

CHAPTER 1

MENU PLANNING

Diet has a powerful yet complex effect on health. Dietetics is a science that deals with the adequacy of diets during normal life cycle and modifications required during diseased conditions. Menu planning is the process of planning and scheduling intake of meals for a general or specific individual requirements.

The following terms and concepts are widely used and a clear understanding of these terms makes menu planning efficient.

EXPLANATION OF TERMS

Health is defined by the World Health Organisation of the United Nations as the “State of complete physical, mental and social well-being and not merely the absence of disease and infirmity.”

The essential requisites (or dimensions) of “health” would include the following:

- Achievement of optimal growth and development, reflecting the full expression of one’s genetic potential.
- Maintenance of the structural integrity and functional efficiency of body tissues necessary for an active and productive life.
- Mental well-being.
- Ability to withstand the inevitable process of ageing with minimal disability and functional impairment, and
- Ability to combat disease, such as
 - (a) resisting infections (immunocompetence)
 - (b) preventing the onset (and retarding the progress) of degenerative diseases such as cancer and
 - (c) resisting the effect of environmental toxins and pollutants.

Nutrient requirement can be defined as the minimum amount of the absorbed nutrient that is necessary for maintaining the normal physiological functions of the body.

Dietary Reference Intakes (DRI) values are replacing the traditional Recommended Dietary Allowances in North America. This nutrient reference provides four sources of information:

- **Recommended Dietary Allowances (RDA)**—the estimated nutrient allowance that is adequate in 97% to 98% of the healthy population specific for life-stage, age, and gender. RDA includes addition of safety factor to the requirement of the nutrient, to cover the variation among individuals; losses during cooking and the lack of precision inherent in

the estimated requirement. The RDA is the dietary intake goal for individuals, but its purpose is not to assess diets of individuals or groups.

- **Estimated Average Requirements (EAR)**—the estimated nutrient requirement that is adequate in 50% of the population. This may be used to assess diets of individuals or groups, and is used to develop the RDAs.
- **Adequate Intakes (AI)**—used when insufficient scientific evidence exists to calculate the EAR and RDA, and may be used as a goal for dietary intakes of individuals.
- **Tolerable Upper Intake Level (UL)**—the maximum nutrient intake that is *not* associated with adverse side effects in most individuals of a healthy population. This is not meant to be a recommended level of intake.

Nutraceuticals combine 'nutrition' and 'pharmaceuticals' to mean that food extracts can be used as preventive drugs or food supplements.

Functional food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions of the body, beyond adequate nutritional effects. Functional foods must remain foods and they must demonstrate their effects in amounts that can normally be expected to be consumed in the diet. They are not pills or capsules but part of a normal food pattern.

Dietary/food supplements are concentrated sources of nutrients or other substances with a nutritional or physiological effect whose purpose is to supplement the normal diet.

Phytochemicals are of plant origin like terpenes, phytosterols, flavonoids, theols and allylic sulphides which are antimutagenic and anticarcinogenic agents and thus have nutraceutical properties.

Balanced diet is one which contains different types of foods in such quantities and proportions so that the need for calories, proteins, minerals, vitamins and other nutrients is adequately met and a small provision is made for extra nutrients to withstand short duration of leanness.

In addition a balanced diet should provide bioactive phytochemicals such as dietary fibre, antioxidants and other nutraceuticals which have positive health benefits. Low glycaemic index foods are preferred.

A balanced diet should provide around 60–70% of total calories from carbohydrate, 10–12% from protein and 20–25% of total calories from fat.

Balanced diet

- meets nutritional requirement
- prevents degenerative diseases
- improves longevity
- prolongs productive life
- improves immunity
- increases endurance level
- develops optimum cognitive ability
- helps in coping up stress.

Thus balanced diet enhances quality of life.

Five Food Group System

The five food group plan permits an individual to plan a menu to achieve nutrient intakes as specified by RDA. The five food groups suggested by ICMR are given in Table 1.1.

Table 1.1 The five food groups and their major nutrients

Food group	Main nutrients
1. Cereal grains and products: Rice, Wheat, Ragi, Bajra, Maize, Jowar, Barley, Rice flakes, wheat flour.	Energy, Protein, Invisible fat, Vitamin-B ₁ , Vitamin-B ₂ , Folic acid, Iron, Fibre.
2. Pulses and Legumes: Bengalgram, Blackgram, Greengram, Redgram, Lentil (whole as well as dhals), Cowpea, Peas, Rajmah, Soyabean, Beans.	Energy, Protein, Invisible fat, Vitamin-B ₁ , Vitamin-B ₂ , Folic acid, Calcium, Iron, Fibre.
3. Milk and Meat Products: Milk, Curd, Skimmed Milk, Cheese, Chicken, Liver, Fish, Egg, Meat.	Protein, Fat, Vitamin-B ₂ , Calcium
4. Fruits and Vegetables: Fruits: Mango, Guava, Tomato, Papaya, Orange, Sweet lime, Water melon. Vegetables: (green leafy) Amaranth, Spinach, Gogu, Drumstick leaves, Coriander leaves, Fenugreek leaves. Other Vegetables: Carrots, Brinjal, Ladies finger, Beans Capsicum, Onion, Drumstick, Cauliflower.	Carotenoids, Vitamin-C, Fibre, Invisible fat, Vitamin-B ₂ , Folic acid, Iron. Carotenoids, Vitamin-B ₂ , Folic acid, Calcium, Iron, Fibre. Carotenoids, Folic acid, Calcium, Fibre.
5. Fats and Sugar: Fats: Butter, Ghee, Hydrogerated fat, Cooking oils like groundnut, Mustard, Coconut. Sugar: Jaggery and sugar	Energy, Fat, Essential fatty acids. Energy

