for one-fourth of the child's height at two years of age. The trunk and the limbs begin to grow at a faster pace in this period compared to the first year. The arms increase by about 60-70 per cent of their length at birth. Legs grow more slowly in comparison and increase by 40 per cent of their length at birth. As a result of these changes, the child's body looks more proportionate than it did in the first year and she has a better balance.

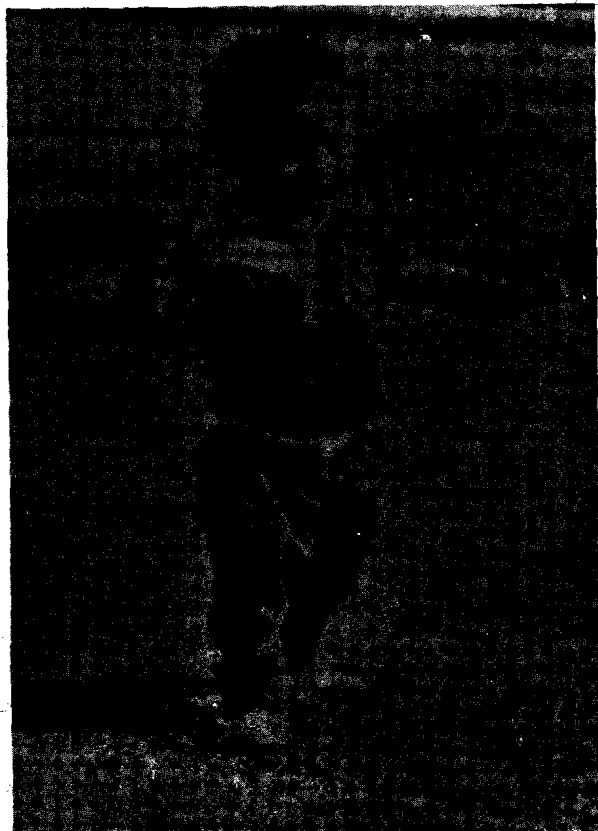
The brain continues to develop rapidly. You know from your reading of the last Block that at birth the child has most of the nerve cells of the brain. During toddlerhood and later, they increase in size, become well-connected and more specialized. These developments of the brain are of great importance as they allow the child to have greater control over her movements and add speed and accuracy to her gross and fine motor skills. Besides physical development, language and cognitive development also result from brain growth. In fact, all developments are closely related to the maturation of the brain.

In the period of toddlerhood, the muscle fibres in the body increase in length and thickness, and muscular control improves. The hardening of the soft cartilage, which began in the foetal period, continues. The spinal cord and the bones of the arms and legs harden so that the toddler can support her weight. This helps the toddler to stand upright and enables her to master increasingly complex motor tasks. The number of bones in the body also increase. The small bones join to form larger ones and the cartilage tissue hardens to form new bones. By the time the toddler is three years old, she has a complete set of twenty teeth, called milk teeth. The abilities of vision, hearing, taste, smell and touch become more developed during toddlerhood.

