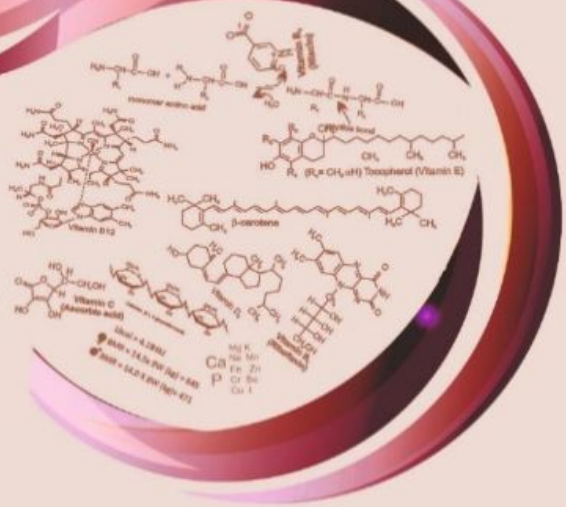
Short Summary Report of NUTRIENT REQUIREMENTS FOR INDIANS

RECOMMENDED DIETARY ALLOWANCES

ESTIMATED AVERAGE REQUIREMENTS



A REPORT OF THE EXPERT GROUP, 2020 (Updated 2024)

ICMR-National Institute of Nutrition
Indian Council of Medical Research
Department of Health Research
Ministry of Health and Family Welfare
Government of India

Short Summary Report of

NUTRIENT REQUIREMENTS FOR INDIANS

Recommended Dietary Allowances (RDA)

and

Estimated Average Requirements (EAR)

ICMR-National Institute of Nutrition

Hyderabad - 500 007, India

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Tarnaka, Hyderabad-500 007
Telangana, India
Website: www.nin.res.in; Email: nin@nic.in
Phone: +91-40-27197200

Expert Committee Members

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Tarnaka, Hyderabad-500 007

Dr. K. V. Radhakrishna
Consultant, NIN-TATA Centre
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. Kamala Krishnaswamy
Former Director, ICMR-NIN
H.No. 2-98/2, Sriniketan, Kakateeya Nagar Colony
Habsiguda, Hyderabad-500 007

Dr. Prema Ramachandran
Director, Nutrition Foundation of India
C-13, Qutab Institutional Area
New Delhi-110 016

Dr. H. P. S. Sachdev
Sr. Consultant in Paediatrics & Clinical Epidemiology
Sitaram Bharatia Institute
of Science and Research, B-16
Qutab Institutional Area, New Delhi-110 016

Dr. Mahtab. S. Bamji
Former Director Grade Scientist, ICMR-NIN
211, Sri Dattasai Apartments
Charminar x Roads, Hyderabad-500 020

Dr. B. Sesikeran
Former Director, ICMR-NIN
105, Sumeda Apts, St No 2, Habsiguda
Hyderabad-500 007

Dr. G. S. Toteja
Scientist-H & Additional DG and Head (Nutrition)
Indian Council of Medical Research
Ansari Nagar, New Delhi-110 029

Resource Persons

Dr. V. Vijayalakshmi
Scientist G & HoD
Division of Stem Cell Research
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. G. Bhanuprakash Reddy
Scientist G & HoD
Division of Biochemistry
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. Bharati Kulkarni
Scientist F & HoD
Division of Clinical Research
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. Ahamed Ibrahim
Scientist F & HoD
Division of Lipid Chemistry
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. N. Arlappa
Scientist F
Public Health Nutrition Division
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. P. Suryanarayana
Scientist F
Division of Lipid Chemistry
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. Ayesha Ismail
Scientist E
Division of Biochemistry
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. P. Raghu
Scientist E
Division of Biochemistry
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. M. Radhika
Scientist E & HoD
Dietetics Division
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. R. Ananthan
Scientist D
Division of Food Chemistry
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. B. Santosh Kumar
Scientist C
Division of Clinical Research
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. Paras Sharma
Scientist C
Division of Food Chemistry
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. M. Raja Sriswan
Scientist C
Division of Clinical Epidemiology
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. M. Mahesh Kumar
Scientist C
Division of Clinical Epidemiology
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. B. Naveen Kumar
Scientist C
Statistics Division
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. P. Raghavendra
Scientist B
Division of Public Health Nutrition
ICMR-National Institute of Nutrition
Tarnaka, Hyderabad-500 007

Dr. K. Damayanti
Former Scientist-E & HoD
Dietetics Division, ICMR-NIN
H.No.3-4-1007, A-G, M.G. Naidu Apartments
Barkatpura-500 027

Dr. Y. Venkataramana
Former Scientist G, ICMR-NIN
H.No.19-58/2/B/1, Jaya Raghavendra Nagar
Teachers Colony, Kalyanpuri, Uppal
Hyderabad

Dr. Santu Ghosh
Assistant Professor
Dept. of Biostatistics
St. John's Medical College
Bengaluru

Dr. Tinku Thomas
Professor & Head
Dept. of Biostatistics
St. John's Medical College
Bengaluru

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SUMMARY OF RECOMMENDATIONS: ICMR-NIN

1. INTRODUCTION

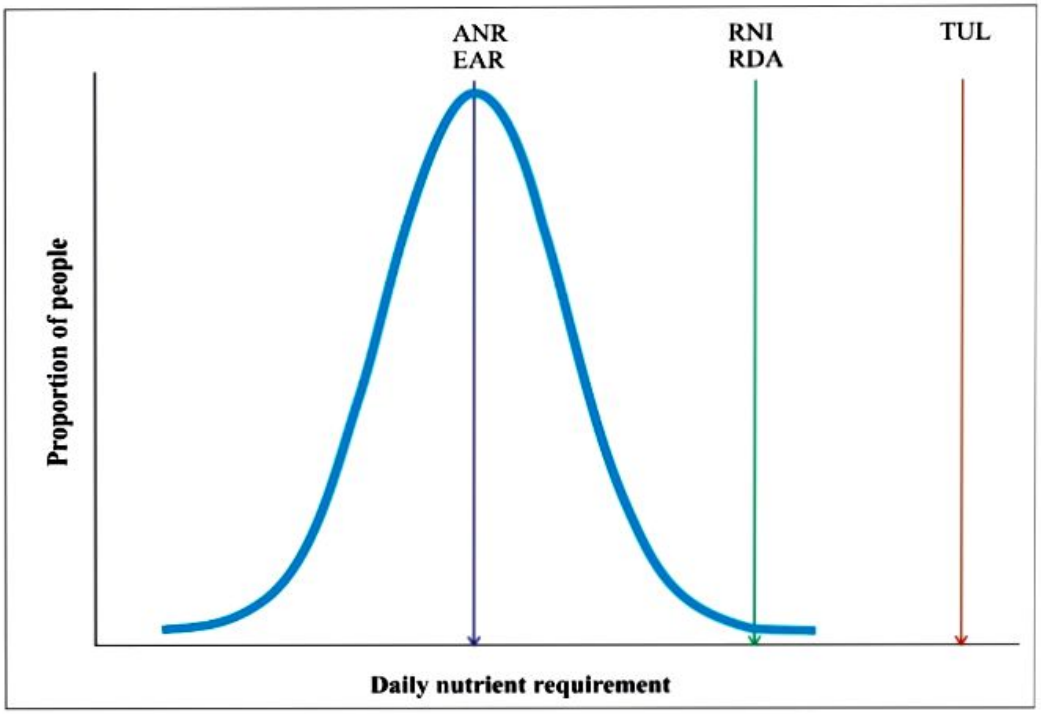
Over the past decade, dietary patterns have changed with economic and nutrition transition at the community level. These rapid changes are relevant to the dual burden of malnutrition in India. Nutrient requirements have to be reviewed with respect to these changes in food intake, access and lifestyle.