The five food group system can be used by health professionals for the following purposes:

- *Tool for nutritional assessment and screenings:* A brief dietary history system can disclose inadequacies of nutrient from any of the five groups. The information can be the first clue for the possibility of the subject may be at the risk of developing nutritional deficiency.
- *Tool for nutritional counselling:* The dietary history based on the five food group system allows a health team to counsel or teach a patient about nutrition.
- *Explaining therapeutic diets to the patient:* Therapeutic diets are scientifically based on nutrient composition and groups which can be used in menu planning.
- *Food labelling and surveillance system:* Food groups can be used for food labelling and for nutrition surveillance system.

Food Exchange Lists

The Exchange Lists are the basis of a meal planning. Food exchange lists are groups of measured foods of the same calorific value and similar protein, fat and carbohydrate. All foods of exchange lists make a specific contribution to a good diet. None of the exchange groups can itself supply all the nutrients needed for a well balanced diet. Exchange lists are based on principles of good nutrition that apply to everyone though extremely helpful for diabetics. Food exchange lists help in manipulation of protein, calories and other nutrients.

Food Composition Database

Food composition database are compilation of foods and their nutrient and non-nutrient components. All food groups are covered. The nutritive value is given per 100 g edible portion.

Energy content of food is calculated based on the content of protein, fat and carbohydrate.

Fat is measured as the fraction of the food soluble in lipid solvents which includes triacylglycerides.

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Carbohydrate is a derived value obtained by subtracting the percentage of water, protein, fat, ash, crude fibre from 100 to give the percentage of carbohydrate 'by difference'.

Protein is measured as total nitrogen multiplied by a factor continues to dominate food composition. The general nitrogen conversion factor originally is 6.25 based on the assumption that protein contained 16% of nitrogen.

If data are not available, users with specific needs have two options:

- They can generate the data themselves, gathering representative samples of the foods.
- They can estimate/impute the missing values from known data on similar foods and components.

National Institute of Nutrition. Indian Council of Medical Research, Hyderabad has published a book called 'Nutritive value of Indian Foods'. The values given are average of many samples collected from different regions of India. One needs to keep this in mind while using these values.

PLANNING DIETS

People's eating habits vary enormously and dietitians must respect dietary freedom and diversity when making recommendations. Dietary diversity is one of our culture's strengths and sources of pleasure. There are many ways to eat to be healthy. The best way to achieve balanced diet is to plan meals in relation to other food for the whole day. It is advisable to eat small regular meals rather than one huge meal.

Principles of Planning Diets

- **Meeting nutritional requirement:** A good menu is one which will not only provide adequate calories, fat and proteins but also minerals, vitamins essential for the physical well being of each member of a family. In a balanced diet the ratio of energy distribution from carbohydrate, protein and fat would be 7:1:2. The diet should contain 'Basic five food groups'.
- **Meal pattern must fulfill family needs:** A family meal should cater to the needs of the different members. A growing adolescent boy may need rich food to satisfy his appetite, whereas a young child may require soft and bland diet. Pregnant women require more greens in the diet. A heavy worker requires more calories and B vitamins than other members of the family. Meal pattern varies with age, occupation and life style of the family members. The family meal must offer children enough fat and flexibility in caloric density so that their energy needs are met.
- **Meal planning should save time and energy:** Planning of meals should be done in such a way, that the recipes should be simple and nutritious. Labour and time saving devices can be used. Using convenience foods save time and energy.
- **Economic consideration:** Meals planned that are not within budget, cannot be put into practice. The cost of meals can be reduced by bulk purchasing and using seasonal fruits and vegetables.
- **Meal plan should give maximum nutrients:** Losses of nutrients during processing, cooking should be minimised. Sprouted grams, malted cereals, fermented foods enhance the nutritive value. Good quality protein should be distributed in all meals. Pressure cooker can be used to conserve the nutrients.

- *Consideration for individual likes and dislikes:* The meal planned should not only meet RDA but also individual preferences, particularly vegetarian or non-vegetarian preferences. If a person does not like particular greens, it can be tried in a different form or substituted by some other equally nourishing food. Food habits and dietary pattern should also be considered. Religion, traditions and customs of the individual should be considered in planning the menu.
- *Planned meals should provide variety:* If the meals are monotonous it is not consumed. Variety can be introduced in colour, texture and taste, by using different kinds of foods and cooking methods. Variety also helps in meeting the nutritional requirement.
- *Meals should give satiety:* Each meal should have some amount of fat, protein and fibre to get satiety. Meals should be planned in such a way that interval between the meals is also considered.
- *Availability of foods:* Menus should include locally available foods. The wide variation in dietary patterns throughout the world depends largely upon the available food supply.
- *Health value of foods should be considered:* Ideal diets should provide besides nutrients those bioactive chemicals which can help to prevent and retard disease processes.

Following the International Conference of Nutrition in 1992 the WHO and FAO recommended that all regions of the world provide advice to the public through qualitative and/or quantitative dietary guidelines relevant for different age groups and life styles appropriate for the population. Food based dietary guidelines published as a technical bulletin by the WHO expresses the principles of nutrition education in terms of foods and reinforces the link between dietary pattern and reduced risk of certain diseases.

