CHAPTER 7

NUTRITION AND THE PREVALENCE OF ANAEMIA

This chapter focuses on the nutrition of women and young children, examining both the types of food consumed and the consequences of inadequate nutrition and poor feeding practices. NFHS-1 included basic information about feeding practices and the nutritional status of young children. NFHS-2 contains more comprehensive information on these topics, and, for the first time, information on the diet of women. Measurement of height and weight has been expanded to include ever-married women as well as young children. Two additional tests have been included for the first time—anaemia testing for women and young children and the testing of cooking salt to determine the extent of iodization. A specially trained health investigator attached to each interviewing team conducted height and weight measurements and anaemia testing.

7.1 Women's Food Consumption

The consumption of a wide variety of nutritious foods is important for good health. Adequate amounts of protein, fat, carbohydrates, vitamins, and minerals are required for a well-balanced diet. Meat, fish, eggs, and milk, as well as pulses and nuts, are rich in protein. Green, leafy vegetables are a rich source of iron, folic acid, vitamin C, carotene, riboflavin, and calcium. Many fruits are also good sources of vitamin C. Bananas are rich in carbohydrates. Papayas, mangoes, and other yellow fruits contain carotene, which is converted to vitamin A. Vitamin A is also present in milk and milk products, as well as egg yolks (Gopalan et al., 1996).

NFHS-2 asked ever-married women how often they consume various types of food (daily, weekly, occasionally, or never). The diet of women in Kerala is rich in a variety of foods, with chicken, meat or fish being consumed most often (Table 7.1). Three in five (62 percent) women consume chicken, meat, or fish on a daily basis and 83 percent consume these items at least once a week. In addition, vegetables, other than green, leafy vegetables, are an important part of the diet of women: 54 percent of women consume such vegetables every day and 91 percent consume them at least once a week. Pulses and beans are also frequently consumed by women with 70 percent of women consuming pulses and beans at least once a week. Fruits and green, leafy vegetables are less frequently consumed, although a majority of women (57 percent and 55 percent, respectively) do consume these foods at least once a week. Milk or curd is a

Table 7.1 Women's food consumption

Percent distribution of ever-married women by frequency of consumption of specific foods, Kerala, 1999

Type of food	Frequency of consumption				Total percent
	Daily	Weekly	Occasionally	Never	
Milk or curd	31.5	13.8	36.9	17.7	100.0
Pulses or beans	20.2	49.6	26.9	3.3	100.0
Green, leafy vegetables	8.4	46.4	43.1	2.1	100.0
Other vegetables	53.9	37.0	9.0	0.1	100.0
Fruits	17.9	38.6	41.8	1.7	100.0
Eggs	5.7	21.5	56.6	16.1	100.0
Chicken, meat, or fish	61.6	21.2	13.5	3.6	100.0

Table 7.2 Women's food consumption by background characteristics

Percentage of ever-married women consuming specific foods at least once a week by selected background characteristics, Kerala, 1999

Background characteristic	Type of food							Number of women
	Milk or curd	Pulses or beans	Green, leafy vegetables	Other vegetables	Fruits	Eggs	Chicken, meat, or fish	
Age								
15–24	45.6	70.6	58.9	90.8	59.5	34.6	84.1	459
25–34	46.8	72.3	54.2	92.2	58.7	27.5	85.2	1,080
35–49	44.1	67.6	53.8	89.9	53.8	24.6	80.5	1,346
Residence								
Urban	49.2	75.9	51.5	91.4	65.1	30.9	78.8	667
Rural	44.2	68.0	55.8	90.7	53.9	26.2	84.0	2,217
Education								
Illiterate	26.3	62.6	44.3	86.2	35.9	17.2	82.0	362
Literate, < middle school complete	34.6	67.0	53.1	88.6	46.2	23.3	86.0	871
Middle school complete	41.5	70.2	52.0	90.0	53.7	24.6	85.6	493
High school complete and above	61.0	74.0	60.5	94.4	71.9	34.4	79.5	1,158
Religion								
Hindu	48.0	73.7	56.9	93.2	56.8	23.5	74.7	1,478
Muslim	37.7	67.4	53.5	87.3	52.7	28.5	92.6	941
Christian	52.0	62.4	50.7	90.8	63.2	36.7	89.0	462
Caste/tribe								
Scheduled caste	33.5	70.2	49.5	91.7	44.4	26.1	74.2	252
Scheduled tribe	(26.7)	(55.2)	(47.8)	(82.6)	(22.2)	(16.2)	(71.3)	32
Other backward class	40.9	74.0	55.8	91.4	54.8	27.1	85.1	1,244
Other	52.1	66.3	55.0	90.4	61.2	27.9	82.7	1,356
Standard of living index								
Low	23.0	59.7	43.9	85.4	31.3	14.9	80.5	448
Medium	41.0	69.4	55.1	90.8	53.4	25.6	84.1	1,590
High	65.4	75.9	59.9	94.0	75.7	36.9	81.7	846
Total	45.3	69.8	54.8	90.9	56.5	27.3	82.8	2,884

Note: Total includes 2 women belonging to other religions, who are not shown separately.
( ) Based on 25–49 unweighted cases

common part of the diet for a minority of women. Only 45 percent consume milk or curd at least once a week and 32 percent consume milk or curd everyday. Notably, almost one out of five (18 percent) women in Kerala never consume milk or curd. Eggs are consumed only occasionally by a majority (57 percent) of women and 16 percent of women never consume eggs.

Table 7.2 shows that there are substantial differentials in food consumption patterns by selected background characteristics. While age does not play an important role in women's consumption patterns most foods are less likely to be consumed by the oldest women (age 35–49). Eggs and green leafy vegetables, in particular, are more likely to be consumed by the youngest women than by older women. Most foods are consumed by similar proportions of urban and rural women, however, women in urban areas are somewhat more likely than women in rural areas to include milk and curd, pulses or beans, fruits, and eggs in their diet, whereas women in rural areas are more likely than women in urban areas to include chicken, meat, or fish

and green leafy vegetables in their diet. Illiterate women have poorer and less varied diets than literate women, and their diet is particularly deficient in such nutritious foods as eggs, milk or curd, and fruits. The dietary patterns of women become more varied with increases in the level of education. Women who have completed at least high school are the most likely to consume all kinds of food except chicken, meat, or fish. Pulses or beans and vegetables are consumed more frequently and chicken, meat, or fish and eggs are consumed less frequently by Hindu women than by women of other religions. Muslim women are more likely than either Hindu or Christian women to consume chicken, meat, or fish and Christian women are more likely than Hindu or Muslim women to consume milk or curd, fruits, and eggs. Women from the scheduled castes and scheduled tribes have a relatively poor diet that is particularly deficient in milk or curd, fruits, green leafy vegetables, and chicken, meat, or fish. As expected, poverty has a strong negative effect on the consumption of nutritious types of food. Women in households with a low standard of living are much less likely than other women to eat all types of food on a regular basis.

7.2 Nutritional Status of Women

In NFHS-2, ever-married women age 15–49 were weighed using a solar-powered digital scale with an accuracy of ±100 grams. Their height was measured using an adjustable wooden measuring board specially designed to provide accurate measurements (to the nearest 0.1 cm) of women and children in a field situation. The weight and height data were used to calculate several indicators of women's nutritional status, which are shown in Table 7.3. The height of an adult is an outcome of several factors including nutrition during childhood and adolescence. A woman's height can be used to identify women at risk of having a difficult delivery, since small stature is often related to small pelvic size. The risk of having a baby with a low birth weight is also higher for mothers who are short.

The cutoff point for height, below which a woman can be identified as nutritionally at risk, varies among populations, but it is usually considered to be in the range of 140–150 centimetres (cm). NFHS-2 shows that the mean height for women in Kerala is 153 cm (about 2 cm greater than the mean height for women in India as a whole). The mean height varies only slightly (between 151 cm and 154 cm) for women in different population groups, as shown in Table 7.3. Specifically, women belonging to the scheduled tribes and scheduled castes, women who are not currently married, and illiterate women tend, on average, to be shorter (151 cm), whereas women living in households with a high standard of living, Christian women, women age 15–29, and women who have completed at least high school tend, on average, to be taller (154 cm). Overall, 9 percent of women in Kerala are under 145 cm in height, compared with 13 percent of women in India as a whole. The likelihood of being less than 145 cm tall is particularly high for scheduled-caste women (20 percent), followed by women who are not currently married (15 percent), and women who work on a family farm or family business (14 percent).