Humans require a wide range of foods and nutrients to lead a healthy and active life. Food and nutrient requirement vary considerably depending upon age, sex, physiological status and lifestyle of individuals. The Expert Group of Indian Council of Medical Research, National Institute of Nutrition (ICMR-NIN, 2020 Report) developed the nutrient requirements for Indians, based on concepts related to the distribution of nutrient requirements in normal individuals. The median/mean of this (normal or normalized) requirement distribution is called the Estimated Average Requirement (EAR) and the Recommended Dietary Allowances (RDA) is derived from the EAR. The key measurement is the EAR, which is ideally directly measured experimentally. EAR is adjusted for absorption, which is tightly regulated and varies between individuals depending on nutrient intakes and deficiency status etc. The EAR levels are approximately 80% of the nutrient intake values compared to the RDAs, which is nearly 100% of the nutrient intake level. The goal is to achieve an ≥EAR level of nutrient intake to lead a healthy life. Among healthy population the distribution of nutrient requirement and dietary intake is expected to superimpose (Figure 1). The EAR has to be determined for different ages, since growth imposes its own demands on daily nutrient intake, while aging has its unique impact on the requirement.

Factors that affect nutrient requirements:

- Age
- Gender
- Physical activity
- Body weight
- Physiological status: infants, children, adolescents, pregnancy, lactation, geriatric.

Figure 1. Distribution of the requirements of nutrient in a population, showing ANR/EAR and RNI/RDA. The TUL is also depicted as an intake in excess



Different metrics in the Dietary Reference Intakes (DRI) and their specific uses

Average Nutrient Requirement (ANR) or Estimated Average Requirement (EAR)	This nutrient value (EAR) refers to the average (median/mean) daily nutrient intake level of healthy individuals in a particular life stage and gender group. The EAR is used to calculate the RDA. The EAR is the fundamental value used to evaluate nutrient adequacies and nutrient requirement of individuals and populations or groups. The EAR is also used for meal planning of individuals and groups/ population.
Recommended Nutrient Intake (RNI) or Recommended Dietary Allowance (RDA)	The RDA value is derived from the ANR/EAR as the mean plus 2 standard deviations (SD) of the distribution of nutrient requirements. This value refers to the daily dietary nutrient intake level of nearly all healthy individuals in a particular life stage and gender group. RDA is intended for the purpose of supervised supplementation in deficient individuals or conditions.
Upper Nutrient Level (UNL)or Tolerable Upper Level (TUL)	The TUL refers to the highest daily nutrient intake level that is likely to pose no risk of adverse health effects to almost all individuals in the general population. As intake increases above the UL, the risk of adverse effects will increase. Several foods now being fortified with nutrients, the TUL of intake for nutrients is essential to calculate the risk of exposure to high level of nutrients.

Adequate Intake (AI) or Safe Intake	**These values are used when EAR or RDA cannot be determined. The AI is the recommended average daily intake level based on observed or experimentally determined estimates of nutrient intake by a group of apparently healthy people.**
Lower reference nutrient intake (LRNI) or Lower threshold intake (LTI)	Refers to a value derived from the ANR/EAR and is calculated as the ANR/EAR minus 2 SD of the distribution of requirements. Regular intake of this level of nutrient will lead to deficiency status.

* One should aim to achieve EAR level of nutrients intake.

AMDR: The Acceptable Macronutrient Distribution Ranges (AMDR) is the sixth metric used for macronutrients (dietary carbohydrates, proteins and fats). The AMDR is a range of macronutrient intakes that is associated with a reduced risk of chronic diseases, but at the same time, provides adequate intakes of essential nutrients. It is usually expressed as a percentage of energy, with a lower and upper limit.

General principles for deriving human nutrient requirements:

***Nutrient balance studies*:** Classical metabolic balance studies are expensive and time-consuming. But this technique is known for precision and sensitivity as the study is conducted under controlled conditions. For eg, the carefully defined dietary intake, degree of exercise, and environmental temperature etc.

Obligatory loss of nutrients: Loss of nutrients or its metabolic product (viz. nitrogenous end products of proteins) through urine, faeces and sweat is determined on a diet devoid of, or very low in the nutrient under study (viz. protein-free diet). It represents the maintenance needs of an individual (viz. adults). In infants and children, growth requirements are added.

Nutrient turnover studies: Isotopically labelled nutrients are employed in arriving at the requirement of certain nutrients. The turnover of nutrients in healthy persons is studied to estimate the nutrient requirements.

Factorial approach: In this approach, the nutrients required for different functions, are assessed individually and added up to arrive at the total daily requirement. This has been the basis for computing the energy requirement (viz., sleep+rest+occupational activity+non-occupational activity).

Depletion and repletion studies: This approach is used in arriving at the human requirement of water-soluble vitamins. The level of the vitamin or its coenzyme in serum or cells (erythrocytes, leucocytes) is used as the biochemical marker of the vitamin status. Healthy volunteers are first fed a diet with very low levels of the vitamin till the biochemical parameter of the vitamin (or its coenzyme) reaches a low level. Response to feeding graded doses of the vitamin with the

diet is then determined. The level at which the response increases rapidly corresponds to the level of the requirement of the vitamin.

The detailed version of the Report on 'Nutrient requirements for Indians-2020', provides the scientific database, analytical framework followed, details of the methods used to arrive at the requirement of each of the nutrients in different groups. This short summary report provides the ready reckoner information on EAR, RDA and TUL needed for the practicing clinicians, nutritionists, dietitians, public health professionals and food industry.

The new version of the short summary has been updated and includes changes as mentioned bellow

1. A summary table has been included which defines food-based approaches to fulfill the daily nutrient requirements (Table A7) for all age groups.
2. The summary tables of RDA & EAR for each nutrient is now included separately.
3. Recommendations on phosphorus has been revisited keeping in view the required molar ratio of the calcium and phosphorus intake in humans.
4. Weight based energy requirement and method of calculation has been introduced.

2. REFERENCE BODY WEIGHT

The present committee (2020) has considered the recent, nationally representative datasets such as the National Nutrition Monitoring Bureau (NNMB, 2015–16), National Family Health Survey-4 (NFHS-4, 2015–16), the World Health Organization (WHO, 2006–07) and the Indian Academy of Paediatrics (IAP 2015) to derive acceptable reference body weight values through the lifespan. The 95th centile of height was taken, for adult male and female, as it represents full growth potential. The reference body weight for male and female were derived from the median weight of male and female population whose height and BMI (18.5–22.9kg/m2) were in the proposed range (the height and BMI are only for reference purpose).

The reference Indian adult man is 19–39 years old, with a body weight of 65 kg; and the reference Indian adult woman is 19–39 years old and weighing 55 kg. These body weights were derived for the 95th centile height (NNMB data) to achieve a normal BMI.

Reference body weights that were used to define nutrient requirements for Indian population in specified age groups.