Points to be Considered in Planning a Diet

For planning the menu the following points should be considered:

- For all nutrients minimum RDA must be met. For energy, the total calories can be RDA \pm 50.
- Energy derived from cereals should not be more than 75 per cent.
- It is better to include two cereals in one meal like rice and wheat or millets and rice.
- Whole grain cereals, parboiled grains or malted grains give higher nutritive value.
- Flour should not be sieved for chapathi as it reduces bran content.
- Minimise refined cereals like maida.
- To improve the cereal and pulse protein quality minimum ratio of cereal protein to pulse protein should be 4 : 1. In terms of the grains it will be eight parts of cereals and one part of pulses.
- Two to three servings of pulses should be taken every day. Germinated pulses are more nutritious.
- One egg weighs around 40 g. This can be served along with cereal or pulses to improve the quality of protein. Instead, one serving of poultry/fish can also be included in the diet.
- A minimum quantity of 500 ml milk/day should be included. Two glasses of milk or curd should be included in a balanced diet. Curd provides probiotics. Low fat milk should be preferred.
- Foods rich in fibre should be included in the diet.
- Every meal should contain atleast one medium size fruit. It is better to serve the fruit raw. Taking juice out of it causes loss of vitamin C.

- Inclusion of salads or raita not only help in meeting the vitamin requirements but the meals would be attractive and have high satiety value due to the fibre content.
- Green leafy vegetables can be taken more than one serving. Coloured vegetables and fruits are preferred.
- Five servings of colourful fruits and vegetables should be included in a day's diet to meet antioxidant requirement.
- Energy derived from fats or oils is 15-20 per cent of total calories and 5 per cent from sugar and jaggery.
- It is better to use more than one type of oil. Combination of oils have proper balance between n-3 and n-6 fatty acids.
- Choose a diet low in fat, saturated fat, trans fats and cholesterol.
- Fried foods cannot be planned if oil allowance is less or in low calorie diets.
- Variety of foods should be used in the menu. No single food has all the nutrients.
- Use salt and sugar in moderation.
- Ideally each meal should consist of all the five food groups.
- Usually the number of meals would be four and for very young children and patients, number of meals can be more.
- One-third of nutritional requirement—at least calories and protein should be met by lunch as well as by dinner.
- For quick calculations food exchange list can be used.
- If possible, meals should be planned at a time for several days.
- Water should be taken in adequate quantities.
- Use processed and ready to eat foods judiciously. Processed foods contain a variety of food additives.
- Children and patients whose nutritional requirements are high, supplementary foods can be given.

Steps Involved in Planning a Diet

There are three steps involved in planning a menu.

Step I: Recommended dietary allowances

To calculate balanced diet, as a first step there is a need to know Recommended Dietary Allowances for different age groups prescribed by Nutrition Expert Committee of ICMR. Table 1.2 shows Recommended Dietary Allowances for Indians (1989).

Step II: Food list

Food list can be prepared either by using ICMR Tables or Exchange lists.

A. Using ICMR Tables

As a second step while planning the daily diet the foods are chosen from all five food groups. To make menu planning more convenient ICMR has suggested the portion size and balanced diets for adults and for different age groups (Tables 1.3, 1.4 and 1.5).

The balanced diets for adults and different age groups are given as multiples of these portion sizes. The portion sizes are given in terms of raw food.

Table 1.2 Recommended dietary allowances for Indians—1989

Group	Particulars	Body wt kg	Net energy kcal/d	Protein g/d	Fat g/d	Calcium mg/d	Iron mg/d	Vitamin A		Thia- min mg/d	Ribo- flavin mg/d	Nico- tinic acid mg/d	Pyri- doxin mg/d	Asc- orbic acid mg/d	Folic acid µg/d	Vit. B ₁₂ µg/d	
								Ret- inol µg/d	β-car- otene µg/d								
Man	Sedentary work	60	2425	60	20	400	28	600	2400	1.2	1.4	16	2.0	40	100	1	
	Moderate work		2875							1.4	1.6	18					
	Heavy work		3800							1.6	1.9	21					
Women	Sedentary work	50	1875	50	20	400	30	600	2400	0.9	1.1	12	2.0	40	100	1	
			Moderate work							2225	1.1	1.3					14
			Heavy work							2925	1.2	1.5					16
	Pregnant woman		+300	+15	30	1000	38	600	2400	+0.2	+0.2	+2	2.5	40	400	1	
	Lactation																
	0-6 months	50	+550	+25						+0.3	+0.3	+4					
	6-12 months		+400	+18	45	1000	30	950	3800	+0.2	+0.2	+3	2.5	80	150	1.5	
Infants	0-6 months	5.4	108/kg	2.05/kg						55 µg/ kg	65 µg/ kg	710 µg/ kg	0.1		25	25	0.2
	6-12 months	8.6	98/kg	1.65/kg				350	1400	50 µg/ kg	60 µg/ kg	650 µg/ kg	0.4				
Children	1-3 years	12.2	1240	22			12	400		0.6	0.7	8	0.9		30		
	4-6 years	19.0	1690	30	25	400	18	400	1600	0.9	1.0	11		40	40	0.2-1.0	
	7-9 years	26.9	1950	41			26	600	2400	1.0	1.2	13	1.6		60		
Boys	10-12 years	35.4	2190	54			34			1.1	1.3	15	1.6	40	70	0.2-1.0	
Girls	10-12 years	31.5	1970	57	22	600	19	600	2400	1.0	1.2	13					
Boys	13-15 years	47.8	2450	70			41			1.2	1.5	16					
Girls	13-15 years	46.7	2060	65	22	600	28	600	2400	1.0	1.2	14	2.0	40	100	0.2-1.0	
Boys	16-18 years	57.1	2640	78			50			1.3	1.6	17					
Girls	16-18 years	49.9	2060	63	22	500	30	600	2400	1.0	1.2	14	2.0	40	100	0.2-1.0	

Source: Gopalan C., B.V. Ramasastri and S.C. Balasubramanian, 1991, Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad, India.