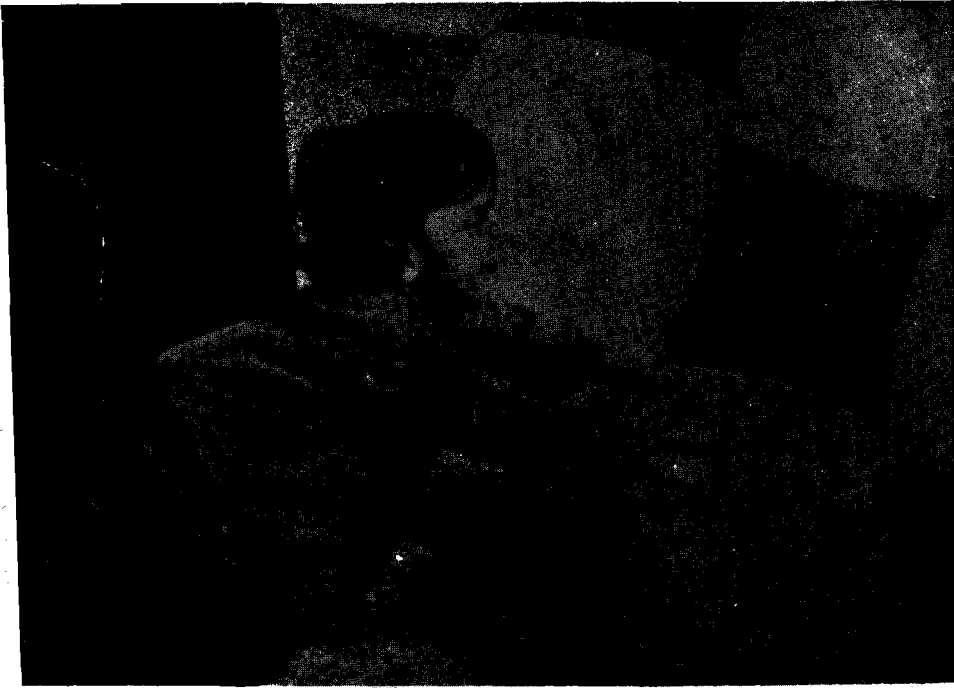
The physical changes described in the above paragraphs enable the development of motor skills like walking, running, climbing, jumping, scribbling and grasping.

12.3 GROSS MOTOR SKILLS

As a result of gross motor development, the toddler acquires abilities that demand increased motor co-ordination and speed. Let us read about some gross motor abilities that emerge during toddlerhood. These are walking, running, jumping and kicking.



Being able to move on her own changes the child's world in many ways. Children begin to **walk independently** some time between 11 and 15 months of age. When the child first attempts to walk, her feet are spread apart, the toes are turned outwards and the arms are held away from the body for better balance. While walking, she does not bend her legs from the knees but instead swings them from the hips which makes her walk a little stiff. The child toddles — hence the name 'toddler'. By the time she is 16 to 18 months old, she can push a small table or a chair while walking. At this age she also picks up toys and other light articles to carry them from one place to another. Around 18 months of age, she is also able to climb over obstacles that are about one foot high — she can climb out of her cradle or crib if it is placed on the floor. The furniture that once seemed an obstacle is now a challenge — the child enjoys climbing on to it and pushing it.



With practice, the irregular movement during walking gives way to steps that are more even. The gait of the two-year-old is steady and she places one foot ahead of the other, similar to an adult's walk. Although she does not need to concentrate on balancing herself, she sometimes has to monitor her feet visually as she walks, in order to avoid obstacles. Once the toddler is steady in her walk, she enjoys pulling along a toy that is tied to a string. By two-and-a-half years of age, most toddlers walk quite well. Once confident about walking, they try variations. Most three-year-olds are able to walk backwards.

Walking leads to **running**. Initially many toddlers combine walking with running into a 'hurried walk'. The movements of the toddler while running are jerky and her stops and starts are not controlled. She runs for a short distance, falls down, gets up and begins to run again. The ability to run steadily, with controlled starts and stops, develops over the preschool years.

In the period of 19 to 24 months the toddler can **climb stairs** if someone holds her hand. She can, however, go up and down the stairs by herself on all fours, using her legs and arms in a combination of stepping and crawling. Between the second and the third year, she can climb stairs by alternating her feet, while holding on to something. Many three-year-olds can ride a tricycle.

Jumping emerges as toddlers experiment with stepping down from stairs or boxes. In their first attempts at jumping, toddlers step off with one foot but are fearful to let go with the other. By two years of age, most toddlers can jump from a low platform (about half a foot high) with both feet.



Three-year-olds also try to kick toys, large balls and other objects. They do this in a clumsy fashion and may not be able to kick the ball, often falling while trying to do so.