Category	Age Group	Body weights (kg)
Adult Men	>18y	**65.0**
Adult Women	>18y	**55.0**
Infants	0–6m	**5.8**
	6–12m	**8.5**
Children	1–3y	**12.9**
	4–6y	**18.3**
	7–9y	**25.3**
Boys	10–12y	**34.9**
Girls	10–12y	**36.4**
Boys	13–15y	**50.5**
Girls	13–15y	**49.6**
Boys	16–18y	**64.4**
Girls	16–18y	**55.7**

Age groups for Children and Boys/Girls: e.g., 1 to 3 yrs means 1+ to 3 yrs 11months; 4 to 5 yrs means 4+ to 5 year 11 months and so on.

3. ENERGY REQUIREMENTS

The total energy requirement or the total energy expenditure (TEE) is the product of the basal metabolic rate (BMR) and physical activity level (PAL): TEE=BMR x PAL. The BMR is calculated by using double labelled water or whole-body calorimeter or by factorial approach. The PAL is the ratio of the energy expenditure for 24 hours and the BMR over 24 hours. While the physical activity ratio (PAR) is the ratio of the energy cost of an individual activity per minute to the cost of the BMR per minute. The aggregate of PAR values of a 24-hour period yields the PAL values. In the 2020 Nutrient Requirements, the gender and age specific equations that were derived by the FAO/WHO/UNU 2004 were used to predict energy requirements. However, the data generated for the Schofield equation used in FAO/WHO/ UNU were found to overestimate the energy requirements for Indians, perhaps due to the fact that these data were derived from studies conducted on muscular, young men. Secondly, the energy spent for each physical activity, the PAR, was also found to be lower for Indians. Altered body composition, with relatively more fat and lower lean mass among Indians, has been hypothesised to the observed lower BMR and PAR values in studies conducted in India. To correct this variance, the earlier ICMR-NIN, 2010 Nutrient requirement committee, used the FAO/WHO/UNU 2004 equation and reduced the BMR value by 5% while deriving energy requirements for Indian adults. While the 2020 Nutrient Requirement Committee, based on the evidence, further reduced the BMR by another 5 % for adults with a total of 10% reduction from the global BMR values of FAO/WHO/UNU 2004 (Table 1). Energy requirements for different body weights are given in tables 2 and 3; however, the recommendations in these tables are based on normal weight for height (Body Mass Index, BMI) calculations and hence are not suitable for those who are under weight or overweight. Underweight people should consume additional calories from nutritious food to gain appropriate BMI (18.5–23). Also refer Table A7 to get an idea about food-based approach to meet the needed energy and protein requirement.

As data on pregnant Indian women is unavailable, the present committee has retained the additional energy requirement proposed by ICMR 2010. In the case of lactation, the average energy utilization for milk production based on actual observation was taken into consideration and an increase has been considered. However, no changes from the previous recommendations have been made in the additional requirements of lactating women.

Similar to the earlier committee, the current committee had adopted the FAO/WHO/UNU, 2004 equations for deriving the energy requirement for infants and children in the absence of Indian data. However, the present committee has used the WHO child growth standard data for body weight of children and re-analyzed the energy requirement for infants and children (Table 4). With the use of these values, a minor increase in the requirements of energy of 1-2 kcal/kg body weight/day, for infants and children up to six years of age, is reported when compared to the previous recommendations. Among children of 13–17 years, there was an increase in requirements on account of using same quadratic equation generated from FAO/ WHO/ UNU

2004 to which a higher PAL value was used based on a higher physical activity level. It is recommended that children should be engaged in moderate physical activity.

Table 1. Energy requirements of Men weighing 65 kg and Women weighing 55 kg

Category	Physical activity level	Body weight	Energy (Kcal/d)[a]
Men*	Sedentary work	65.0	2110
	Moderate work	65.0	2710
	Heavy work	65.0	3470
Women*	Sedentary work	55.0	1660
	Moderate work	55.0	2130
	Heavy work	55.0	2720
[b]Pregnant Women	-	55.0	addl. calories 350
Lactating (0–6m)	-	55.0	addl. calories 600
Lactating (7–12m)	-	55.0	addl. calories 520

[a] Rounded off to the nearest 10 Kcal/d

* Energy requirements is specific for given body weight, gender and physical activity. Men and women with different body weights may refer to Tables 2 and 3.

[b] GWG-Gestational Weight Gain. Energy need in pregnancy should be adjusted for actual bodyweight, observed weight gain and activity pattern for the population.

Table 2. Estimated energy requirements for Indian Men (to maintain normal BMI) as per body weight and age

(Refer to Table A7 for food-based recommendations)

Body Weight (kg)	18-30 y		30-60 y		>60 y	
	Sedentary Activity TEE	Moderate Activity TEE	Sedentary Activity TEE	Moderate Activity TEE	Sedentary Activity TEE	Moderate Activity TEE
	(Kcal/d)					
50	1823	2344	1824	2346	1478	1900
51	1842	2369	1839	2364	1492	1919
52	1862	2393	1853	2383	1507	1938
53	1881	2418	1868	2402	1522	1957
54	1900	2442	1882	2420	1537	1976
55	1919	2467	1897	2439	1551	1995
56	1938	2491	1911	2458	1566	2013
57	1957	2516	1926	2476	1581	2032
58	1976	2540	1940	2495	1596	2051
59	1995	2565	1955	2513	1610	2070
60	2014	2589	1969	2532	1625	2089
61	2033	2614	1984	2551	1640	2108
62	2052	2638	1998	2569	1655	2127
63	2071	2662	2013	2588	1669	2146
64	2090	2687	2027	2607	1684	2165
65	2109	2711	2042	2625	1699	2184
66	2128	2736	2056	2644	1713	2203
67	2147	2760	2071	2662	1728	2222
68	2166	2785	2085	2681	1743	2241
69	2185	2809	2100	2700	1758	2260
70	2204	2834	2114	2718	1772	2279
71	2223	2858	2129	2737	1787	2298
72	2242	2883	2143	2756	1802	2317
73	2261	2907	2158	2774	1817	2336
74	2280	2932	2172	2793	1831	2355
75	2299	2956	2187	2812	1846	2374
76	2318	2980	2201	2830	1861	2393
77	2337	3005	2216	2849	1876	2412
78	2356	3029	2230	2867	1890	2430
79	2375	3054	2245	2886	1905	2449
80	2394	3078	2259	2905	1920	2468
81	2413	3103	2274	2923	1935	2487

BMR calculated using FAO/WHO/UNU, 2004 equation and adjusted to 10% lower value.
Physical Activity Level (PAL) Values: Sedentary–1.40; Moderate–1.80; Total Energy Expenditure (TEE) or EAR= BMR x PAL (Pl. refer to Table 5 for calculation). Body Mass Index: Normal BMI ranges from 18.5 to 23.