Table 1.3 Portion size for menu plan

<i>Food groups</i>	<i>Portion g</i>	<i>Energy kcal</i>	<i>Protein g</i>	<i>Carbohydrate g</i>	<i>Fat g</i>
Cereals and Millets	30	100	3.0	20	0.8
Pulses	30	100	6.0	15	0.7
Egg	50	85	7.0	—	7.0
Meat, Chicken or fish	50	100	9	—	7.0
Milk	100	70	3.0	5	3.0
Roots and Tubers	100	80	1.3	19	—
Green leafy vegetables	100	45	3.6	—	0.4
Other vegetables	100	30	1.7	—	0.2
Fruits	100	40	—	10	—
Sugar	5	20	—	5	—
Fats & Oils	5	45	—	—	5

Source: Dietary Guidelines for Indians—A manual, 1999, National Institute of Nutrition, ICMR, Hyderabad.

Table 1.4 Balanced diet for adults—sedentary/moderate/heavy activity (number of portions)

<i>Food Groups</i>	<i>Portion g</i>	<i>Type of work</i>					
		<i>Sedentary</i>		<i>Moderate</i>		<i>Heavy</i>	
		<i>Man</i>	<i>Woman</i>	<i>Man</i>	<i>Woman</i>	<i>Man</i>	<i>Woman</i>
Cereals and millets	30	14	10	16	12	23	16
Pulses	30	2	2	3	2.5	3	3
Milk	100 ml	3	3	3	3	3	3
Roots & tubers	100	2	1	2	1	2	2
Green leafy vegetables	100	1	1	1	1	1	1
Other vegetables	100	1	1	1	1	1	1
Fruits	100	1	1	1	1	1	1
Sugar	5	5	4	8	5	11	9
Fats and Oils (visible)	5	4	4	7	6	11	8

For non-vegetarians substitute one pulse portion with one portion of egg/meat/chicken/fish.
For infants introduce egg/meat/chicken/fish around 9 months.
Specific recommendations as compared to a sedentary woman:

Children

1–6 years : $\frac{1}{2}$ to $\frac{3}{4}$ the amount of cereals, pulses and vegetables and extra cup of milk.
7–12 years : Extra cup of milk
Adolescent girls : Extra cup of milk
Adolescent boys : Diet of sedentary man with extra cup of milk.

Source: Dietary Guidelines for Indians—A manual, 1999, National Institute of Nutrition, ICMR, Hyderabad.

Table 1.5 Balanced diet for infants, children and adolescents (number of portions)

Food groups	Portion g	Infants 6–12 months	Years						
			1–3	4–6	7–9	10–12		13–18	
						Girls	Boys	Girls	Boys
Cereals and millets	30	1.5	4	7	9	9	11	10	14
Pulses	30	0.5	1	1.5	2	2	2	2	2
Milk (ml)	100	5*	5	5	5	5	5	5	5
Roots & tubers	100	0.5	0.5	1	1	1	1	1	2
Green leafy vegetables	100	0.25	0.5	0.5	1	1	1	1	1
Other vegetables	100	0.25	0.5	0.5	1	1	1	1	1
Fruits	100	1	1	1	1	1	1	1	1
Sugar	5	5	5	6	6	6	7	6	7
Fats/Oils (visible)	5	2	4	5	5	5	5	5	5

*Quantity indicates top milk. For breastfed infants, 200 ml top milk is required.

One portion of pulse may be exchanged with one portion (50 g) of egg/meat/chicken/fish.

B. Using Cooked Food Exchange Lists

The diet can also be prescribed in terms of exchange lists. Each exchange provides 100 kcals.

There is no fat exchange as the calorie value of the recipes include fat that is used. If additional fat or sugar is used, calorie value can be calculated by multiplying with 9 or 4 per gram respectively.

All the food portions in the given list provide approximately the same amount of kilocalories. Portion sizes are strictly defined so that every item on a given list provides roughly the same amount of energy. Any food on a list can be exchanged for any other food on that same list without affecting a plan's balance or total calories.

Recipes from exchange lists are selected from all groups and energy and protein value are calculated in accordance with the RDA. If specific number of exchange lists are chosen from each group and energy and protein RDA are met, most of the time all the other nutrients are also met. Average nutritive value of foods are given in appendix 1. Another food exchange system is given in Appendix 2.

Table 1.6 100 kcal exchange list
Capacity of one standard calori is 150 ml.