Games of **throwing and catching** interest the toddler but her skill in this is elementary. Perhaps you have played a game of throwing and catching a ball with a toddler. Did you notice her actions as she tried to catch and throw the ball ? It would be interesting to write your description of her actions in the space provided below and then read the one that follows.

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While trying to catch, the three-year-old prepares to receive the ball by extending her arms stiffly but as the ball approaches, she flinches and loses track of it. If the ball happens to land in her arms, she holds it by trapping it against her body. The toddler does not move her body to catch the ball if it comes little towards the side or falls a little before her. While throwing the ball, she simply hurls the ball forward in a simple overhand, back-to-front motion. She does not rotate her body while throwing and keeps

her feet firmly on the ground instead of lifting one foot slightly, which would result in a better throw. These skills require better visual-motor co-ordination and evolve during the preschool years.

When in good health, toddlers are a whirlwind of activity. They are literally everywhere, much to the parents' exasperation—under the bed, over the chair, behind the door, into the cupboard. Everything—a book, a tumbler, a pot—is a toy for them—something to be explored and then abandoned as they look for something new. What is the importance of this movement and motion for the child? Write your thoughts in the space below and then go on to the discussion that follows.

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Being able to move around allows the toddler to discover. She is able to explore the world and comes in contact with other people. Movement promotes balance and co-ordination. As toddlers stack objects, push them over and carry their toys, they are finding out how to manipulate things. As they handle objects, they develop an understanding of space and direction. They are constantly learning from their experiences. Movement is also an important factor in the development of the child's self-image and self-esteem. Being able to move on her own gives her a sense of independence and the confidence to encounter challenges. If the child's movements are restricted, she is likely to lack confidence in her physical abilities and may hesitate in playing with peers and adults. You will read more about this aspect in Unit 15.

12.4 FINE MOTOR SKILLS

During toddlerhood, the child becomes more skilled in using her hands. Her grasp becomes better. She is able to pick up small objects and hold them. As a result, she is able to do many tasks that were difficult for her earlier.



Grasp : The 15-month-old can pick up things using the thumb and forefinger, just as we do. This skill of using the forefinger and thumb to hold an object is very important and is used for many tasks in our day-to-day life such as writing, buttoning clothes and eating. Toddlers are able to pick up small objects like buttons, pebbles or seeds. As their grasp improves, they enjoy stacking objects so that an 18-month-old can arrange a few wooden blocks one on top of another to build a tower. She delights in repeatedly pushing the blocks down and stacking them. Eye-hand co-ordination develops so that toddlers can push pebbles or buttons into a container through a small hole made in its lid. By three years, they can turn the pages of a book fairly well.

Toddlers have begun to eat on their own. They can hold the tumbler firmly in both hands and tip it up to drink from it. However, while doing so they spill some of the contents. They may insist on eating food themselves, using spoons or their hand. While doing so, they smear some on their face and drop some of it as they carry it from the bowl to their mouth. By three years, however, they manage to eat food without smearing and can drink from a cup without spilling.

Scribbling : Some time in the second year of life, the toddler 'discovers' scribbling. Scribbling is the earliest stage of writing. The increased muscular co-ordination and the ability to use the thumb and the forefinger to hold a chalk enables the toddler to scribble.

When the toddler first begins to scribble, she grips the crayon tightly in her palm. So tight is her grip that after some time her grasp opens because of fatigue and the crayon drops. The lines the toddler draws may seem to us as if they have been drawn by