Table 3. Estimated energy requirements for Indian women (to maintain normal BMI) as per body weight and age

(Refer to Table A7 for food-based recommendations)

Body Weight (kg)	18-30 y		30-60 y		>60 y	
	Sedentary Activity TEE	Moderate Activity TEE	Sedentary Activity TEE	Moderate Activity TEE	Sedentary Activity TEE	Moderate Activity TEE
	(Kcal/d)					
45	1468	1888	1542	1982	1361	1749
46	1487	1912	1552	1995	1372	1764
47	1506	1936	1562	2009	1384	1779
48	1525	1961	1573	2022	1395	1794
49	1544	1985	1583	2035	1407	1809
50	1563	2009	1593	2048	1419	1824
51	1582	2033	1604	2062	1430	1839
52	1600	2058	1614	2075	1442	1854
53	1619	2082	1624	2088	1453	1869
54	1638	2106	1635	2102	1465	1884
55	1657	2130	1645	2115	1477	1898
56	1676	2155	1655	2128	1488	1913
57	1695	2179	1666	2141	1500	1928
58	1714	2203	1676	2155	1511	1943
59	1732	2227	1686	2168	1523	1958
60	1751	2252	1696	2181	1535	1973
61	1770	2276	1707	2194	1546	1988
62	1789	2300	1717	2208	1558	2003
63	1808	2324	1727	2221	1569	2018
64	1827	2349	1738	2234	1581	2033
65	1846	2373	1748	2247	1593	2048
66	1864	2397	1758	2261	1604	2062
67	1883	2421	1769	2274	1616	2077
68	1902	2446	1779	2287	1627	2092
69	1921	2470	1789	2301	1639	2107
70	1940	2494	1800	2314	1650	2122
71	1959	2518	1810	2327	1662	2137
72	1978	2543	1820	2340	1674	2152
73	1996	2567	1831	2354	1685	2167

BMR calculated using FAO/WHO/UNU, 2004 equation and adjusted to 9% lower value.
Physical Activity Level (PAL) Values: Sedentary–1.40; Moderate–1.80; Total Energy Expenditure (TEE) or EAR= BMR x PAL (Pl. refer to Table 5 for calculation). Body Mass Index: Normal BMI ranges from 18.5 to 23.

Energy needs of children and adolescents have been computed for reference children and adolescents; these reference children were assumed to have a moderate daily physical activity level. The actual requirement in specific population groups should be adjusted for the actual weight and physical activity of that population, especially when computing the gap between energy requirement and actual intake that needs to be filled by supplementation programs.

Table 4. Energy requirements of Infants, Children and Adolescents Boys & Girls for the given body weights

Category	Age group	Body weight	Requirement	
			(Kcal/d)[a]	(Kcal/kg/day)
Infants	0–6 m	5.8	530	90
	6–12m	8.5	660	80
Children	1–3y	12.9	1110	83
	4–6y	18.3	1360	74
	7–9 y	25.3	1700	67
Boys	10–12y	34.9	2220	64
Girls	10–12y	36.4	2060	57
Boys	13–15y	50.5	2860	57
Girls	13–15y	49.6	2400	49
Boys	16–18y	64.4	3320	52
Girls	16–18y	55.7	2500	45

[a] Rounded off to the nearest 10 Kcal/d

How to calculate Total Energy Expenditure (TEE)/ Total Energy Requirement (TER)

For example, a male adult weighing 60 kg, aged 20 years, the value obtained with FAO/WHO/ UNU equation (15.1 x B.W.(kg) + 692.2) is multiplied by 0.90, to obtain the BMR of 1438 kcal/day for Indian males. Similarly, for a female adult weighing 50 kg, aged 20 years, the value obtained with FAO/WHO/UNU equation (14.8xB.W.(kg)+486.6) is multiplied by 0.91 to obtain the BMR of 1116 kcal/day for Indian females (Table 5). The estimated BMR value should be multiplied with physical activity level (PAL); that is 1.4 for sedentary life style, 1.8 for moderate activity or 2.5 for those with heavy physical activity status. The TEE = BMR xPAL.

Table 5. Prediction equation FAO/ WHO/ UNU Consultation (2004)

Sex	Age (years)	Prediction equation proposed by FAO/WHO/UNU Consultation (2004)
Males	18–30	15.1xB.W.(kg)+692.2
	30–60	11.5xB.W.(kg)+873
	>60	11.7xB.W.(kg)+587.7
Females	18–30	14.8xB.W.(kg)+486.6
	30–60	8.1xB.W.(kg)+845.6
	>60	9.1xB.W.(kg)+658.5

4. PROTEIN REQUIREMENTS

The present Expert Group of the ICMR-NIN adopted the following approaches to define the protein requirements for Indians of different age groups. A median obligatory nitrogen loss of 48 mg/kg (WHO, 2007) has been used to compute mean (0.66 g/kg/day) and a safe quality protein requirement (0.83 g/kg/day) for healthy Indian adults (Table 6). Most habitual diets in India provide 10 to 15% Energy from protein. The total protein (crude protein) from diets multiplied with 0.8 provides the value for quality protein. For example, if the total crude protein intake from diets is 60g per day then 60x0.8=48g/day, which is the quality protein intake. However, qualitatively the total protein consumed may not necessarily provide all the essential amino acids (EAA). It is therefore important to comprehend that to achieve adequate levels of all AAs (quality), food-based allowance is the ideal method of recommendation for protein quality adequacy. Cereals have lower levels of lysine and higher levels of sulphur-containing amino acids (methionine and cysteine) and the reverse is true for pulses. Appropriate combination of cereals with pulses (pulses, beans) in the ratio of 3:1 (raw weight) and adding 250 ml milk per day to the diet can provide good quality proteins, wherein all the EAA are met. Non-vegetarians can easily source their proteins from recommended level (700 to 900 g/week of fish, poultry or lean meat) of flesh food consumption for adults.

Considering high quality protein sources as the premise for defining requirements, the present committee has removed the protein digestibility corrections (PDCAAS) applied on safe intakes for all age groups. However, for people consuming protein from a cereal-based diet with lower quality protein, the requirement was estimated to be 1 g/kg per day. The EAR of 0.66 g/kg/day and an RDA of 0.83/kg/day translates to an EAR of 43 g protein/day or RDA of 54 g protein/day for a person weighing 65 kg, regardless of physical activity or gender. The recommended amount of protein can be easily met through judicious combination of grains, pulses, nuts and milk.

A newer protein quality index, digestible indispensable amino acid score (DIAAS), which is based on true ileal digestibility of individual amino acids has been introduced in the current document. Data on true ileal amino acid digestibility values of both high and low quality proteins in Indian adults and children, obtained using dual tracer method has been included in the present document.

Diets for sedentary and moderate active man and woman, and pregnant woman have been modified based on the revised energy and protein requirements. The nutritive values of each food are taken from recently published Indian Food Composition Tables (IFCT, 2017). In addition, the protein contents of each food group have been corrected for true fecal digestibility values (WHO, 2007) to ensure safe protein intakes. The cereal-pulse-milk composition (Refer Table A7) of the diet has been improved to 3:1:2.5 as compared to the earlier 11:1:3 (ICMR 2010).

Table 6. EAR and RDA of Protein (for quality protein) for various physiological groups

Groups		Reference body weight (kg)	#EAR (g/d)	#RDA (g/d)	*EAR (g/kg/d)	*RDA (g/kg/d)	TUL$ (PE ratio)
Adult Men	Sedentary	65	43.0	54.0	0.66	0.83	<40%
	Moderate						<40%
	Heavy Work						<40%
Adult Women	Sedentary	55	36.0	46.0	0.66	0.83	<40%
	Moderate						<40%
	Heavy Work						<40%
Pregnant Women^	2nd Trimester	55 + GWG	44.0	55.5	0.66 (additional 7.6g/day)	0.83 (additional 9.5g/day)	<30%
	3rd Trimester		54.0	68.0	0.66 (additional 17.6g/day)	0.83 (additional 22.0g/day)	<30%
Lactating Women^	0–6 months	55	50.0	63.0	0.66 (additional 13.6g/day)	0.83 (additional 17.0g/day)	<40%
	6–12 months		47.0	59.0	0.66 (additional 10.6g/day)	0.83 (additional 13.0g/day)	<40%
Infants	0–6 months	5.8	7.0	8.0	1.16	1.40	<15%
	6–12 months	8.5	9.0	10.5	1.04	1.23	<15%
Children	1–3y	12.9	10.0	12.5	0.79	0.97	<15%
	4–6y	18.3	13.0	16.0	0.70	0.87	<15%
	7–9y	25.3	19.0	23.0	0.75	0.92	<15%
Boys	10–12y	34.9	26.0	32.0	0.75	0.91	<15%
Girls	10–12y	36.4	27.0	33.0	0.73	0.90	<15%
Boys	13–15y	50.5	36.0	45.0	0.72	0.89	<15%
Girls	13–15y	49.6	35.0	43.0	0.70	0.87	<15%
Boys	16–18y	64.4	45.0	55.0	0.70	0.86	<15%
Girls	16–18y	55.7	37.0	46.0	0.66	0.83	<15%

Additional protein requirement at 2nd and 3rd trimester over and above 0.66 g /kg/day for pregnant women with GWG of 10 kg and for lactating women are given. For GWG of 12 kg, see Table 5.2 in the Full version (https://www.nin.res.in/RDA_Full_Report_2020.html).