Table 7.3 also shows two measures of an index that relate a woman's weight to her height. These indices exclude women who were pregnant at the time of the survey or women who gave birth during the two months preceding the survey. The body mass index (BMI) can be used to assess both thinness and obesity. The BMI is defined as the weight in kilograms divided by the height in metres squared (kg/m^2). The mean BMI for women in Kerala is 22 (varying within a narrow range of 20–24 for all the groups shown in the table). Chronic energy deficiency is usually indicated by a BMI of less than 18.5. About one-fifth (19 percent) of women in Kerala

Table 7.3 Nutritional status of women

Among ever-married women, mean height, percentage with height below 145 cm, mean body mass index (BMI), and percentage with BMI below 18.5 kg/m^2 by selected background characteristics, Kerala, 1999

Background characteristic	Height			Weight-for-height[1]		
	Mean height (cm)	Percentage below 145 cm	Number of women for height	Mean body mass index (BMI)	Percentage with BMI below 18.5 kg/m^2	Number of women for BMI
Age						
15–19	153.8	5.4	78	20.8	13.5	79
20–24	153.7	4.5	360	20.7	26.8	316
25–29	153.6	6.8	530	21.3	24.6	487
30–34	153.1	7.0	504	22.0	19.5	484
35–49	151.7	11.7	1,293	22.7	14.5	1,286
Marital status						
Currently married	152.8	8.3	2,573	22.1	18.1	2,461
Not currently married	150.9	14.9	193	21.4	26.9	192
Residence						
Urban	152.6	9.1	639	22.6	14.7	618
Rural	152.7	8.7	2,126	21.9	19.9	2,035
Education						
Illiterate	151.1	12.5	342	21.0	26.6	339
Literate, < middle school complete	151.6	12.1	833	22.0	19.6	812
Middle school complete	152.8	8.0	474	22.2	17.2	456
High school complete and above	153.8	5.5	1,116	22.3	16.1	1,045
Religion						
Hindu	152.0	10.6	1,437	21.6	21.6	1,386
Muslim	153.1	6.1	882	22.4	17.1	836
Christian	153.9	8.1	445	22.8	12.4	429
Caste/tribe						
Scheduled caste	150.9	19.7	240	20.9	27.6	230
Scheduled tribe	(150.5)	(11.0)	28	(20.5)	(29.4)	26
Other backward class	152.3	8.9	1,203	21.9	19.8	1,160
Other	153.3	6.6	1,295	22.4	15.8	1,236
Work status						
Working in family farm/business	152.1	14.2	66	22.6	19.0	65
Employed by someone else	152.3	10.6	466	21.2	24.5	452
Self-employed	152.6	9.4	159	21.6	18.0	156
Not worked in past 12 months	152.7	8.2	2,075	22.2	17.4	1,980
Standard of living index						
Low	151.5	13.2	431	20.2	33.1	412
Medium	152.2	9.1	1,524	21.7	19.2	1,465
High	154.1	5.8	810	23.6	10.1	776
Total	152.6	8.8	2,765	22.0	18.7	2,653

Note: Total includes 2 women belonging to other religions, who are not shown separately.
( ) Based on 25–49 unweighted cases
[1]Excludes women who are pregnant and women with a birth in the preceding two months. The body mass index (BMI) is the ratio of the weight in kilograms to the square of the height in metres (kg/m^2).

have a BMI below 18.5, indicating a high prevalence of nutritional deficiency. Nutritional problems, as indicated by the BMI, are particularly serious for women who belong to households with a low standard of living: one out of three women from these households has a BMI below 18.5. In addition, one-quarter or more of scheduled-caste and scheduled-tribe women, ever-married women who are not currently married, illiterate women, women in their twenties, and

women employed by someone else have a BMI below 18.5. Notably, household standard of living is most strongly related to chronic energy deficiency. Women from households with a low standard of living are more than thrice as likely to have a low BMI as women from households with a high standard of living.

7.3 Anaemia Among Women

Anaemia is characterized by a low level of haemoglobin in the blood. Haemoglobin is necessary for transporting oxygen from the lungs to other tissues and organs of the body. Anaemia usually results from a nutritional deficiency of iron, folate, vitamin B_{12}, or some other nutrients. This type of anaemia is commonly referred to as iron-deficiency anaemia. Iron deficiency is the most widespread form of malnutrition in the world, affecting more than two billion people (Stolzfus and Dreyfuss, 1998). In India, anaemia affects an estimated 50 percent of the population (Seshadri, 1998).

Anaemia may have detrimental effects on the health of women and children and may become an underlying cause of maternal mortality and perinatal mortality. Anaemia results in an increased risk of premature delivery and low birth weight (Seshadri, 1997). Early detection of anaemia can help to prevent complications related to pregnancy and delivery as well as child-development problems. Information on the prevalence of anaemia can be useful for the development of health-intervention programmes designed to prevent anaemia, such as iron-fortification programmes.

In India, under the Government's Reproductive and Child Health Programme, iron and folic acid tablets are provided to pregnant women in order to prevent anaemia during pregnancy. Because anaemia is such a serious health problem in India, NFHS-2 undertook direct measurement of the haemoglobin levels of all ever-married women age 15–49 years and their children under three years of age. Measurements were taken in the field using the HemoCue system[1]. This system uses a single drop of blood from a finger prick (or a heel prick in the case of infants under six months old), which is drawn into a cuvette and then inserted into a portable, battery-operated instrument[2]. In less than one minute, the haemoglobin concentration is indicated on a digital read-out.

Before the anaemia testing was undertaken in a household, the health investigator read a detailed informed consent statement to the respondent, informing her about anaemia, describing the procedure to be followed for the test, and emphasizing the voluntary nature of the test. She was then asked whether or not she would consent to have the test done for herself and her young children, if any. The health investigator then signed the questionnaire at the bottom of the statement to indicate that it had been read to the respondent and recorded her agreement or lack of agreement to the testing. If the test was conducted, at the end of the test the respondent was given a written record of the results for herself and each of her young children. In addition, the

[1]The HemoCue instrument has been used extensively throughout the world for estimating the concentration of haemoglobin in capillary blood in field situations. The HemoCue has been found to give accurate results on venous blood samples, comparable to estimates from more sophisticated laboratory instruments (Von Schenk et al., 1986; McNulty et al., 1995; Krenzicheck and Tanseco, 1996). A recent small–scale study in India (Prakash et al., 1999), however, found that the HemoCue provided slightly higher estimates of haemoglobin than the standard blood cell counter (BCC) method.

[2]Because the first 2–3 drops of blood are wiped away to be sure that the sample used for analysis consists of fresh capillary blood, it is actually the third or fourth drop of blood that is drawn into the cuvette.

health investigator described to her the meaning of the results and advised her if medical treatment was necessary. In cases of severe anaemia, the respondent was read an additional statement asking whether or not she would give her permission for the survey organization to inform a local health official about the problem. For each Primary Sampling Unit, a local health official was given a list of severely anaemic women (and children) who had consented to the referral.

Table 7.4 and Figure 7.1 show anaemia levels for ever-married women age 15–49. The table and figure distinguish three levels of severity of anaemia: mild anaemia (10.0–10.9 grams/decilitre for pregnant women and 10.0–11.9 g/dl for non-pregnant women), moderate anaemia (7.0–9.9 g/dl), and severe anaemia (less than 7.0 g/dl). Appropriate adjustments in these cutoff points are needed for women living at altitudes above 1,000 metres and women who smoke, since both of these groups require more haemoglobin in their blood (Centers for Disease Control and Prevention, 1998). In Kerala, the haemoglobin levels were tested for 94 percent of women (see Table B.3 in Appendix B), compared with 88 percent of women in India as a whole.

Overall, 23 percent of women have some degree of anaemia[3]. Twenty percent of women are mildly anaemic, 3 percent are moderately anaemic, and one percent are severely anaemic. The prevalence of anaemia varies little by most background characteristics. The prevalence of anaemia does not vary consistently with age ranging from 26 percent for women age 15–19 and 30–34, to 19 percent for women age 20–24. Prevalence of anaemia is slightly higher for rural than urban women and is higher for illiterate women than for women in other educational categories. More than one-quarter of Hindu women are anaemic (26 percent), compared with less than one-fifth of Muslim or Christian women (both 19 percent). Women belonging to the scheduled tribes and scheduled castes are more likely than women belonging to the other backward classes or other women to be anaemic. Anaemia decreases steadily with increases in the standard of living index, ranging from 28 percent among women from households with a low standard of living to 19 percent among women from households with a high standard of living.