Scribbles by a 2 1/2, Year old child

accident, but the toddler has done very definite back and forth lines. The lines at this time are usually straight. The toddler repeats the lines over and over again. So intent is she at scribbling that while she may look at something else, she will continue the same movement. At this age the toddler does not have total control over the movement of her hand and so the lines often run off the paper. While scribbling the toddler moves her entire arm. She does not use her wrist to move the crayon, unlike older children and adults. Therefore, while scribbling her arm movements are large sweeping ones, employing the shoulder and the elbow. This stage extends up to two-and-a-half to three years of age. However, some toddlers who are deft may go on to the next stage of scribbling before they are three years of age. In this stage, semi-circular and circular patterns and loops appear. This indicates that the toddler has begun to use the movement of the wrist to scribble. This reflects better muscular co-ordination. The scribbles now are not allowed to run off the paper—a sign of increased eye-hand co-ordination and muscular control. The toddler experiments with different types of scribbles and varies the amount of pressure she exerts on the crayon. Scribbling gives the growing child a sense of achievement. It is one of the first accomplishments in producing something. Some toddlers who have been taught may write some alphabets and numbers or draw squares and triangles. But these figures are not precise and the children find it difficult to write them. They should not be forced to do so. It would be interesting to collect a sample of a toddler's scribbles and write a description in the following lines. Which stage does this child seem to be in ?

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Writing will develop during the preschool years as the child's fine muscles develop. The milestones in scribbling and writing during the preschool years will be described in the next Block.

The development of motor skills, as the development in any other area, depends upon the maturation of the central nervous system. But once the child is ready to perform a certain skill, she should be encouraged and given opportunity to practice. If the child is not ready to pick up a skill, do not force her to learn. Sometimes the child's progress may be affected by an illness or an accident. Also, as children are eager to try out so many things at this age, they may not be able to keep pace with all of them at once. As they learn one skill, they may slow down in the learning of others. But this is not a matter of serious concern. All of us, and particularly children, have a natural drive for mastery and competence that keeps us trying. Small delays now will be made up later.

During toddlerhood children begin to show preference in using one of the hands and subsequently use this one predominantly. In the first year, infants use both their hands equally for grasping and picking up objects. By two years most toddlers prefer one hand over the other and this preference, which is firmly established by five to six years of age, is called the dominant hand. Most of us use the right hand dominantly, a few clearly use the left, while some of us learn to use both hands with equal efficiency. Left-handed people face a slight disadvantage in that most tools and instruments like scissors, musical instruments, writing desks and door handles are designed with right-handed people in mind. However, the left-handed person learns to adjust to a right-handed world. Studies show that there are no differences in school achievement, intelligence or personal-social relationships between left and right-handed children. So do not force a left-handed child to use the right hand, just because most people are right-handed. In fact, forcing the child to change the hand preference may seriously harm her.

Before we complete this section, it is important to state that while we have discussed the development of gross and fine motor skills separately, most of the activities of children, as well as ours, require a combination of gross and fine motor skills.

Check Your Progress Exercise 1

Answer the following questions in the space provided below.

- 1) List the milestones in physical development during toddlerhood that aid in acquisition of motor skills.

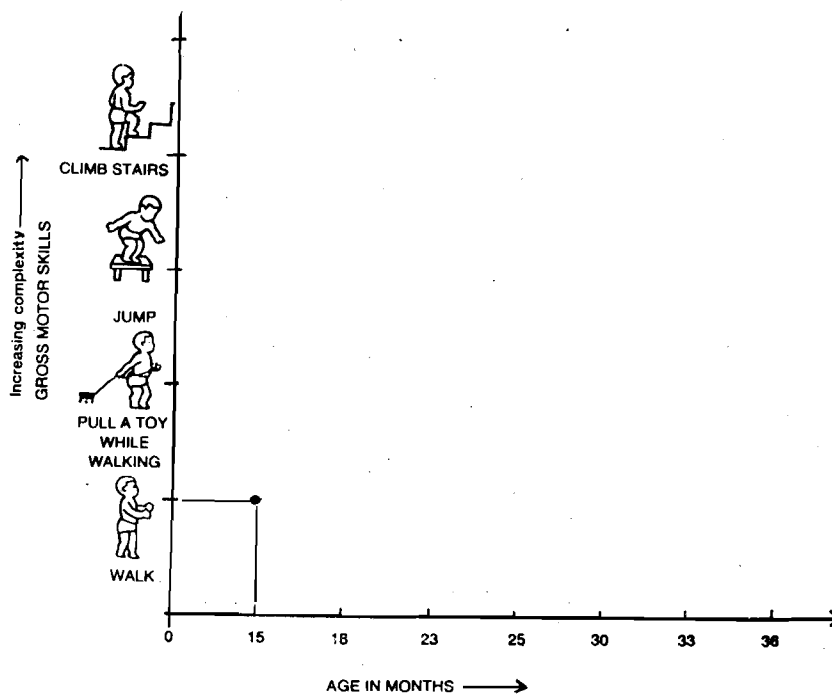
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- 2) In the following graph the 'X' axis represents the age of the toddler and on the 'Y' axis are plotted some gross motor skills. Complete the graph by matching the skills with the age at which they emerge, as shown in the example of walking.