* For people consuming cereal-based diet with low quality protein, the protein requirements are 1 g/kg per day.

\# Total protein required per day for 55kg body weights are given in column 3. For specific body weight one can calculate from EAR column* that provides protein requirement for per kg body weight

$ Tolerable Upper Limits (TUL) indicates <15-40% of total energy from proteins.

^ EAR: Pregnant women (during 2nd & 3rd Trimester) and lactating women (during 0-6 & 6-12 months) should additionally take 7.6gm & 17.6gm and 13.6gm & 10.6gm of protein per day respectively.

^ RDA: Pregnant women (during 2nd & 3rd Trimester) and lactating women (during 0-6 & 6-12 months) should additionally take 9.5gm & 22 gm and 17gm & 13gm of protein per day respectively. Additional protein recommendation of protein is for 10 kg gestational weight gain (GWG)

For details Refer: Chapter Protein; Nutrient Requirements for Indians-Recommended Dietary Allowances and Estimated Average Requirements, 2020.

5. FATS AND OILS

The FAO/ WHO recommendations on fats were taken into account. The recommendations are directed towards meeting the requirements for optimal fetal and infant growth and development, maternal health and for combating Diet Related Non-Communicable Diseases (DR-NCD) in adults. An upper limit of 30% energy from total fats has been recommended, with 10% each from saturated fatty acids (SFA), mono unsaturated fatty acids (MUFA) and poly unsaturated fatty acids (PUFA) (Table 7).

There was a conscious effort to provide physical activity-based recommendations. Consequently, the upper limit of visible fat intake for sedentary, moderate and heavy activity has been set at 25, 30 and 40 g/d for adult man and 20, 25 and 30 g/d for adult woman (Table 7) as against the single level recommended earlier. PUFAs such as linoleic acid (also known as n-6 or omega 6 or LA) and alpha linolenic (also known as n-3 or omega 3 or ALA) cannot be formed in our body, hence they are categorised as essential, and a dietary source is important to meet the LA and ALA needs of the body.

Edible plant foods have a low content of fat and SFAs (except for nuts and oilseeds) and are fairly good sources of MUFAs and PUFAs. In most cereals, and pulses, fat content ranges between 1.5-3%. In cereals, and most oilseeds, LA is the major fatty acid, whereas pulses/ beans, green leafy vegetables, some oilseeds and fenugreek seeds are good sources of both LA and ALA. LA and ALA are precursors of long chain PUFA (LC-PUFA) such as AA (Arachidonic acid) and EPA (Eicosapentaenoic acid) & DHA (Docosahexaenoic acid) which are essential for growth and development among children and metabolic functions in adults. Adequate consumption of nuts, oilseeds, grains, pulses, leafy vegetables, fish and sea foods will meet the requirements of both the essential PUFAs.

- Minimum of 20% E should come from dietary fats to ensure adequate consumption of essential fatty acids and fat-soluble vitamins for adults.
- 30-35% E is the maximum total fat recommended for adults. To optimize health, special attention should be given to both the overall dietary pattern, in terms of types of food consumed, and total energy intakes.
- The RDA for ALA is 1.6g per day for men and 1.1g per day for women. And, atleast 10% of the total ALA should be contributed by EPA and DHA. The Food and Agriculture Organization (FAO-2010) recommends 300mg per day EPA+DHA (100mg EPA and 200mg DHA per day) for adults, which can be obtained from an intake of 250g of marine fish (fatty fish) per week.
- Recommended intakes are summarized in Table 7. Of the recommended total fats (30% E), at least 50% should come from dietary fats and added fats (used for cooking) should not be more than 15% of total energy per day (Table 7).

Table 7. Recommendations for dietary fat intake for various physiological groups

Gender/ Age/ physiological groups	Physical activity level	Minimum level of total fat (% E)	Minimum level* of fat (%E) from foods (Excluding fats/oils used for cooking)	Added or visible fat	
				%E	g/p/d
Adult men >18y	Sedentary	20	15	15	25
	Moderate				30
	Heavy				40
Adult women >18y	Sedentary	20	15	15	20
	Moderate				25
	Heavy				30
Pregnant women	–	20	15	15	30
Lactating women	–				30
Infants 0–6 m	–	40–60	Human milk		
6–24 m	–	35	15	20	25
Children 3–6 y	–	25	15	15	25
7–9 y					30
Boys 10–12 y	–				35
13–15 y					45
16–18 y					50
Girls 10–12 y	–				35
13–15 y					40
16–18 y					35

* If diet provides higher than 10% E from fat, visible fat requirement proportionately reduces.

6. DIETARY FIBRE

For the first time committee considered recommendations for fiber based on energy intake. Accordingly, about 15g/1000 Kcal and 30g/2000 Kcal are considered as safe intake. No additional total dietary fibre allowances are given for pregnant and lactating women as intakes in these population were similar to that of NPNL women.

7. CARBOHYDRATES

The quantity and quality of CHO are important to maintain good health and have been indicated substantially to impact nutrition related chronic disorders/non-communicable diseases (NCDs). For the first time recommendations have been made for the dietary intakes of carbohydrates. A minimum intake of 100g–130g of carbohydrates/day should be ensured for ages one year and above. This level is the minimum required for brain glucose utilization.

8. MINERALS

The present committee has done extensive deliberations on recommendations for minerals like calcium, phosphorus, zinc, selenium and iodine and have been included as separate chapters in the new document.

Calcium and Phosphorus

The previous committee in 2010, considering balance studies and ICMR multi-centric study and derived 600mg/day calcium for adults. However, it is important to note that the calcium zero retention set at 334mg for men by the previous committee, is much lower than other countries. There is a further uncertainty as to the true retention rates as there is a wide variability seen from various countries. Attaining peak bone densities is essential to prevent osteoporotic fractures in later life. Also attaining optimal accretion rate of bone mass during puberty is critical for optimum body size and skeletal maturity. There is concern that women from low-income group are exposed to a greater risk of developing bone abnormalities due to poor nutrition and their occupational or non-occupational activity aggravating the situation. Based on the dietary intake versus bone density projections from ICMR multi-centric data and based on the evidence from balance studies and bone density studies, the current committee has considered an EAR of 800 mg for the adult population.

Adding 25% (2 CV), RDA has been set at 1000 mg for adult males and females (Table 8). Taking into consideration a twofold increase in calcium absorption that occur during pregnancy and lactation, the same values as adults were retained for pregnant and lactating women. However, during menopause, calcium requirement is increased due to poor absorption.