Since anaemia is often considered to be particularly problematic for pregnant women, it is noteworthy that pregnant women have slightly lower than average levels of anaemia in Kerala. The provision of iron and folic acid supplements to pregnant women has undoubtedly reduced the overall prevalence of anaemia in pregnant women to some extent (95 percent of pregnant women received IFA tablets or syrup during pregnancy for births in the three years preceding the survey—see Table 8.5). Notably, however, the highest levels of moderate anaemia are experienced by pregnant women (9 percent).

Short women (height less than 145 cm) and women with a low body mass index (less than 18.5) have a higher prevalence of anaemia than most other women. The diet of women also plays a role in the likelihood that they have anaemia. Consumption of iron-rich foods can reduce the prevalence or severity of anaemia, and the absorption of iron from the diet can be enhanced (for example, by vitamin C) or inhibited (for example, by tea or coffee) if particular items are consumed around the time that a meal is eaten. In Kerala, differentials in anaemia by fruit and vegetable consumption are small. Nonetheless, women who eat fruit and green, leafy vegetables

[3]Since none of the PSUs in Kerala is at an altitude above 1,000 metres and the proportion of women who smoke is negligible (Table 2.12), the adjustment factor does not make any difference in the prevalence rates of anaemia.

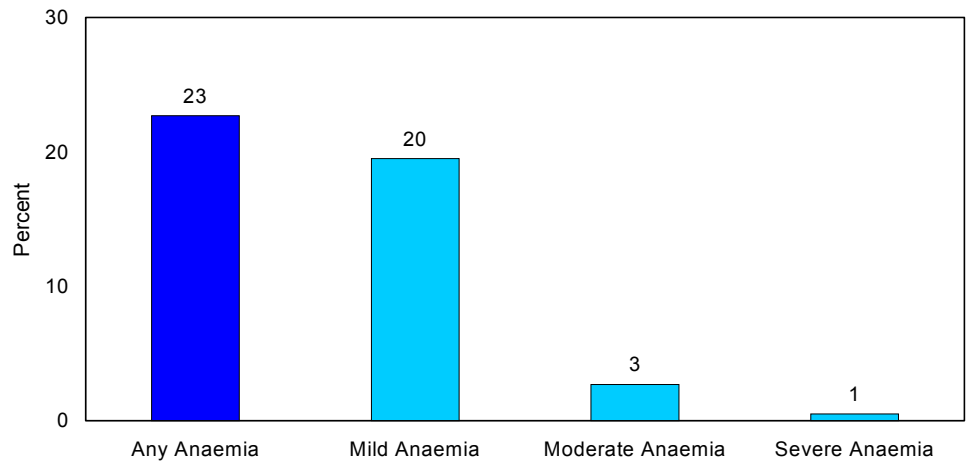
Table 7.4 Anaemia among women

Percentage of ever-married women classified as having iron-deficiency anaemia by degree of anaemia, according to selected background characteristics, Kerala, 1999

Background characteristic	Percentage of women with any anaemia	Percentage of women with:			Number of women
		Mild anaemia	Moderate anaemia	Severe anaemia	
Age					
15–19	26.4	24.0	2.4	0.0	76
20–24	18.5	15.4	2.4	0.7	353
25–29	24.3	21.1	2.8	0.4	520
30–34	26.1	23.2	2.1	0.8	500
35–49	21.7	18.3	3.0	0.4	1,271
Marital status					
Currently married	22.5	19.4	2.6	0.5	2,536
Not currently married	26.0	21.1	4.4	0.5	185
Residence					
Urban	20.4	16.9	3.0	0.5	629
Rural	23.4	20.3	2.6	0.5	2,092
Education					
Illiterate	25.7	18.8	5.6	1.2	338
Literate, < middle school complete	22.4	19.3	2.8	0.3	815
Middle school complete	20.6	18.6	1.8	0.3	468
High school complete and above	22.9	20.2	2.1	0.6	1,101
Religion					
Hindu	25.9	21.7	3.6	0.6	1,429
Muslim	19.4	17.5	1.7	0.3	851
Christian	18.9	16.3	2.0	0.7	439
Caste/tribe					
Scheduled caste	26.8	20.1	5.3	1.3	238
Scheduled tribe	(34.1)	(27.5)	(2.8)	(3.8)	27
Other backward class	22.3	19.7	2.4	0.2	1,187
Other	22.1	19.0	2.5	0.6	1,268
Work status					
Working in family farm/business	20.2	20.2	0.0	0.0	66
Employed by someone else	28.1	22.0	4.7	1.4	460
Self-employed	27.2	25.7	1.5	0.0	154
Not worked in past 12 months	21.3	18.4	2.4	0.4	2,042
Standard of living Index					
Low	28.1	22.9	4.3	1.0	430
Medium	23.0	20.0	2.6	0.5	1,499
High	19.2	16.7	2.2	0.3	792
Pregnancy/breastfeeding status					
Pregnant	20.3	11.6	8.7	0.0	140
Breastfeeding (not pregnant)	21.3	20.0	1.1	0.2	455
Not pregnant/not breastfeeding	23.2	19.9	2.7	0.6	2,126
Height					
< 145 cm	29.6	24.4	3.9	1.2	242
≥ 145 cm	22.0	19.0	2.6	0.4	2,476
Body mass index					
< 18.5 kg/m^2	29.0	23.5	4.0	1.4	504
≥ 18.5 kg/m^2	21.3	18.5	2.4	0.3	2,210
Fruit and vegetable consumption[1]					
Fruits and vegetables	20.6	17.9	2.4	0.4	978
Fruits only	22.8	20.4	2.2	0.2	549
Vegetables only	23.8	20.5	2.4	0.9	505
Neither	24.9	20.3	3.9	0.7	688
Total	22.7	19.5	2.7	0.5	2,721

Note: The haemoglobin levels are adjusted for smoking when calculating the degree of anaemia. No adjustment for altitude of the enumeration area was made because all of the Primary Sampling Units in Kerala are below 1,000 metres. Total includes 2 women belonging to other religions and 3 and 6 women with missing information on height and body mass index, respectively, who are not shown separately.
( ) Based on 25–49 unweighted cases
[1]Based on consumption at least weekly. Vegetables include only green, leafy vegetables.

Figure 7.1
Anaemia Among Women



NFHS-2, Kerala, 1999

at least weekly are slightly less likely (20 percent) to be anaemic than women who eat neither fruit nor vegetables regularly (25 percent).

7.4 Infant Feeding Practices

Infant feeding practices have significant effects on both mothers and children. Mothers are affected through the influence of breastfeeding on the period of postpartum infertility, and hence on fertility levels and the length of birth intervals. These effects vary by both the duration and intensity of breastfeeding. Proper infant feeding, starting from the time of birth, is important for the physical and mental development of the child. Breastfeeding improves the nutritional status of young children and reduces morbidity and mortality. Breast milk not only provides important nutrients but also protects the child against infection. The timing and type of supplementary foods introduced in an infant's diet also have significant effects on the child's nutritional status.

The Baby Friendly Hospitals Initiative, launched by the United Nations Children's Fund (UNICEF) recommends initiation of breastfeeding immediately after childbirth. The World Health Organization (WHO) and UNICEF recommend that infants should be given only breast milk for about the first six months of their life. Under the Reproductive and Child Health Programme, the Government of India recommends that infants should be exclusively breastfed from birth to age four months (Ministry of Health and Family Welfare, n.d.). Most babies do not require any other foods or liquids during this period. By age seven months, adequate and appropriate complementary foods should be added to the infant's diet in order to provide sufficient nutrients for optimal growth. It is recommended that breastfeeding should continue, along with complementary foods, through the second year of life or beyond. It is further recommended that a feeding bottle with a nipple should not be used at any age, for reasons related mainly to sanitation and the prevention of infections.