Cereal exchange – 1.5–3.5 g protein	
Idli (big)	1
(medium)	1 ¹ / ₃
Dosa (small)	1
(big)	1 ¹ / ₂
Phulka	2
Chapathi	1
Puri	1 ¹ / ₂
Rava idli	1
Veg. sandwich	3/4
Bread toast (medium)	1 ¹ / ₂
Bread pakoda	3
Plain rice	3/4 kg
Upma	1/2 kg
Veg. noodles	1 kg

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Coconut Rice	1/2 kg
Pongal	1/2 kg
Boiled Wheat Rava	1 kg
Sweet Pongal	2 Tb Sp
Paniyaram	1¼ pieces
Verrmicelli payasam	2 Tb Sp
Kesari	1½ Tb Sp
Rice flakes upma	1/2 kg
Naan	2/3
Cheese Sandwich	1/3
Ragi puttu	3/4 kg
Ragi adai	3/4
Pulao	1/2 kg
Bise bela bath	1/2 kg
Tamarind rice	1/2 kg
Curd rice	1/2 kg
Idiappam	1

Pulse Exchange – 3–5 g protein

Sambar	1½ kg
Rasam	2½ kg
Thick dal	1/2 kg
Thin dal	1 kg
Channa masala	1/2 kg
Dry peas sundal	3/4 kg
Roasted bengal gram chutney (without coconut)	1/2 kg
Sprouted moong salad	1 heaped katori
Pesarattu	3/4
Baked Masala Vada (with negligible amount of fat)	2 nos
Adai	1
Vada	1
Keerai vada	3/4
Bajji	2
Bonda	1

Meat exchange – 5 g of protein

Egg omelette	1
Scrambled egg	One egg
Fish Kolambu	2/3 kg
Fish fry	1 small piece
Boiled egg with gravy	1/3 to 1/2 serving
Meat curry	1 serving
Egg Custard	1/2 kg

Milk exchange – 4.5 g protein

Milk	150 ml–1 tea cup
Curd	150 ml–1 full katori
Cheese	1 ⅓ cube 30 g
Paneer	40 g
Butter milk	1 glass–(350 ml)
Badam Milk Shake	1/4 glass
Banana Milk Shake	1/3 glass
Milk kheer	1/2 kg
Carrot Kheer	3/4 kg

Vegetable A exchange

Curry without coconut and gravy (with simple seasoning)	Amaranth curry	1 heaped katori
Plain tomato soup		2 kg (1 soup bowl)
Soup with white sauce		1 kg (1/2 soup bowl)
Mint Chutney		1/2 kg
Onion Chutney		1/2 kg

Vegetable B exchange

Roots and tubers curry		1/2 kg
Cutlet		1/2

Fruit exchange

Apple		1 medium
Banana		1
Custard apple		1
Pine apple		3 slices
Orange		2 ½
Sapota		2 (small)
Fruit salad (no sugar or dressing)		3/4 kg
Guava		1 (Big)

Appendix 3 gives work out details of Table 1.6.

Recipes not included in the exchange list, can be extrapolated or calculated using the book 'Nutritive Value of Indian foods' published by ICMR.

Step III : Making menu

The foods that are listed in step II are converted into the actual recipes and distributed in different meals like breakfast, lunch, evening tea and dinner. Recipes in exchange lists are distributed in different meals.

Menu Plan Using Exchange List**RDA**

Energy	—	2425 kcal
Protein	—	60 g

Exchange list (100 kcal each):

Food exchange	Total no. of exchanges/ day	Distribution		
		Breakfast+ Mid morning	Lunch+ Evening tea	Dinner+ after dinner
Cereal exchange	11	3	4	4
Pulse exchange	3	1	1	1
Milk exchange	4	1	2	1
Fruit+Vegetable exchange	5	1	2	2
Meat exchange	1	—	1	—

Energy value of fat and oil are included in the above exchanges. Sugar 1 g = 4 kcal. Fat 1 g = 9 kcal.

THE FOOD GUIDE PYRAMID—MYPYRAMID

MyPyramid is a plan from the U.S. Department of Agriculture, designed to help people choose the foods and amounts that are right for them, to balance with their daily physical activity. MyPyramid is meant for any healthy person, who is above the age of two years. The following points are emphasised in MyPyramid:

- **Be active:** The person climbing up the steps reminds consumers to fit physical activity into every day.
- **Vary your choices:** The six bands stand for the five food groups plus an area for oils. For health, it is essential to consume a variety among and within these groups to get the array of nutrients needed by the body. No one food or food group supplies all the nutrients, fibre and other substances the body needs. Besides, variety adds flavour, interest and pleasure to eating.
- **Think in proportions:** The food-group bands differ in width, reminding consumers to eat more of some types of foods than others. These widths are just estimates and not specifically the amount that is right for a person.
- **Make moderation the mind-set and everyday eating habit.** For each food group, the wider base stands for foods with little or no solid fats or added sugars; they should be eaten more often. The narrower top stands for foods with more added sugars and solid fats—the more active a person is, the more of these foods he can consume.
- **Customize:** MyPyramid is available for kids and also for vegetarians. They can be used according to a person's need.
- **Improve gradually:** Small steps should be taken towards healthier eating and active living. Small steps add up to big benefits.

Individual foods as well as foods within the same food group vary in their nutrient content. Large fat and energy differences exist within a single food group for example between non-fat milk and ice cream, fish and hot dogs, green beans and french fries, apples and avocados or bread and biscuits yet according to the Food Guide—any of these substitutes would be acceptable. No one food contains all the essential nutrients. Eating foods from each of the different food groups helps ensure that all nutrient needs are met. People who have low energy allowance are advised to select the most nutrient dense foods within each group, whereas people with high energy needs may select some of the less nutrient dense, higher kilocalorie foods.