Phosphorus: The urban dietary surveys in 16 states, showed mean phosphorus intakes of 270 mg/day in infants, 457mg/day in children aged 1 to <3 years, 615 to 700mg/day in children aged 3 to <10 years, 830 to 837mg/day in children aged 10 to <18 years and 1117mg/day in adult males and 992 mg/day in adult females (≥18 years). Using the calcium to phosphorus molar ratio in bone and adjusting for the proportion of calcium and phosphorus found outside bone (IOM), the adequate intake (AI) for phosphorus has been revised and set the P requirement based on a molar ratio of 1:1 with Ca (Table 8).

Table 8. EAR and RDA of Calcium and Phosphorus for various physiological groups

Category	Age group	Calcium (Ca)		Phosphorus (P)
		EAR (mg/day)	RDA (mg/day)	AI (mg/day)
Adult Men	>18 y	800	1000	600
Adult Women (NPNL)	>18 y	800	1000	600
Pregnant women	-	800	1000	600
Lactating women	-	1000	1200	750
Post-menopausal women	-	1000	1200	750

Infants	0–6 m 6–12m	-	300 (AI)	200
Children	1–3y	400	500	300
	4–6y	450	550	350
	7–9 y	500	650	400
Boys	10–12y	650	850	500
Girls	10–12y	650	850	500
Boys	13–15y	800	1000	600
Girls	13–15y	800	1000	600
Boys	16–18y	800	1000	600
Girls	16–18y	800	1000	600

Magnesium: Dietary requirements of magnesium was derived using available data on intakes, faecal loss, urinary loss and balance. Accordingly, the dietary intake of Mg, for a zero balance after accounting for absorption, was calculated to be 368mg/day. This was rounded to 370mg/day and was considered to be the average requirement (EAR) for adult males and was extrapolated, based on body weight, for other physiological groups (Table 9).

Table 9. EAR and RDA of Magnesium for various physiological groups

Category	Age group	EAR (mg/day)	RDA (mg/day)	TUL* (mg/day) [pharmacological preparation]
Adult men	>18 y	370	440	350
Adult women	>18 y	310	370	350
Pregnant	-	370	440	350
Lactating	-	335	400	350
Infants	0–6 m	-	30 (AI)	-
	6–12m	-	75 (AI)	-
Children	1–3y	73	90	65
	4–6y	104	125	110
	7–9 y	144	175	110
Boys	10–12y	199	240	350
Girls	10–12y	207	250	350
Boys	13–15y	287	345	350
Girls	13–15y	282	340	350
Boys	16–18y	367	440	350
Girls	16–18y	317	380	350

*Note: TUL values are only for non-dietary pharmacological doses only.

Sodium and Potassium: Specific recommendations have been made on adequate intakes for sodium and potassium for adult man and woman based on WHO (2012) recommendation. With regard to sodium due to emerging concerns on prevalence of hypertension, a safe intake of 2000mg sodium per day which amounts to 5g salt per day is recommended; while an intake of

3500mg/day is recommended for potassium. The desirable sodium: potassium molar ratio from the diet was fixed at 1:1 (Table 10).

Table 10. Recommended intakes of sodium and potassium

Category/ Age group		Molar ratio	Sodium mg/d	Potassium mg/d
Adult (18–60y)	Men	1:1	2000	3500
	Women	1:1	2000	3500
Infants	0–6 m	1:1	500	900
	7–12 m	1:1	650	1100
Children	1–3 y	1:1	1000	1750
	4–6 y	1:1	1300	2250
	7–9 y	1:1	1600	2825

Iron: The iron requirements were derived using factorial approach, where the average iron losses from the body such as sweat, urine, seminal fluid, menstrual losses and endogenous fecal iron excretion. Additional requirements for growth and lactation were summed, and adjusted for bioavailability to derive the EAR (Table 11). Additional requirements for growth and lactation were added. The bioavailability of 8% was considered for men, women and adolescents, 9% for 0.5–1 year infants, 6% for children, and 12% for pregnant women, based on available studies in India. Consumption of 20mg/1000 kcal ascorbic acid (vitamin C) in the daily diet was also recommended for improved iron absorption (Table 11).

Table 11. EAR and RDA for Iron for various physiological groups

Category	Age group	EAR (mg/day)	RDA (mg/day)	TUL (mg/day)
Adult men	>18 y	11	19	45
Adult women	>18 y	15	29	45
Pregnant*	-	21	27	45
Lactating	-	16	23	45
Infants	0–6 m	--	--	40
	6–12m	4	6	40
Children	1–3y	6	8	40
	4–6y	8	11	40
	7–9 y	10	15	40
Boys	10–12y	12	16	40
Girls	10–12y	16	28	40
Boys	13–15y	15	22	45
Girls	13–15y	17	30	45
Boys	16–18y	18	26	45
Girls	16–18y	18	32	45

*Due to high variation (Standard Deviation) in iron losses through menstruation, the RDA for non-pregnant women is higher compared to pregnant women.
EAR and RDA are given as average of all 3 trimester for a woman having 12kg GWG.

Zinc: The Zn requirements were derived using factorial approach, where the average zinc losses from the body such as sweat, urine, seminal fluid, menstrual losses and endogenous fecal zinc excretion and additional requirements for growth and lactation were summed, and adjusted for bioavailability to derive EAR. Additional requirements for growth and lactation were added. The RDA was computed by assuming 10% CV. Based on studies conducted in India and elsewhere 23% bioavailability was assumed for all age and gender groups, except that 25% and 30% bioavailability was considered for pregnant and lactating women, respectively (Table 12).

Table 12. EAR and RDA of zinc for various physiological groups

Category	Age group	EAR (mg/day)	RDA* (mg/day)
Adult men	>18 y	14.1	17
Adult women	>18 y	11.0	13.2
Pregnant#	-	12.0	14.5
Lactating	-	11.8	14.1
Infants	0–6 m	-	-
	6–12m	2.1	2.5
Children	1–3y	2.8	3.3
	4–6y	3.7	4.5
	7–9 y	4.9	5.9
Boys	10–12y	7.0	8.5
Girls	10–12y	7.1	8.5
Boys	13–15y	11.9	14.3
Girls	13–15y	10.7	12.8
Boys	16–18y	14.7	17.6
Girls	16–18y	11.8	14.2

*RDA was computed by multiplying EAR with a factor of 1.2.

#Pre-pregnancy weight; EAR and RDA is given as average of all 3 trimester for a woman having 10 kg GWG (Refer to Table 10.2 of Full version: Nutrient Requirements for Indians-Recommended Dietary Allowances and Estimated Average Requirements, 2020).

Copper (Cu), Manganese (Mn), Chromium (Cr) and Selenium (Se):

The RDA for Cu, Cr and Mn have been considered separately in view of their importance and a brief account of relevant information on the nutritional significance and suggested adequate dietary intakes for adults are provided in this report. The present Committee recommended 40 µg/day as adequate intake of selenium (Table 13).