WHO has suggested several indicators of breastfeeding practices to guide countries in gathering information for measuring and evaluating infant feeding practices. These indicators

include the ever breastfed rate, the exclusive breastfeeding rate, the timely complementary feeding rate, the continued breastfeeding rate, and the bottle feeding rate. The *exclusive breastfeeding rate* is defined as the proportion of infants under age four months who receive only breast milk.[4] The *timely complementary feeding rate* is the proportion of infants age 6–9 months who receive both breast milk and solid or semi-solid food. The *continued breastfeeding rate through one year of age* is the proportion of children age 12–15 months who are still breastfed. The *continued breastfeeding rate until two years of age* is the proportion of children age 20–23 months who are still breastfed. The *bottle feeding rate* is the proportion of infants who are fed using a bottle with a nipple.

In NFHS-2, data on breastfeeding and complementary feeding were obtained from a series of questions in the Woman's Questionnaire. These questions pertain to births since January, 1996, but the tables are restricted to children born in the three years preceding the survey. For any given woman, information was obtained for a maximum of two births.

Initiation of breastfeeding immediately after childbirth is important because it benefits both the mother and the infant. As soon as the infant starts suckling at the breast, the hormone oxytocin is released, resulting in uterine contractions that facilitate expulsion of the placenta and reduce the risk of postpartum haemorrhage. It is also recommended that the first breast milk (colostrum) should be given to the child rather than squeezed from the breast and discarded because it contains colostrum, which provides natural immunity to the child.

Table 7.5 shows the percentage of children born during the three years before the survey who started breastfeeding within one hour and one day of birth. It also gives the percentage of children whose mothers squeezed the first milk from the breast before breastfeeding, which is not recommended. Although breastfeeding is nearly universal in Kerala, only 43 percent of children begin breastfeeding within one hour of birth. Most children (92 percent) begin breastfeeding within one day of birth, however.

Differentials in the early initiation of breastfeeding and in squeezing the first milk from the breast are also shown in Table 7.5. Initiation of breastfeeding does not vary consistently with mother's education. Children born to Muslim women, women who have completed only middle school, and scheduled-caste women are more likely to initiate breastfeeding within one hour of birth than most other children, whereas children born to Christian women and women who live in households with a high standard of living are less likely to initiate breastfeeding within one hour of birth than most other children. The circumstances surrounding delivery of the baby can have an important effect on the early initiation of breastfeeding. Children born in public health facilities were much more likely than children born at home or in private health facilities to start breastfeeding within one hour of birth.

The custom of squeezing the first milk from the breast before breastfeeding a child is practised by a majority of women in Kerala. Contrary to recommendations regarding infant feeding, mothers squeezed the first milk from the breast before breastfeeding in the case of 53 percent of births. Scheduled-caste women, illiterate women, women who gave birth at home, and women who have not completed middle school are all much more likely than other women to squeeze the breast milk before breastfeeding.

[4]International recommendations have recently been revised to promote exclusive breastfeeding up to six months of age.

Table 7.5 Initiation of breastfeeding

Percentage of children born during the three years preceding the survey who started breastfeeding within one hour and within one day of birth and percentage whose mother squeezed the first milk from her breast before breastfeeding by selected background characteristics, Kerala, 1999

Background characteristic	Percentage started breastfeeding within one hour of birth	Percentage started breastfeeding within one day of birth[1]	Percentage whose mother squeezed first milk from breast	Number of children
Residence				
Urban	42.8	90.0	49.9	134
Rural	42.9	92.4	53.5	572
Mother's education				
Illiterate	(38.8)	(92.8)	(65.1)	29
Literate, < middle school complete	44.5	91.1	61.5	153
Middle school complete	47.6	90.3	48.3	144
High school complete and above	40.8	92.9	50.0	380
Religion				
Hindu	40.3	90.1	52.0	315
Muslim	48.9	93.9	56.5	285
Christian	34.6	92.3	45.3	106
Caste/tribe				
Scheduled caste	47.6	94.8	65.2	57
Other backward class	43.1	91.1	54.8	303
Other[2]	41.9	92.3	48.8	339
Mother's work status				
Employed by someone else	44.5	93.9	49.6	62
Not worked in past 12 months	43.3	91.6	54.0	612
Standard of living index				
Low	44.1	87.3	55.5	105
Medium	46.0	92.9	56.3	397
High	36.2	92.5	44.6	204
Place of delivery				
Public health facility	48.1	93.7	56.8	257
Private health facility	41.4	93.4	49.1	380
Own home	(32.4)	(90.5)	(64.5)	33
Total	42.9	92.0	52.8	707

Note: Table includes only the two most recent births during the three years preceding the survey, whether living or dead at the time of interview. Total includes 7 children belonging to other religions, 11 children whose mothers work in a family farm/business, 21 children whose mothers are self emlpoyed, 21, 9, and 1 children delivered in nongovernmental organization or trust hospitals/ clinics, parents' homes, and 'other' places, respectively, and 6 children with missing information on place of delivery, who are not shown separately.
( ) Based on 25–49 unweighted cases
[1]Includes children who started breastfeeding within one hour of birth
[2]Not belonging to a scheduled caste, a scheduled tribe, or an other backward class

Mothers of children born in the three years preceding the survey were asked if the child had been given plain water, other liquids, or solid or mushy (semi-solid) food at any time during the day or night before the interview. Results are shown in Tables 7.6 and 7.7. Children who received nothing but breast milk during that period are defined as being *exclusively breastfed.* The introduction of supplementary foods before four months of age may put infants at risk of malnutrition because other liquids and solid foods are nutritionally inferior to breast milk. Consumption of liquids and solid or mushy foods at an early age also increases children's exposure to pathogens and consequently puts them at a greater risk of getting diarrhoea. However, a recent study based on findings from NFHS-1 (Anandaiah and Choe, 2000) concluded that breastfeeding with supplements is more beneficial than exclusive breastfeeding

Table 7.6 Breastfeeding status by child's age

Percent distribution of children under age 3 years by breastfeeding status, according to child's age in months, Kerala, 1999

Age in months	Breastfeeding status				Total percent	Number of living children
			Breastfeeding and:			
	Not breastfeeding	Exclusively breastfeeding	Receiving plain water only	Receiving supplements		
< 2	(0.0)	(88.3)	(0.0)	(11.7)	100.0	32
2–3	(0.0)	(54.0)	(13.7)	(32.4)	100.0	43
4–5	(0.0)	(20.8)	(9.5)	(69.8)	100.0	35
6–7	(2.2)	(8.5)	(0.0)	(89.3)	100.0	47
8–9	(5.2)	(0.0)	(9.0)	(85.9)	100.0	36
10–11	(5.5)	(0.0)	(3.2)	(91.3)	100.0	35
12–13	(4.4)	(0.0)	(1.7)	(93.9)	100.0	43
14–15	(4.6)	(0.0)	(5.4)	(90.0)	100.0	34
16–17	(11.3)	(0.0)	(3.2)	(85.5)	100.0	35
18–19	27.8	0.0	0.0	72.2	100.0	52
20–21	(31.8)	(0.0)	(3.1)	(65.0)	100.0	36
22–23	(43.5)	(0.0)	(0.0)	(56.5)	100.0	43
24–25	38.1	2.1	0.0	59.8	100.0	51
26–27	(67.4)	(0.0)	(0.0)	(32.6)	100.0	47
28–29	(72.9)	(0.0)	(0.0)	(27.1)	100.0	39
30–31	(74.2)	(0.0)	(0.0)	(25.8)	100.0	28
32–33	(83.0)	(0.0)	(0.0)	(17.0)	100.0	29
34–35	(81.4)	(0.0)	(3.3)	(15.3)	100.0	33
< 4 months	0.0	68.5	7.9	23.6	100.0	75
4–6 months	0.0	20.4	6.0	73.6	100.0	55
7–9 months	4.6	0.0	5.2	90.2	100.0	63

Note: Table includes only surviving children from among the two most recent births in the three years preceding the survey. Breastfeeding status refers to the day or night before the interview. Children classified as 'breastfeeding and receiving plain water only' receive no supplements.
( ) Based on 25–49 unweighted cases

even for children at very young ages (less than four months). That report suggests that mothers who are not well nourished and who are in poor health themselves may not be able to provide adequate breast milk for their infants.