12.5 CARE OF THE TODDLER

With growth and development there are changes in the amount and kind of the food the child requires and in the scheduling of meal times of the child. Growth monitoring and immunization must continue during toddlerhood as well. Let us read about these aspects of care in the following sub-sections.

12.5.1 Feeding

During toddlerhood eating becomes a social activity for the child—she likes to eat with others and share their food. Toddlers are not always able to express their need for rest and food when they are tired and hungry. Instead, they cry or become irritable. Therefore, the caregiver will need to be attuned to the child and plan the child's time for eating and rest.

While in some families there is sufficient food for the child, in others the child does not get enough to eat. Generally, this is related to poverty, and occasionally, to neglect by the mother. In such cases the role of the day care centre becomes important. The supplementary food that is given in the centre is very important for the child. You will read more about this in Block 7.

Often feeding becomes a situation where the child likes to have her way. The mother may insist that the child eat whatever she is given at a specific time. But if the child does not eat a particular food item, it is better to give it to her in some other form rather than insist that she eat what has been cooked. If she does not eat vegetables, for example, these can be cooked in pulses or stuffed in *chapati* (pancakes made from wheat flour). Spinach can be cooked in green gram (*moong dal*) and bottle gourd in bengal gram (*channa dal*). Spinach or *methi* leaves can be chopped and kneaded in the dough for making *chapatis* or *poories*. These green *poories* are likely to interest the child. Vegetables like cauliflower or radish can be grated to make stuffed *paranthas*. Preparations like *sambhar*, that are made from pulses and vegetables, can also be given to the child.

The following recipe of *suji chila* allows you to use any vegetable.

Take four spoonfuls of semolina (suji). Add a pinch of salt and make a batter by mixing it with water. Leave it for two to three hours. Chop vegetables like onion, carrot, spinach and cabbage. Heat the frying pan, put a spoonful of cooking oil in the pan and then spread two spoons of batter on it. Then spread the chopped vegetables on top of it. Cook the chila on slow fire. When the underside is golden brown, turn the chila upside down. Cook for another three to four minutes. When both sides of the chila are golden brown, it is ready to serve. You can try variations of this.

While planning meals for anybody, one important point to remember is that the meal should be balanced. What do we mean by the term 'balanced'? A balanced meal contains all the nutrients in the amounts required by the body. The nutrients that are required by the human body have been categorized as follows : Carbohydrates and fats that give energy to the body, proteins that help in body building, and minerals and vitamins that provide resistance to diseases. In addition to these five nutrients, the diet should also contain adequate amount of fluids.

Let us list some major foods according to the nutrients they provide :

Carbohydrates—wheat, rice, *ragi*, *jowar*, i.e. cereals and sugar.

Proteins—pulses, milk and milk products, egg, meat, fish.

Fats—oil, *ghee*, *vanaspati* and butter.

Vitamins and Minerals—vegetables and fruits.

The food items mentioned above provide nutrients in addition to the ones that they have been listed under. For example, wheat provides carbohydrates in large amounts but it also provides other nutrients. However, the foods have been classified thus according to the major or dominant nutrients they provide. They are important in our diet as contributors of that particular nutrient.