Table 13. Absorption and acceptable intakes of Cu, Mn, Cr and Se for Indian adults

Trace elements	Indian adults	
	Mean and range (Absorption %)	Acceptable intake*
Cu (mg/d)	18 (7–37)	1.7
Mn (mg/d)	14 (2–24)	4.0
Cr (µg/d)	79 (63–94)	50
Selenium (µg/d)	≈ 90	40

Iodine: Based on accumulation of radioiodine in the thyroid gland in turnover studies observed in euthyroid individuals, and positive iodine balance studies in adults with normal thyroid function, the requirements of iodine were estimated and considering a CV of 20% due to variations in experimental design, the RDA was calculated. Accordingly, the EAR for Indian adults ≥19y (Men and Women) is set at 95µg/day and the RDA at 133µg/day, which is rounded off to 140µg/day (Table 14).

Table 14. EAR and RDA of Iodine for various physiological groups

Category	Age group	EAR(µg/day)	RDA(µg/day)	TUL**(µg/day)
Adult men	>18 y	95	140	1100
Adult women	>18 y	95	140	1100
Pregnant	-	160	220	1100
Lactating	-	200	280	1100
Infants	0–6 m	100 (AI)		ND
	6–12m	130 (AI)		ND
Children	1–3y	65	90	200
	4–6y	65	90	300
	7–9 y	65	90	400
Boys	10–12y	70*	100	600
Girls	10–12y	70*	100	600
Boys	13–15y	100*	140	900
Girls	13–15y	100*	140	900
Boys	16–18y	100*	140	1100
Girls	16–18y	100*	140	1100

* The values are pooled for gender; ** The TUL recommended by IOM, 2001 for adult men, adult NPNL women, pregnant women and lactating women was considered. Average adult reference body weight (men and NPNL women) of 60kg was considered to extrapolate TUL values for children and adults based on reference body weights.

9. VITAMINS

9.1. Water Soluble Vitamins

Thiamine (B1): The requirement of thiamine was determined by plotting erythrocyte transketolase activity coefficient (ETK-AC) values versus dietary thiamine intake data obtained from healthy human adult population studies. Average requirement (EAR) was calculated from regression analysis. The acceptable cut-off used for ETK-AC is 1.15. The EAR of thiamine is estimated as 1.2. Based on the ETK-AC cut-off and with assumed normal distribution for adult men the corresponding RDA is set at 1.4. Similarly, EAR of thiamine is 1.1 and corresponding RDA is 1.4 for adult women. Additional allowances of thiamine were made for pregnant and lactating women based on the additional calorie allowances of current recommendations (Table 15).

Riboflavin (B2): The requirement of riboflavin was determined by plotting erythrocyte glutathione reductase activity coefficient (EGR-AC) values versus dietary riboflavin intake data obtained from human studies. Average requirement (EAR) was calculated from regression analysis. The acceptable cut off used for EGR-AC is 1.2. Based on the cut-off and intake data, the EAR for riboflavin is arrived at 1.6 and corresponding RDA is 2.0 for adult men. Similarly, EAR of riboflavin is 1.6 and corresponding RDA is 1.9 for adult women. Additional allowances of riboflavin were made for pregnant and lactating women based on the additional calorie allowances of current recommendations (Table 15).

Table 15. Recommended intakes of Thiamine and Riboflavin for various physiological groups

Category/ Age group	Physical activity level	Thiamine		Riboflavin	
		EAR (mg/d)	RDA (mg/d)	EAR (mg/d)	RDA (mg/d)
Adult men >18y	Sedentary	1.2	1.4	1.6	2.0
	Moderate	1.5	1.8	2.1	2.5
	Heavy	1.9	2.3	2.7	3.2
Adult women >18y	Sedentary	1.1	1.4	1.6	1.9
	Moderate	1.4	1.7	2.0	2.4
	Heavy	1.8	2.2	2.6	3.1
Pregnant	--	1.6	2.0	2.3	2.7
Lactating	--				
0–6m		1.7	2.1	2.5	3.0
7–12m		1.7	2.1	2.4	2.9
Infants	--	-	0.2 (AI)	-	0.4 (AI)
0–6 m		-	0.4 (AI)	-	0.6 (AI)
6–12m					
Children	--	0.6	0.7	0.8	1.1
1–3y		0.8	0.9	1.1	1.3
4–6y		1.0	1.1	1.3	1.6
7–9 y					

Boys 10–12y	--	1.3	1.5	1.7	2.1
Girls 10–12y	--	1.2	1.4	1.6	1.9
Boys 13–15y	--	1.6	1.9	2.2	2.7
Girls 13–15y	--	1.3	1.6	1.9	2.2
Boys 16–18y	--	1.9	2.2	2.5	3.1
Girls 16–18y	--	1.4	1.7	1.9	2.3

Niacin (B3): Diet surveys from India show that the average intake of niacin is around 10 mg daily. Based on the EAR of 5.6mg/1000 kcals for adults, which was derived by urinary metabolite studies of niacin, 10% CV (20% 2SD) was added to EAR to derive the RDA. Individual requirements were computed based on energy requirements. The EAR (RDA) was set at 12mg/day (14mg/day) and 9mg/day (11mg/day) for sedentary men and women respectively (Table 16).

Table 16. Recommended intakes of Niacin for various physiological groups

Category/ Age group	Physical activity level	EAR (mg/d)	RDA (mg/d)
Adult men >18y	Sedentary	12	14
	Moderate	15	18
	Heavy	19	23
Adult women >18y	Sedentary	9	11
	Moderate	12	14
	Heavy	15	18
Pregnant	--	11	13
Lactating	--	13	16
0–6m		13	16
7–12m			
Infants	--	2 (AI)	
0–6 m		5 (AI)	
6–12m			
Children	--	6	7
1–3y		8	9
4–6y		10	11
7–9 y			
Boys 10–12y	--	12	15
Girls 10–12y	--	12	14
Boys 13–15y	--	16	19
Girls 13–15y	--	13	16
Boys 16–18y	--	19	22
Girls 16–18y	--	14	17

Pantothenic acid (B5): Based on intakes of apparently healthy people an AI of 5mg per day for adults and pregnant women is proposed, with an additional allowance of 2mg/day for lactating women accounting for losses through breast milk. The AI for children and adolescents is set at 4 & 5mg/day (Table 17).

Table 17. Recommended intakes of Pantothenic acid (B5) for various physiological groups

Category	Age group	AI (mg/day)
Adult men	>18 y	5
Adult women	>18 y	5
Pregnant	-	5
Lactating	-	7
Infants	0–6 m	2
	6–12m	2
Children	1–3y	2
	4–6y	3
	7–9 y	4
Boys	10–12y	5
Girls	10–12y	5
Boys	13–15y	5
Girls	13–15y	5
Boys	16–18y	5
Girls	16–18y	5

Pyridoxine (B6): The functional activity of erythrocyte aspartate aminotransferase (EAST) which requires PLP as a cofactor, was used for determining the estimated average requirement (EAR) of vitamin B6, Regression analysis was performed by plotting EAST-AC (activation coefficient) values versus dietary vitamin B6 intake data obtained from human studies for both men and women. The required dietary intake of B6 was 1.6 mg/day with an EAST-AC cut off 1.8. Considering 1.6 mg as the requirement (EAR) of B6/day, the RDA was calculated by considering CV of 10%, and RDA of 2.0 and 1.9 mg/day were arrived for adult men and women. The EAR and RDA thus derived for adults based on EAST-AC calculation was extrapolated for other physiological and age groups based on the energy requirements (Table 18).