In Kerala, 69 percent of children under four months of age are exclusively breastfed (much higher than the national level of 55 percent), 8 percent receive breast milk plus water, and 24 percent receive supplements along with breast milk (Table 7.6). By age 4–6 months, however, only 20 percent of infants are exclusively breastfed. Children are not exclusively breastfed in Kerala beyond the age of 6 months. The proportion of children receiving supplements along with breast milk increases from 12 percent for children age less than 2 months to 94 percent for children age 12–13 months, and declines thereafter as children are weaned from the breast and their food consumption is no longer supplementing their consumption of breast milk. However, breastfeeding generally continues for a long period. Ninety-six percent of children are still being breastfed at 12–13 months of age, as are 62 percent of children age 24–25 months. For the majority of children in Kerala, breastfeeding usually stops at about 26–27 months of age, but 19 percent of children age 34–35 months are still breastfed.

Table 7.7 shows in more detail the types of foods consumed by children under age three years the day or night before the interview. Because of the small number of non-breastfeeding children, two-month age categories have been combined into broader age groups. Powdered milk

Table 7.7 Type of food received by children

Percentage of children under age 3 years who received specific types of food the day or night before the interview and percentage using a bottle with a nipple by current breastfeeding status and child's age in months, Kerala, 1999

Age in months	Type of food received						Using bottle with a nipple	Number of living children
	Powdered milk	Any other milk	Any other liquid	Green, leafy vegetables	Fruits	Any solid or mushy food[1]		
BREASTFEEDING CHILDREN								
< 2	(0.0)	(11.7)	(0.0)	(0.0)	(0.0)	(0.0)	(5.9)	32
2–3	(8.6)	(9.9)	(4.4)	(0.0)	(2.5)	(12.0)	(21.2)	43
4–5	(8.4)	(25.8)	(34.1)	(3.2)	(25.5)	(63.5)	(8.6)	35
6–7	(11.6)	(65.5)	(43.7)	(10.5)	(45.9)	(73.8)	(17.1)	46
8–9	(11.6)	(57.8)	(74.6)	(5.6)	(54.5)	(77.9)	(36.4)	34
10–11	(11.6)	(53.5)	(68.3)	(25.5)	(77.3)	(93.3)	(22.0)	33
12–13	(17.5)	(41.4)	(74.3)	(16.8)	(49.5)	(80.1)	(34.2)	42
14–15	(3.4)	(50.9)	(67.3)	(42.2)	(57.3)	(86.0)	(9.9)	32
16–17	(14.1)	(41.9)	(79.8)	(28.9)	(61.1)	(78.7)	(18.7)	31
18–23	7.5	64.1	71.4	32.5	74.4	89.1	17.5	87
24–29	9.3	58.6	72.4	29.5	54.5	87.2	8.2	57
30–35	*	*	*	*	*	*	*	18
< 4 months	5.0	10.7	2.5	0.0	1.5	6.9	14.7	75
4–5 months	8.4	25.8	34.1	3.2	25.5	63.5	8.6	35
6–9 months	11.6	62.2	56.9	8.4	49.6	75.6	25.4	81
NON-BREASTFEEDING CHILDREN								
< 23	30.1	78.4	82.9	39.2	80.5	94.3	38.6	57
24–29	14.1	67.6	81.8	38.3	66.5	87.8	26.7	79
30–35	8.6	72.6	76.4	50.8	77.0	94.0	12.4	71
ALL CHILDREN								
< 2	(0.0)	(11.7)	(0.0)	(0.0)	(0.0)	(0.0)	(5.9)	32
2–3	(8.6)	(9.9)	(4.4)	(0.0)	(2.5)	(12.0)	(21.2)	43
4–5	(8.4)	(25.8)	(34.1)	(3.2)	(25.5)	(63.5)	(8.6)	35
6–7	(11.3)	(66.2)	(44.9)	(10.3)	(47.1)	(74.4)	(18.9)	47
8–9	(16.2)	(56.9)	(73.7)	(7.5)	(56.8)	(79.1)	(39.7)	36
10–11	(16.4)	(52.8)	(66.8)	(24.1)	(78.6)	(93.6)	(26.3)	35
12–13	(16.7)	(44.0)	(75.4)	(16.1)	(50.0)	(80.9)	(34.5)	43
14–15	(5.6)	(53.2)	(66.5)	(40.3)	(57.0)	(86.6)	(11.7)	34
16–17	(14.8)	(48.5)	(82.1)	(34.0)	(62.5)	(78.1)	(27.9)	35
18–23	13.9	68.6	75.8	35.6	76.7	91.1	20.4	131
24–29	12.1	63.8	77.8	34.6	61.5	87.5	18.9	136
30–35	8.1	71.7	79.1	48.1	73.2	90.3	11.1	89
< 4 months	5.0	10.7	2.5	0.0	1.5	6.9	14.7	75
4–5 months	8.4	25.8	34.1	3.2	25.5	63.5	8.6	35
6–9 months	13.5	62.2	57.5	9.1	51.4	76.4	28.0	83

Note: Table includes only surviving children from among the two most recent births during the three years preceding the survey.
( ) Based on 25–49 unweighted cases
*Percentage not shown; based on fewer than 25 unweighted cases
[1]Includes green, leafy vegetables and fruits

is rarely given to young children at any age, but other milk (such as cow's or buffalo's milk) is given to young children more often. More than two-thirds of non-breastfeeding children in each age group were given these other types of milk the day or night before the interview. Among breastfeeding children, 11 percent age less than 4 months, 26 percent age 4–5 months, and 62 percent age 6–9 months received non-powdered milk in addition to breast milk. Children age 8 months or older are likely to receive other liquids, such as juice or tea, more often than milk. The consumption of green, leafy vegetables generally increases with age among all children, from 3 percent at age 4–5 months to 48 percent at age 30–35 months. Also, the consumption of fruits

increases from 26 percent for children age 4–5 months to 73 percent for children age 30–35 months.

From about six months of age, the introduction of complementary foods is critical for meeting the protein, energy, and micronutrient needs of children. However, in Kerala the introduction of complementary foods is delayed for about a quarter of breastfeeding children. Only 74 percent of breastfeeding children age 6–7 months were given solid or mushy foods the night before the interview. This proportion rises to 93 percent for children age 10–11 months. Overall, among all (breastfeeding and non-breastfeeding) children age 6–9 months, 74 percent received solid or mushy food along with breastmilk, as recommended. This proportion is more than twice the proportion for India as a whole (33 percent).

Bottle feeding has a direct effect on the mother's exposure to the risk of pregnancy because the period of amenorrhoea may be shortened when breastfeeding is reduced or replaced by bottle feeding. Because it is often difficult to sterilize the nipple properly, the use of bottles with nipples also exposes children to an increased risk of getting diarrhoea and other diseases. For children who are being breastfed in Kerala, the use of bottles with nipples is substantial in some age groups. Fifteen percent of breastfeeding children age less than 4 months and 25 percent of breastfeeding children age 6–9 months drank something from a bottle with a nipple the day or night before the interview (Table 7.7). The use of a bottle with a nipple is even more common for children who are not being breastfed.

Table 7.8 shows several statistics that describe the duration of breastfeeding. Estimates of both means and medians are based on the current proportions of children breastfeeding in each age group because information on current status is usually more accurate than information based on mother's recall. The median length of any breastfeeding in Kerala is slightly more than two years

Table 7.8 Median duration of breastfeeding

Median duration of breastfeeding among children under age 3 years by sex of child and residence, and mean duration of breastfeeding, Kerala, 1999

Background characteristic	Median duration (months)[1]			Number of children
	Any breastfeeding	Exclusive breastfeeding	Exclusive breastfeeding or breastfeeding plus water only	
Sex of child				
Male	25.4	2.8	3.2	362
Female	24.0	2.8	3.5	345
Residence				
Urban	(23.4)	(2.5)	(3.2)	134
Rural	24.8	2.8	3.4	572
Median duration	24.5	2.8	3.4	707
Mean duration (months)[1]	24.8	4.0	4.9	707
Prevalence/incidence mean	24.6	3.2	4.2	707

Note: Table includes only the two most recent births during the three years preceding the survey.
( ) Based on 25–49 unweighted cases
[1]Based on current status

(24.5 months). Supplementation begins relatively early, however. The median length of exclusive breastfeeding is 2.8 months and the median length of exclusive breastfeeding or breastfeeding plus water only is 3.4 months. The corresponding estimates of the mean durations of any breastfeeding, exclusive breastfeeding, and exclusive breastfeeding or breastfeeding plus only water are 24.8 months, 4.0 months, and 4.9 months, respectively.