As people are getting knowledge in nutrition and diets, they are developing some superstitious beliefs. In the anxiety to keep healthy people are blindly trusting the advertisements and unproven theories. By eating a particular food or by not eating a food, one cannot balance the diet.

There is no substitute for balanced diet. The principles of balanced diet one need to follow throughout life. The advantage of a proven phytochemical can be felt only when all the principles of life style are followed.

The diet not good for health if it is

- too high in total fat, saturated fat, trans fat and cholesterol
- too high in sodium and sugar
- too high in processed foods and food that give only empty calories
- too high in snack foods, junk foods and refined floors
- too low in antioxidants
- too low in fibre and fluid

too low in α linolenic acid
and too low in protein, minerals and vitamins.

Nutritional scientists agree that at all ages of life, well planned diets that incorporate the principles of adequacy, balance and moderation can be nutritious and healthful.

NUTRITIONAL REQUIREMENTS OF ADULTS

Man needs a wide range of nutrients to perform various functions in the body and to lead a healthy life. During adulthood nutrients are required for the purpose of energy, for replacement of wornout tissues and maintenance of body functions. Though there is no growth during adulthood, protein is required for the replacement of wornout tissues. The nutritional requirement of other age groups is sometimes extrapolated from adults' requirements.

Energy

Energy requirements of an adult man and woman are based on Reference man and Reference woman. Energy requirements for other individuals of different body weights and age are calculated.

Reference man is between 20–39 years of age and weighs 60 kg. He is free from disease and physically fit for active work. On each working day he is employed for 8 hours in occupation that usually involves moderate activity. While not at work he spends 8 hours in bed 4–6 hours sitting and moving around and 2 hours in walking and in active recreation or in household duties.

Reference woman is between 20–39 years of age, healthy and weighs 50 kg. She may be engaged for 8 hours in general household work, in light industry or in other moderately active work. Apart from 8 hours in bed she spends 4–6 hours sitting or moving around in light activity and 2 hours in walking or in active recreation or in household duties.

An important factor which determines energy needs is the nature and duration of physical activity, whether moderate or heavy. For those whose occupation entails heavy work, allowances have to be higher than for those who are either, sedentary or engaged in moderate work. The allowances are made under the assumption that the energy expenditure for non-occupational activities remains unchanged. Table 1.7 gives RDA for an adult suggested by ICMR.

Protein

The average daily protein requirement of an Indian adult, in terms of a high quality protein like milk, egg at the physiological level is estimated to be 0.5 g/kg of body weight. One gram per kilogram of body weight is the RDA for men as well as women is suggested considering protein of mixed vegetable origin with NPU 65 relative to egg. The estimates of nitrogen losses and the amount of nitrogen needed to maintain balance have a coefficient of variation in the same individual from day to day. The figure of 1.0 g/kg body weight includes a 30 per cent addition to cover this variability.

Table 1.7 Recommended dietary allowances for an adult man and woman

Nutrient	Man			Woman		
	Sedentary	Moderate	Heavy	Sedentary	Moderate	Heavy
Energy kcal.	2425	2875	3800	1875	2225	2925
Protein g.	60	60	60	50	50	50
Calcium mg.	400	400	400	400	400	400
Iron mg.	28	28	28	30	30	30
Vitamin A						
Retinol µg.	600	600	600	600	600	600
β carotene µg.	2400	2400	2400	2400	2400	2400
Thiamin mg.	1.2	1.4	1.6	0.9	1.1	1.2
Riboflavin mg.	1.4	1.6	1.9	1.1	1.3	1.5
Niacin mg.	16	18	21	12	14	16
Pyridoxin mg.	2	2	2	2	2	2
Vitamin C mg.	40	40	40	40	40	40
Folic acid µg.	100	100	100	100	100	100
Vitamin B ₁₂ µg.	1	1	1	1	1	1

Protein/Calorie Ratio of Diets

It is useful to consider together the protein and energy requirement on habitual Indian diets. The protein requirement can be expressed as the ratio of protein calories to total dietary calories (PE %).

This concept is useful because in many population groups enough diet is not consumed to meet energy needs resulting in energy deficits. It will be seen that a PE% between 8 and 12 would meet the protein requirement of any group provided its energy needs are met.

Fat

In the diets of adults in India, about 20 per cent energy may be derived from fats. At all levels of calorie intake, invisible fat furnishes about 9 per cent energy and visible fat 10 per cent. This would come to 10–20 g of fat per day depending upon the level of calories consumed.

In habitual diets of our country, which are cereal-legume based, about half the invisible fat (6 per cent energy) is composed of linolic acid. The Expert FAO/WHO consultation committee has placed it at 3 per cent energy. It has also been deduced to be 5g per day. This requirement can be met even by the invisible fat component of existing Indian diets. Saturated fatty acids, cis-monosaturated fatty acids, proteins and cholesterol can increase essential fatty acid requirement. It would appear prudent to choose the visible or cooking fat from unsaturated vegetable oils. Average Indian diet predominantly based on cereals and pulses including the diets of poor income groups, carry sufficient amount of linoleic acid.