If one takes care to see that every meal contains one food item from each of the above mentioned categories (carbohydrates, proteins, fats, minerals and vitamins), then each meal is a balanced meal. When each meal is balanced, particularly the three main meals of breakfast, lunch and dinner, then the person's diet for the whole day is a balanced one. On the face of it, it may seem that including one item from each of the categories would be expensive and may be cumbersome to cook. But this is not so. Take the following meal that was served for lunch to Feroza. She ate *besan*-Cauliflower *chapatis* with curd. The dough for the *chapatis* was prepared by kneading wheat flour, *besan* flour made from bengal gram or *channa dal* and finely grated cauliflower.

Feroza got a balanced meal. The *chapatis* provided carbohydrates, proteins, vitamins and minerals. Let us read how this was so. The wheat flour provided carbohydrates, *besan* provided proteins and cauliflower provided vitamins and minerals. You can substitute cauliflower with green leafy vegetables like spinach and *methi* leaves. The *ghee* spread on the hot *chapati* provided fats. Curd provided proteins. Thus with only two food items you can provide a balanced meal. The meal was not expensive.

Let us see what Hema ate for breakfast—milk, an egg sandwich and a small slice of papaya. Egg and milk provided proteins, bread gave her carbohydrates, papaya was rich in vitamins and minerals, and butter used in the sandwich provided the fat. Therefore, Hema also ate a balanced meal.

In contrast, Sunita had plain *paranthas* with pickle for lunch. Her meal mainly included carbohydrates and fat. A little amount of other nutrients would have been provided by these food items but there is no major source of vitamins, minerals or proteins in the meal.

It is important to ensure that each meal the child eats is a balanced one. As regards the amount of food that should be given to the child, usually her appetite is the best guide. However, some children have a poor appetite. In such cases, they will not get a balanced diet. Therefore, you have to be careful about their diet. The three main meals of breakfast, lunch and dinner must be given to the toddler. But since she cannot eat large quantities at one time, you must give her small meals in between these meals. This means that it is better to give the child smaller amounts of food more frequently rather than giving her fewer meals with more to eat at each meal. Therefore, besides giving her the three main meals, the toddler should be given nutritious snacks at mid morning (between breakfast and lunch) and at tea time (between lunch and dinner). At these times you can give her some fruit / sandwiches / biscuits.

You can make nutritious *ladoos* (a sweet) in the following way.

Roast some wheat flour, besan and groundnuts in a little bit of oil. Make a thick sugar syrup using jaggery. Mix this solution in the roasted flour, besan and groundnuts and make ladoos. You can store these ladoos, giving the child one or two every day.

During toddlerhood the requirement for proteins and energy is high since the child's growth is rapid and her activity level high. Proteins are needed for body building and carbohydrates and fats provide energy. Take care to see that there are adequate amounts of these nutrients in the toddler's diet. In addition the child's diet may lack vitamin A, iron and calcium and special care should be taken to see that they get these in adequate amounts. You will find further details about foods rich in these nutrients in the next Block.

This was just a brief overview of the nutrition during toddlerhood. In the next course — DECE-2 — on 'Child Health and Nutrition', we shall read in detail about the nutritional requirements during toddlerhood and planning balanced diets.

12.5.2 Immunization

In the last Block you read about the immunization schedule that should be followed for infants. The immunization must continue during toddlerhood. Between 16 and 24 months of age the toddler must be given booster doses of DPT and poliomyelitis. While giving the booster doses care has to be taken to see that this is done exactly after one year of the last dose.

In DECE-2 we shall read about some common childhood diseases and their management.

Check Your Progress Exercise 2

- 1) In column I are listed the nutrients required for the healthy functioning of the body. column II lists food items. Match the food items with the nutrients they provide.