An alternative measure of the duration of breastfeeding is the prevalence-incidence mean, which is calculated as the 'prevalence' of breastfeeding divided by its 'incidence'. In this case, prevalence is defined as the number of children whose mothers were breastfeeding at the time of the survey, and incidence is defined as the average number of births per month (averaged over a 36-month period to overcome problems of seasonality of births and possible reference-period errors). For each measure of breastfeeding, the prevalence-incidence mean is lower than the mean calculated in the conventional manner.

The median duration of breastfeeding is slightly shorter (by more than one month) for girls than for boys, a pattern generally observed in societies where son preference is strong (because the parents may stop breastfeeding a girl at a younger age to increase their chances of having another child earlier with the hope that the next child will be a boy). However, in Kerala, the somewhat shorter duration of breastfeeding for girls than for boys is unlikely to be related to son preference, since son preference is very weak in the state (see Table 4.17). Notably, the duration of exclusive breastfeeding varies only marginally by the sex of the child. The median length of breastfeeding is one month longer in rural areas than in urban areas. The majority of children living in rural areas are breastfed for more than two years. The median duration of exclusive breastfeeding is also slightly shorter in urban areas than in rural areas.

7.5 Nutritional Status of Children

Nutritional status is a major determinant of the health and well-being of children. Inadequate or unbalanced diets and chronic illness are associated with poor nutrition among children. To assess their nutritional status, measurements of weight and height/length were obtained for children born in the three years preceding the survey. Children were weighed and measured with the same types of scales and measuring boards used for women. Children under two years of age were measured lying down and older children were measured standing up. Data on weight and height/length were used to calculate the following three summary indices of nutritional status:

- weight-for-age
- height-for-age
- weight-for-height

The nutritional status of children calculated according to these three measures is compared with the nutritional status of an international reference population recommended by the World Health Organization (Dibley et al., 1987a; 1987b). The use of this reference population is based on the empirical finding that well-nourished children in all population groups for which data exist follow very similar growth patterns (Martorell and Habicht, 1986). A scientific report from the Nutrition Foundation of India (Agarwal et al., 1991) has concluded that the WHO standard is generally applicable to Indian children.

The three indices of nutritional status are expressed in standard deviation units (z-scores) from the median for the international reference population. Children who are more than two standard deviations below the reference median on any of the indices are considered to be *undernourished*, and children who fall more than three standard deviations below the reference median are considered to be *severely undernourished*.

Each of these indices provides somewhat different information about the nutritional status of children. Weight-for-age is a composite measure that takes into account both chronic and acute undernutrition. Children who are more than two standard deviations below the reference median on this index are considered to be *underweight*. The height-for-age index measures linear growth retardation. Children who are more than two standard deviations below the median of the reference population in terms of height-for-age are considered short for their age or *stunted*. The percentage in this category indicates the prevalence of chronic undernutrition, which often results from a failure to receive adequate nutrition over a long period of time or from chronic or recurrent diarrhoea. Height-for-age, therefore, does not vary appreciably by the season in which data are collected.

The weight-for-height index examines body mass in relation to body length. Children who are more than two standard deviations below the median of the reference population in terms of weight-for-height are considered too thin or *wasted*. The percentage in this category indicates the prevalence of acute undernutrition. Wasting is associated with a failure to receive adequate nutrition in the period immediately before the survey and may be the result of seasonal variations in food supply or recent episodes of illness.

The validity of these indices is determined by many factors, including the coverage of the population of children and the accuracy of the anthropometric measurements. The survey was not able to measure the height and weight of all eligible children, usually because the child was not at home at the time of the health investigator's visit or because the mother refused to allow the child to be weighed and measured. In Kerala, NFHS-2 did not measure height for 12 percent of children and weight for 8 percent of children under age three (see Table B.3 in Appendix B), which is less than the nonresponse rate at the national level (13 percent for both height and weight). Also excluded from the analysis are children whose month and year of birth were not known and those with grossly improbable height or weight measurements. In addition, two of the three indices (weight-for-age and height-for-age) are sensitive to misreporting of children's ages, including heaping on preferred digits.

Table 7.9 shows the percentage of children classified as undernourished by selected demographic characteristics. In Kerala, 27 percent of children under three years of age are underweight and 22 percent are stunted. Corresponding estimates at the national level are about twice as high at 47 and 46 percent, respectively. Eleven percent of children under three years of age are wasted in Kerala, compared with 16 percent in the country as a whole. The proportion of children who are severely undernourished in Kerala is relatively low, at 5 percent, according to weight-for-age, 7 percent according to height-for-age, and 1 percent according to weight-for-height.

There is only a marginal improvement in the nutritional status of children in Kerala in the six and a half year period between NFHS-1 and NFHS-2. Whereas, the proportion of children under three years of age who are underweight remained at the same level of 27 percent in NFHS-

Table 7.9 Nutritional status of children by demographic characteristics

Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to selected demographic characteristics, Kerala, 1999

Demographic characteristic	Weight-for-age		Height-for-age		Weight-for-height		Number of children
	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	
Age of child							
< 6 months	0.0	2.6	1.5	13.7	0.0	2.9	75
6–11 months	3.2	15.3	4.0	11.7	0.0	3.8	99
12–23 months	5.4	34.8	7.2	28.3	1.9	18.7	213
24–35 months	6.5	33.7	11.6	23.2	0.0	9.8	189
Sex of child							
Male	7.4	26.2	8.4	22.1	1.1	12.5	297
Female	1.8	27.6	6.1	21.6	0.3	9.7	279
Birth order							
1	4.4	23.6	5.7	22.1	0.9	8.5	228
2–3	4.0	29.4	8.1	20.7	0.7	12.7	311
Previous birth interval[2]							
First birth	4.4	24.7	6.0	22.7	0.8	8.9	231
< 24 months	10.4	36.0	18.8	34.2	0.0	8.8	60
24–47 months	4.6	28.5	5.4	18.7	0.7	13.5	161
48+ months	2.5	24.5	6.7	18.5	0.9	13.4	124
Total	4.7	26.9	7.3	21.9	0.7	11.1	576

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population. Total includes 25 and 12 children of birth orders 4–5 and 6 or more, respectively, who are not shown separately.
[1]Includes children who are below –3 SD from the International Reference Population median
[2]First-born twins (triplets, etc.) are counted as first births because they do not have a previous birth interval.

2 as in NFHS-1, there was a slight decrease in the proportions stunted (from 25 percent to 22 percent) and wasted (from 13 percent to 11 percent) between the two surveys. The proportions severely underweight, severely stunted, and severely wasted also declined marginally by about one percentage point each between NFHS-1 and NFHS-2.

The proportion of children who are undernourished increases steadily with the child's age through age 12–23 months. Thirty-five percent of children age 12–23 months are underweight, 28 percent are stunted, and 19 percent are wasted. Even during the first six months of life, when most babies are breastfed, 3–14 percent of children are undernourished, according to the three nutritional indices. At age 24–35 months, when most children have been weaned from breast milk, 12 percent are severely stunted and 7 percent are severely underweight.

Girls and boys are about equally likely to be underweight and stunted; however, not only are boys slightly more likely than girls to be wasted, but boys are much more likely than girls to be severely undernourished. Undernutrition as measured by underweight and wasting is higher among children of birth order 2–3 than among first-born children, although, stunting varies little by birth order. Children born after a short birth interval (<24 months) are much more likely than children born after longer birth intervals to be underweight and stunted but slightly less likely to be wasted.