Table 1.8 Classification of activities based on occupation

	Male	Female
Sedentary	Teacher, tailor, barber, executive, shoemaker, priest, retired personnel, landlord, peon, postman, computer professional	Teacher, tailor, executive, housewife, computer professional
Moderate	Fisherman, basket maker, potter, goldsmith, agricultural labour, carpenter, mason, rickshaw-puller, electrician, fitter, turner, welder, industrial labour, coolie, weaver, driver, servant	Maid, coolie, basketmaker, agricultural labour, beedi maker.
Heavy	Stone cutter, blacksmith, mineworker, wood cutter, gangman	Stone cutter

Source: Modified. Gopalan, C., B.V. Ramasastri and S.C. Balasubramanian (1991), *Nutritive Value of Indian Foods*, National Institute of Nutrition, ICMR, Hyderabad, India.

Minerals

The requirement of calcium prescribed by ICMR is same for both men and women. To meet this requirement an adult needs to take atleast 200 ml of buffalo's milk or 350 ml of cow's milk. It is suggested that a Ca : P in the diet should remain somewhere between 1 : 1 and 1 : 2. During infancy the Ca : P ratio suggested is 1 : 1.5. Bone mass increases during childhood and adolescence and peaks between the ages of 20 and 30 years. Peak bone mass is influenced by calcium intake. Other factors like age, sex, genetic factors, hormonal status and exercise also influence. After 30, the rate of withdrawal exceeds the rate of deposit ; therefore establishing healthy bone mass in childhood and early adulthood is crucial.

Iron requirement for woman is 2 mg higher than man. Iron loss through menstruation in women of reproductive age groups are 0.6 mg/day on an average, when spread over the whole month.

Vitamins

The requirement of vitamin A is same for both men and women. The requirement of B vitamins is based on calorie requirement (0.5 mg of thiamine, 0.6 mg of riboflavin and 6.6 mg of niacin per 1000 calories). Hence, requirements of B vitamins are higher for moderate and heavy workers.

An intake of 20 mg of vitamin C may be sufficient to maintain the ascorbic acid levels in the adults. Taking into account that 50 per cent of vitamin C is lost in cooking, 40 mg is suggested for all adults. Where there is minimal exposure to sunlight, a specific recommendation of a daily supplement of 400 µg of vitamin D is made. The requirement of vitamin E suggested is 0.8 mg/g of essential fatty acids.

FOOD SECURITY

Though production of cereals and millets appears to be adequate, production of pulses, the most inexpensive source of protein for the rural poor, actually shows a decline. Total production of vegetables is about 30% less than the demand. The total production of milk is about 66 million tonnes, corresponding to about 197 g per capita per day which is much below the RDA of 250 g.

The distribution of foods, both within the community and the family, is unfavourable to some vulnerable groups due to low income and purchasing power, further reducing the availability of these foods. In view of the high cost of milk and flesh foods a large proportion of the Indian population subsists on diets consisting mostly of plant foods with low nutrient bio-availability. National Nutrition Monitoring Bureau surveys indicate that the daily intake of most foods in Indian households, except for cereals and millets (470 g) is much below the RDA. The diets provide negligible amounts of protective foods like pulses (29 g) and vegetables. Consumption of green leafy vegetables (<15 g) and other vegetables (70–80 g) which are rich sources of micro-nutrients like beta carotene, folate, calcium, riboflavin and iron, is woefully inadequate. Intake of visible fat is less than 60% of the RDA. NNMB Surveys revealed that the energy inadequacy was 48 per cent.

Persistent under-nutrition throughout the growing phase of childhood leads to short stature in adults. About a half of the adults have a Body Mass Index below 18.5, which indicates chronic energy deficiency. It is estimated that nutritional anaemia contributes to about 85,000 maternal deaths every year and is one of the important causes of low birth weight. It adversely affects work output among adults.

Tribal population constitutes about 8 per cent of the total population in India. They live in unique physical, socio-economic and cultural environment, isolated from general populations. Their food intake is influenced by vagaries of nature, with large seasonal variations, depending upon availability of agricultural and forest produce. A close relationship exists between the tribal ecosystem and their nutritional status. Inadequate health care facilities, ecological degradation, further aggravate the situation. Government of India is helping tribal population under Integrated Tribal Development Projects.

Under Common Minimum Programme 2004, food and nutrition security is being achieved by the following:

- Strengthening the Public Distribution System (PDS)
- Special schemes to reach food grains to the most destitute and infirm
- Establishing grain banks in chronically food-scarce areas
- Antyodaya cards for all households at risk of hunger
- Improving the efficiency of functioning of Food Corporation of India
- Particular emphasis for the girl child in nutrition programmes.

Recent evidence indicates that for a similar BMI, Indians have a greater proportion of body fat (adult and even new born) which renders them susceptible to adult morbidity like insulin resistance, diabetes mellitus, coronary artery disease, hypertension and syndrome X.

Table 1.9 gives Nutritional and Health Status of Indians.

On the other side of the spectrum of malnutrition, diet related non-communicable diseases are commonly seen. With increasing urbanisation, energy-rich diets containing higher amounts of fat and sugar, which also provide less dietary fibre and complex carbohydrates are being consumed, particularly in high-income groups. In addition, the urban population is tending to be more sedentary with little physical activity. Hence prevalence of disorders like obesity, heart disease, hypertension and diabetes is on the increase.