COLUMN I
i) Carbohydrates
ii) Proteins
iii) Vitamins and Minerals
iv) Fats

COLUMN II
a) Milk, Curd, Pulses, Fish, Egg
b) Butter, Oil
c) *Chapati*, Rice, *Jowar*, *Bajra*
d) Mango, Apple, Spinach, Cabbage

- 2) Below are described two meals, one that was given to Ravi and the other to Mala for lunch. Who do you think got a more balanced meal ?

- a) Mala's Lunch—spinach *chapati* (made by kneading spinach leaves in the dough) with keema curry
b) Ravi's Lunch—Rice and *Channa* curry with *papad*

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12.6 SUMMING UP

This Unit carries forward the discussion on physical and motor development, with reference to toddlerhood. Changes in the skeletal and muscular system and maturation of the brain help in acquisition of motor skills. The development of motor skills have been traced to show that by the time the child is three years old she can run, jump, kick and walk backwards. Her control over her hands becomes better and she is able to hold small objects. Scribbling emerges during this period. Being able to hold a pencil between the thumb and forefinger will later help her to learn to write.

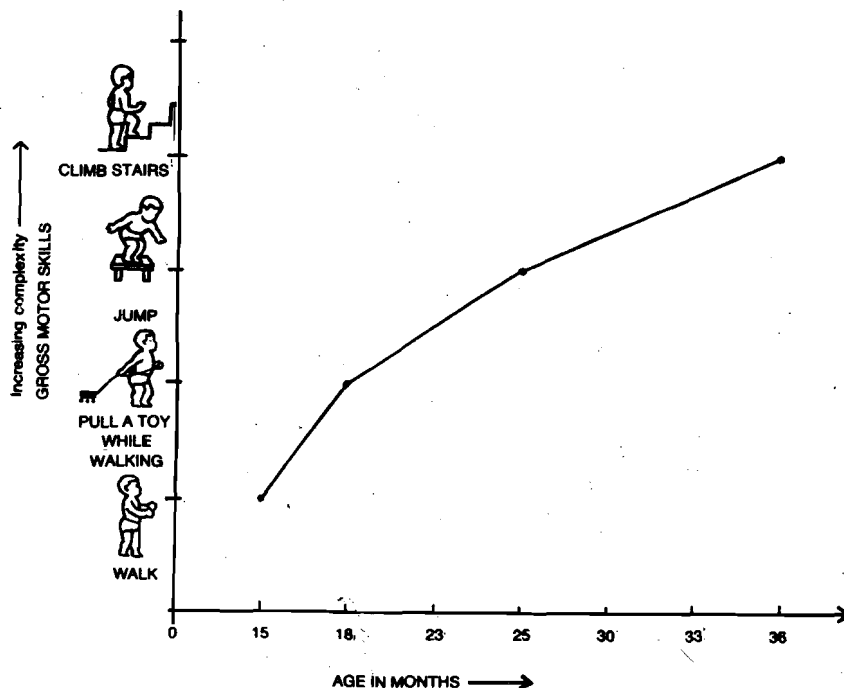
The child needs a balanced diet. This means that she should get all the five nutrients, i.e. carbohydrates, proteins, fats, vitamins and minerals, in her diet. The immunization schedule that should be followed during toddlerhood has also been given.

12.7 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

Check Your Progress Exercise 1

- 1) The physical developments that aid in the acquisition of motor skills are
 - the toddler's body becomes more proportionate, she is able to balance better which allows walking, running and jumping
 - maturation of the brain
 - muscles increase in weight and thickness
 - bones harden and increase in number

2)



Check Your Progress Exercise 2

- 1) i (c), ii (a), iii (d), iv (b)
- 2) Mala's lunch was balanced as it contained food items from all the four categories.
Mala's Lunch :

Spinach Chapati — carbohydrates, vitamins and minerals
Channa Curry — proteins, fats

Ravi's meal was not balanced since he did not get sufficient vitamins and minerals due to lack of vegetables/fruits. He may have got some vitamins from vegetables like tomato in the *channa* curry but this is not enough.