Table 7.10 Nutritional status of children by background characteristics

Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to selected background characteristics, Kerala, 1999

Background characteristic	Weight-for-age		Height-for-age		Weight-for-height		Number of children
	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	
Residence							
Urban	2.9	22.4	7.1	18.5	0.7	10.9	110
Rural	5.1	28.0	7.4	22.7	0.7	11.2	466
Mother's education							
Literate, < middle school complete	4.4	30.5	9.4	25.0	0.0	18.3	121
Middle school complete	7.4	31.2	9.3	24.6	1.6	8.6	118
High school complete and above	3.4	23.6	6.1	19.3	0.3	9.5	312
Religion							
Hindu	5.1	29.6	6.0	20.7	0.7	13.0	265
Muslim	4.8	27.4	9.8	25.8	0.4	10.5	238
Christian	2.7	15.4	4.2	13.4	1.5	6.7	73
Caste/tribe							
Scheduled caste	(12.4)	(43.0)	(17.8)	(38.2)	(0.0)	(12.3)	41
Other backward class	5.2	30.6	9.0	23.4	0.7	12.5	257
Other[2]	2.3	20.1	4.4	17.7	0.4	9.2	270
Mother's work status							
Employed by someone else	(4.6)	(24.0)	(2.3)	(21.7)	(0.0)	(4.0)	47
Not worked in past 12 months	4.9	27.2	8.2	22.5	0.8	11.6	502
Mother's height							
< 145 cm	(3.3)	(44.3)	(9.1)	(35.0)	(3.3)	(16.6)	33
≥ 145 cm	4.8	25.8	7.2	21.1	0.6	10.8	543
Mother's body mass index							
< 18.5 kg/m^2	9.0	42.9	10.9	26.8	0.8	20.2	137
≥ 18.5 kg/m^2	3.3	21.9	6.2	20.3	0.7	8.3	439
Standard of living index							
Low	11.8	35.8	9.7	27.8	2.8	16.2	80
Medium	4.4	28.8	7.6	24.4	0.2	11.2	322
High	1.9	19.2	5.7	14.4	0.6	8.8	174
Total	4.7	26.9	7.3	21.9	0.7	11.1	576

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population. Total includes 24 children whose mothers are illiterate, 7 children belonging to the scheduled tribes, 9 children whose mothers are working in a family farm/business, and 18 children whose mothers are self employed, who are not shown separately.

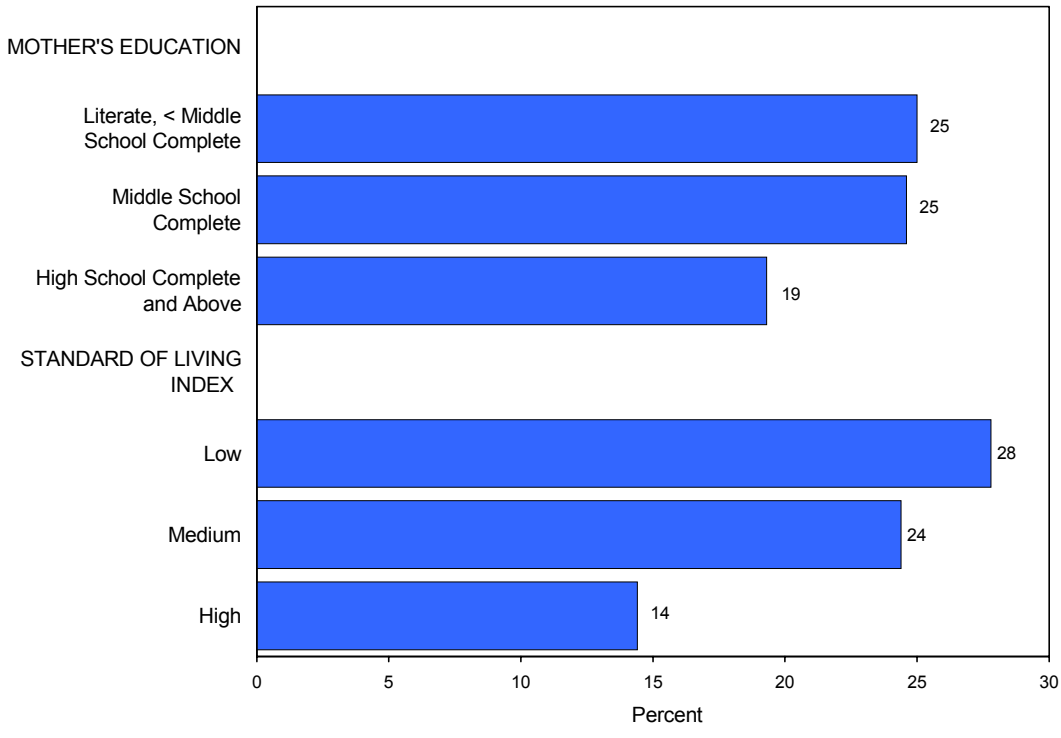
( ) Based on 25–49 unweighted cases

[1]Includes children who are below –3 SD from the International Reference Population median

[2]Not belonging to a scheduled caste, a scheduled tribe, or an other backward class

Table 7.10 shows the nutritional status of children by selected background characteristics. Undernutrition is, in general, higher in rural areas than in urban areas. Even in urban areas, however, 22 percent of children are underweight and 19 percent are stunted. Children whose mothers have completed at least high school are less likely to be underweight and stunted than children whose mothers have completed only a lower level of education (see Figure 7.2). The proportion of children wasted is about the same for mothers who have completed middle school only and at least high school (9–10 percent), but is almost twice as high for children of mothers who have not completed middle school (18 percent). Christian children are much less likely to be

Figure 7.2
Stunting Among Children Under Three Years by Mother's Education and SLI



undernourished according to all the three measures of nutritional status than children in most other population groups. Muslim children are more likely than Hindu children to be stunted, but they are marginally less likely to be underweight and wasted. Children belonging to the scheduled castes have much higher levels of undernutrition than children not belonging to the scheduled castes and other backward classes. Undernutrition, particularly wasting, is relatively high for children whose mothers have not worked in the past 12 months.

The nutritional status of children is strongly related to nutritional status of the mother. Undernutrition is more common among children of mothers whose height is less than 145 centimetres or whose body mass index is below 18.5 than among children of taller mothers and mothers who have a higher BMI. All three measures of undernutrition are strongly related to the household's standard of living. Children from households with a low standard of living are nearly twice as likely to be undernourished as children from households with a high standard of living.

7.6 Anaemia Among Children

Anaemia is a serious concern for young children because it can result in impaired cognitive performance, behavioural, and motor development, coordination, language development, and scholastic achievement, as well as increased morbidity from infectious diseases (Seshadri, 1997). One of the most vulnerable groups is children age 6–24 months (Stoltzfus and Dreyfuss, 1998).

Table 7.11 Anaemia among children

Percentage of children age 6–35 months classified as having iron-deficiency anaemia by selected background characteristics, Kerala, 1999

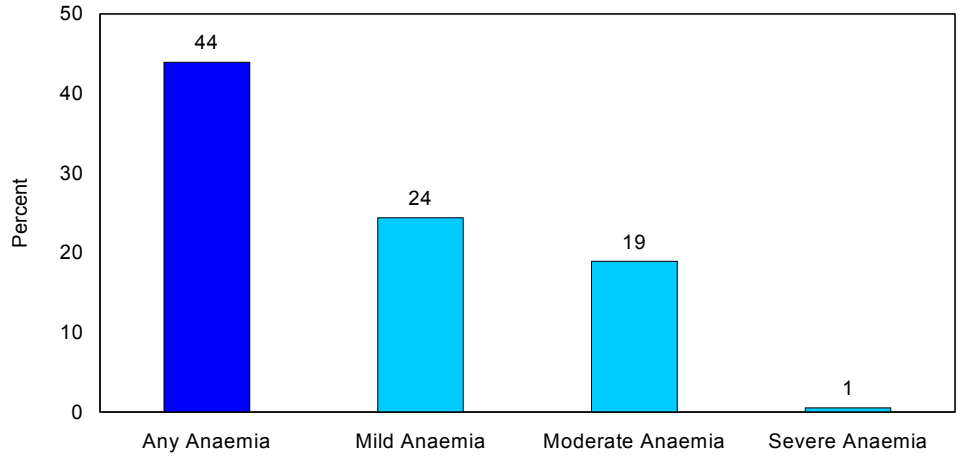
Background characteristic	Percentage of children with any anaemia	Percentage of children with: Mild anaemia	Moderate anaemia	Severe anaemia	Number of children
Age of child					
6–11 months	60.3	35.4	24.9	0.0	104
12–23 months	43.3	23.7	19.2	0.5	217
24–35 months	35.9	19.4	15.5	0.9	196
Sex of child					
Male	42.3	22.1	19.2	1.0	275
Female	45.7	27.1	18.6	0.0	242
Birth order					
1	36.4	18.4	17.4	0.5	198
2–3	48.8	27.5	20.6	0.7	281
4–5	(45.5)	(25.9)	(19.6)	(0.0)	28
Residence					
Urban	46.8	27.7	18.4	0.7	104
Rural	43.2	23.6	19.1	0.5	413
Mother's education					
Illiterate	(32.9)	(21.7)	(11.2)	(0.0)	26
Literate, < middle school complete	46.0	28.3	17.0	0.7	112
Middle school complete	40.5	22.7	17.8	0.0	105
High school complete and above	45.4	23.8	20.9	0.7	274
Religion					
Hindu	44.4	21.6	22.4	0.4	231
Muslim	41.8	26.3	14.7	0.8	220
Christian	48.9	28.2	20.7	0.0	66
Caste/tribe					
Scheduled caste	(36.1)	(17.5)	(18.6)	(0.0)	37
Other backward class	38.6	24.3	13.9	0.4	234
Other[1]	49.2	25.9	22.5	0.8	240
Mother's work status					
Employed by someone else	(25.0)	(3.0)	(22.1)	(0.0)	39
Not worked in past 12 months	45.7	26.5	18.6	0.6	450
Standard of living index					
Low	42.1	20.7	21.4	0.0	74
Medium	44.7	26.6	17.1	1.0	287
High	43.3	22.3	21.0	0.0	156
Mother's anaemia status					
Not anaemic	41.0	24.0	16.3	0.7	396
Mildly anaemic	54.9	28.0	26.9	0.0	112
Total	43.9	24.4	18.9	0.5	517