Table 1.9 Nutritional and health status

Aspects	Prevalence (%)			
Adults (%)				
Chronic Energy Deficiency (BMI < 18.5)	50			
Anaemia in Pregnant women	70–90			
General Population				
Anaemia (%)	50			
Goitre (millions)	40			
Cretinism (millions)	2.2			
Still births due to IDD	90,000			
Prevalence of Chronic Diseases^a	Urban		Rural	
	Male	Female	Male	Female
Hypertension (%)	22.0	25.3	11.9	9.4
Obesity BMI (> 27) (%)	36.7	48.6	8.4	11.4
Diabetes Mellitus (%)	13.0	9.9	2.8	2.7
Coronary Heart Disease (%)	8.7	8.8	4.5	6.0
Cancer Incidence ^b (per million)	824	984	415	408

Source: Dietary Guidelines for Indians—A manual, 1999, National Institute of Nutrition, Hyderabad.

LOW COST BALANCED DIETS

Diets of poor can be improved nutritionally by (1) replacing a single cereal with mixed cereals, one of them being a millet, (2) inclusion of at least 50 g green leafy vegetables to improve the intake of vitamin A, iron and calcium, (3) inclusion of inexpensive yellow fruits like papaya or mango and greens to increase vitamin A and C intake, (4) inclusion of at least 150 ml of milk improves intakes of riboflavin, calcium besides improving protein quality of the diet. (5) Another extra 10 g of oil increases energy and essential fatty acid intake. An example of low cost improved diet by modifying the existing diet as suggested by ICMR is given in Table 1.10.

Table 1.10 Low cost balanced diet for sedentary man

Ingredients	Amount (g)
Cereals	460
Pulses	40
Leafy vegetables	50
Other vegetables	60
Roots and tubers	50
Milk	150
Oil and fat	40
Sugar and Jaggery	30

Source: Gopalan, C., B.V. Ramasastry and S.C. Balasubramanian (1991), *Nutritive value of Indian foods*, National Institute of Nutrition, ICMR, Hyderabad, India.

Dietary Guidelines to Reduce the Cost of a Meal

- Cereals, since they are less expensive, can be increased to more than the normal amount present in a balanced diet.
- Inclusion of millets like ragi, jowar and bajra can reduce the cost of a meal.
- Big and thick rotis can be prepared to save time and fuel.
- Combination of cereals and pulses improve the quality of cereal as well as pulse protein.
- Pulses like horse gram can be included to reduce the cost of a meal.
- Fermenting, malting and sprouting can be done at home which enhance the nutritive value without increasing the processing cost.
- Greens particularly from trees like drumstick or agathi are cheaper. Locally available or kitchen garden produce can be used.
- Leaves of cauliflower, carrots, knol khol and beet root which are highly nutritious can become part of a meal. Curry leaves can be used in consumable form like chutneys, chutney powder or in ground form in curry leaves pulao.
- Inexpensive and nutritious fruits like papaya and guava can be included in the diet.
- Inclusion of dry fish (like nethili) may supply good amount of nutrients without increasing the cost.
- Broken rice, broken eggs (fresh) left over vegetables and fruits (in the shop at the end of the day) cheaper cuts of meat can be bought.
- Jaggery can be used instead of sugar.
- Toned milk with low fat is less expensive but gives all the other nutrients except fat.
- Steamed foods are less expensive than fried foods. Low cost diets have less amount of fats oil and sugars.
- Low priced biscuits or buns can be used as snacks in the diet.
- Natural foods are less expensive compared to processed and preserved foods.
- Foodstuffs that are distributed through public distribution system (Ration shops) can be used.
- Recipes made at home are cheaper than bought. Home made food can be carried to the workplace instead of buying from the canteen.
- Unbranded foods can be included.
- Inclusion of locally available ingredients and seasonal foods reduce the cost of a meal.

One need to have integrated approach for the promotion of health—to include balanced diet, to do regular exercise, to have positive attitude and ability to cope with stress.

The 7th April is World Health Day

Suggested Readings

- Duyff Roberta Larson, 2006, Complete Food and Nutrition Guide, American Dietetic Association, John Wiley & Sons, U.S.
- Mujeeb-ur-Rohman and Visweswara Rao K, 2002, Pattern of Food Consumption and Nutrient Adequacy—A Case Study of Adults by Region—Indian J Nutr Diets, 39.
- Bender A David, 2005, Dictionary of Food and Nutrition, Oxford University Press, Oxford.
- Personalised nutrition counselling site—www.nutricise.com
- USDA Food Guide Pyramid—MyPyramid.gov
- American Dietetic Association—www.eatright.org

QUESTIONS

1. Define and explain balanced diet.
2. Write short notes on food composition table bringing out the limitations of it.
3. Give the five food group system suggested by ICMR and explain the importance of it.
4. Discuss the factors determining RDA.
5. Explain the principles of planning a meal.
6. Discuss in detail the steps involved in planning a menu.
7. Give the importance of planning a menu.
8. What are food exchange lists? How are they used in planning diets?
9. Write the factors to be considered in planning a menu.
10. What is MyPyramid? How is it useful in planning menus?
11. Define reference man and reference woman.
12. Give RDA suggested by ICMR for a male and a female executive.
13. Give RDA suggested by ICMR for male and a female servant.
14. Calculate the cost and nutritive value of low cost balanced diet suggested by ICMR and give your comments.
15. Give RDA of an adult man and plan a day's diet and explain the nutritional importance during adulthood.
16. Describe any five methods to reduce the cost of a meal.
17. Define RDA and nutraceuticals.