Note: Haemoglobin levels are not adjusted for altitude when calculating the degree of anaemia among children because all of the Primary Sampling Units in Kerala are at an altitude below 1,000 metres. Total includes 11 children of birth order 6 or more, 7 children belonging to the scheduled tribes, 10 children whose mothers are working in a family farm/business, 18 children whose mothers are self employed, 8 children whose mothers have a moderate anaemia, and one child whose mother has severe anaemia, who are not shown separately.

( ) Based on 25–49 unweighted cases

[1]Not belonging to a scheduled caste, a scheduled tribe, or an other backward class

Figure 7.3
Anaemia Among Children



NFHS-2, Kerala, 1999

In Kerala, haemoglobin levels were tested for 88 percent of children (see Table B.3 in Appendix B). Table 7.11 and Figure 7.3 show anaemia levels for children age 6–35 months. Overall, 44 percent of these children have some level of anaemia, including 24 percent who are mildly anaemic (10.0–10.9 g/dl), 19 percent who are moderately anaemic (7.0–9.9 g/dl), and about 1 percent who are severely anaemic (less than 7.0 g/dl). Notably, a much larger proportion of children than women are anaemic, and the difference is particularly pronounced in the rates of moderate anaemia.

At least 25 percent of children in every population group are anaemic in Kerala. The prevalence of anaemia is particularly high, at 60 percent, for children age 6–11 months (an age at which children should be given solid and mushy food) but declines to 36 percent for children age 24–35 months. The prevalence of anaemia is also relatively high, at 49 percent, among children who do not belong to a scheduled caste or other backward class, Christian children, and children at birth order 2 or 3. The prevalence of anaemia is lower among children whose mothers are employed by someone else and mothers who are illiterate than among all other children. As expected, the prevalence of anaemia among children is strongly associated with the anaemia status of the mother: 55 percent of children whose mothers are mildly anaemic are themselves anaemic, compared with 41 percent of children whose mothers are not anaemic.

7.7 Iodization of Salt

Iodine is an important micronutrient. A lack of iodine in the diet can lead to Iodine Deficiency Disorders (IDD), which, according to the World Health Organization, can cause miscarriages, brain disorders, cretinism, and retarded psychomotor development. Iodine deficiency is the single most important and preventable cause of mental retardation worldwide.

It has been estimated that 200 million people in India are exposed to the risk of iodine deficiency and 70 million suffer from goitre and other IDDs (IDD & Nutrition Cell, 1998). In addition, about one-fifth of pregnant women are at considerable risk of giving birth to children

who will not reach their optimum physical and mental potential because of maternal iodine deficiency (Vir, 1995).

Iodine deficiency can be avoided by using salt that has been fortified with iodine. In 1983–84, the Government of India adopted a policy to achieve universal iodization of edible salt by 1992. In 1988, the Prevention of Food Adulteration Act was amended to fix the minimum iodine content of salt at 30 parts per million (ppm) at the manufacturing level and 15 ppm at the consumer level (Ministry of Health and Family Welfare, 1994). The Government of India advised all states and union territories to issue notifications banning the sale of edible salt that is not iodized. However, the ban on non-iodized salt was lifted in September, 2000.

NFHS-2, with its representative sample of households throughout Kerala, is an ideal vehicle for measuring the degree of salt iodization in the state. Iodine levels in salt can be measured in the laboratory using a standard titration test or in the field using a rapid-test kit. In NFHS-2, interviewers measured the iodine content of cooking salt in each interviewed household using a rapid-test kit. The test kit consists of ampoules of a stabilized starch solution and of a weak acid-based solution. The interviewer squeezes one drop of the starch solution on a sample of cooking salt obtained from the household respondent. If the colour changes (from light blue through dark violet), the interviewer matches the colour of the salt as closely as possible to a colour chart on the test kit and records the iodine level as 7, 15, or 30 ppm. If the initial test is negative (no change in colour), the interviewer is required to conduct a second confirmatory test on a new salt sample, using the acid-based solution in addition to the starch solution. This test is necessary because the starch solution will not show any colour change even on iodized salt if the salt is alkaline or is mixed with alkaline free-flow agents. If the colour of the salt does not change even after the confirmatory test, the salt is not iodized. Because of uncertainties and subjective judgement in the matching process, the rapid test should not be seen as giving an exact quantitative estimate of salt iodization, but it does provide useful information on whether or not salt is iodized, as well as the extent of iodization. A recent multicentric study in eight centres in India concluded that the rapid test kit can be used for semi-quantitative estimation of the iodine content of salt to monitor the quality of salt being used in a community (Kapil et al., 1999).

Table 7.12 shows the extent of salt iodization at the household level. Overall, only 39 percent of households use cooking salt that is iodized at the recommended level of 15 ppm or more. This level is quite low in light of the government regulations on salt iodization that were in effect at the time of the survey. Almost half of the households (48 percent) use salt that is not iodized at all and 13 percent use salt that is inadequately iodized (less than 15 ppm). Differentials in salt iodization by background characteristics are pronounced. At least 60 percent of households in large and small cities of Kerala use salt with 15 ppm or more of iodine content, compared with 53 percent of households in towns and only 34 percent of households in rural areas. Households headed by Christians are more likely to use adequately iodized salt than households headed by Muslims or Hindus. The use of adequately iodized salt is relatively low in households headed by persons from the scheduled tribes and scheduled castes. The widest differentials are observed by the standard of living index. Sixty-three percent of households with a high standard of living use adequately iodized salt, compared with only 19 percent of households with a low standard of living.

Table 7.12 Iodization of salt

Percent distribution of households by degree of iodization of salt, according to selected background characteristics, Kerala, 1999

Background characteristic	Not iodized	7 ppm	15 ppm	30 ppm	Total percent	Number of households
Type of place of residence						
Large city	27.5	11.8	5.9	54.9	100.0	83
Small city	34.9	4.8	12.0	48.2	100.0	66
Town	30.8	15.9	7.3	46.0	100.0	532
Rural area	52.9	12.8	5.0	29.3	100.0	2,153
Religion of household head						
Hindu	48.5	13.0	5.8	32.7	100.0	1,559
Muslim	46.4	16.9	6.2	30.5	100.0	725
Christian	46.4	8.6	4.3	40.6	100.0	546
Caste/tribe of household head						
Scheduled caste	55.6	10.6	6.2	27.6	100.0	262
Scheduled tribe	(61.6)	(25.4)	(0.0)	(13.0)	100.0	31
Other backward class	45.1	16.5	5.8	32.7	100.0	1,147
Other	47.9	10.7	5.4	36.0	100.0	1,394
Standard of living index						
Low	65.1	15.9	4.4	14.5	100.0	519
Medium	52.4	13.8	5.3	28.5	100.0	1,519
High	26.9	10.1	7.0	56.0	100.0	796
Total	47.6	13.2	5.6	33.7	100.0	2,834

Note: Total includes 4 households with the household head belonging to other religions, which are not shown separately.
ppm: Parts per million
( ) Based on 25–49 unweighted cases