Table 18. Recommended intakes of Pyridoxine (B_6) for various physiological groups

Category/ Age group	Physical activity level	EAR (mg/d)	RDA (mg/d)
Adult men >18y	Sedentary	1.6	1.9
	Moderate	2.1	2.4
	Heavy	2.6	3.1
Adult women >18y	Sedentary	1.6	1.9
	Moderate	1.6	1.9
	Heavy	2.1	2.4
Pregnant	--	1.9	2.3
Lactating 0–6m 7–12m	--	1.82 1.76	2.16 2.07
Infants 0–6 m 6–12m	--	- 0.5	0.1 (AI) 0.6
Children 1–3y 4–6y 7–9 y	--	0.8 1.0 1.3	0.9 1.2 1.5
Boys 10–12y	--	1.7	2.0
Girls 10–12y	--	1.6	1.9
Boys 13–15y	--	2.2	2.6
Girls 13–15y	--	1.8	2.2
Boys 16–18y	--	2.5	3.0
Girls 16–18y	--	1.9	2.3

Biotin (B7): For adults and pregnant women an AI of 25µg/day is proposed; with an additional allowance of 5µg/day for lactating women to compensate for losses through breast milk. The recommended AIs for age groups 1–3, 4–10 and adolescents, are given in the Table 19.

Table 19. Recommended intakes for B7 for various physiological groups

Category	Age group	AI (µg/day)
Adult men	>18 y	25
Adult women	>18 y	25
Pregnant	-	25
Lactating	-	30
Infants	0–6 m	4
	6–12m	5
Children	1–3y	7
	4–6y	9
	7–9 y	12
Boys	10–12y	15
Girls	10–12y	16
Boys	13–15y	20
Girls	13–15y	20
Boys	16–18y	25
Girls	16–18y	25

Folate (B9): The present committee revised the requirements of folate based on some recent Indian data, which includes dietary intakes, and plasma folate and homocysteine levels as functional markers. Based on the available data on serum/plasma folate and the dietary folate intake among healthy Indian adults, the EAR was derived. The requirement (EAR) to maintain normal plasma folate levels of >10nmol/L was considered which is 250µg for adult men and 180µg for adult women. Considering 10% CV, the RDA was calculated as 300µg for adult men and 220µg for adult women. Additional requirements of 300 µg/day and 100µg/day were added respectively during pregnancy and lactation for meeting the factorial extra needs (Table 20).

Table 20. Recommended intakes of Dietary Folate for various physiological groups

Category	Physical activity level	Age group	EAR (µg/d*)	RDA (µg/d*)	TUL (µg)
Adult men	Sedentary	>18y	250	300	1000
	Moderate				
	Heavy				
Adult women	Sedentary	>18y	180	220	1000
	Moderate				
	Heavy				
Pregnant	-	-	480	570	1000
Lactating	-	0–6 m	280	330	1000
	-	6–12 m	280	330	
Infants	-	0–6 m	---	25 (AI)	
	-	6–12 m	71	85	
Children	-	1–3 y	97	120	6-9 y 300
	-	4–6 y	111	135	
	-	7–9 y	142	170	
Boys	-	10–12 y	180	220	9-17 y 600-800
Girls	-	10–12 y	186	225	
Boys	-	13–15 y	238	285	
Girls	-	13–15 y	204	245	
Boys	-	16–18 y	286	340	
Girls	-	16–18 y	223	270	

*1 µg of food/dietary folate = 0.5 µg of synthetic folic acid taken on empty stomach or 0.6 µg folic acid taken with meals; AI: Adequate intake.

Cyanocobalamin (B12): Factorial approach was used for deriving vitamin B12 requirements and the mean daily excretion used in the previous ICMR 2010 recommendation of 1µg/d, was considered. Using mean bioavailability of 50% based on stable isotope kinetic studies in India, an EAR of 2µg/d for adults is recommended. Distribution of the requirement was calculated based on distribution of bioavailability, and the 97.5th percentile of this distribution was used to define RDA of 2.2µg/d (Table 21).

Table 21. Recommended intakes of B12 for various physiological groups

Category/Age group	EAR (µg/d)	RDA (µg/d)
Infants (0–6m)	-	Breast milk
Infants and pre-school children (6m–5 y)	1.0	1.2
School children and adolescents (5–17 y)	2.0	2.2
Adults	2.0	2.2
Pregnant (Additional)	0.20	0.25
Lactating (Additional)	0.8	1.0

For young children, as no specific data is available, an intake of 1µg/day is suggested keeping in view of low prevalence of vitamin B12 deficiency observed in 1–4years old children in the Comprehensive National Nutrition Survey (CNNS); and for school children and adolescents the adult requirement is suggested. For pregnant women, since studies have shown that the human foetus accumulates 0.1µg/d and is required for maintaining adequate foetal growth, an additional EAR of 0.2µg B12/d is suggested adjusting for 50% absorption. With regards to lactating women the B12 requirement was arrived by considering the B12 content of milk and the output in first 6 months, which is around 0.4µg/d. Adjusting for absorption an additional EAR of 0.8µg/d is suggested.

Ascorbic acid (Vitamin C): The committee has evaluated all the available evidence on this subject and estimated the EAR and RDA based on replacement levels of body pool saturation of 900mg, for a metabolic loss of 2.9% per day, compensated for the urinary loss (25% per day), taking absorption efficiency in Indian foods also into consideration, the EAR was set at 65mg per day and RDA at 80mg per day for adult males. Due importance of ascorbic acid in a meal to improve iron absorption among Indians on a vegetarian diet is also emphasized while making the recommendations (Table 22).

Table 22. Recommended intakes of Ascorbic acid (vitamin C) for various physiological groups

Category	Age group	EAR (mg/day)	RDA (mg/day)	TUL (mg/day)
Adult men	>18 y	65	80	2000
Adult women	>18 y	55	65	2000
Pregnant	-	65	80	2000
Lactating	-	95	115	2000
Infants	0–6 m	-	20 (AI)	-
	6–12m	-	30 (AI)	-
Children	1–3y	24	30	350
	4–6y	27	35	550
	7–9 y	36	45	800

Boys	10–12y	45	55	1050
Girls	10–12y	44	50	1300
Boys	13–15y	60	70	1550
Girls	13–15y	55	65	1800
Boys	16–18y	70	85	1950
Girls	16–18y	57	70	2000

9.2. Fat Soluble Vitamins

Vitamin A: The requirements of vitamin A were calculated using the factorial approach by considering daily intake required to balance its daily catabolic loss, which is calculated from an assumed daily loss from the body stores, the absorption and efficiency of storage each with associated variation and their associated CVs. The average and 97.5% centile of this requirement distribution are EAR and RDA, respectively. The vitamin A equivalence was derived by regressing the carotene conversion over the intakes (r^2=0.86; slope: 1.46 and intercept:1.8) from the systematic review of literature with studies that included intrinsically labeled foods. Assuming maximum intake of carotenoids in Indian adult population at ~3mg/day (conversion=1.46* 3+1.8= 6.18), a conservative conversion factor of 6:1 was considered for setting vitamin A equivalence of beta-carotene, while it was 12:1 for β-cryptoxanthine and α-carotene. To ensure adequacy at least in vulnerable groups like pregnant and lactating women, the committee has recommended that a minimum of 50% RE be drawn from animal sources (Table 23).

Table 23. Recommended intakes of Vitamin-A for various physiological groups

Category	Age group	EAR (µg /day)	RDA (µg /day)	TUL (µg /day)
Adult men	>18 y	460	1000	3000
Adult women	>18 y	390	840	3000
Pregnant	-	406	900	3000
Lactating$^{\pi}$	-	720	950	3000
Infants	0–6 m	-	350* AI)	600$^{\$}$
	6–12m	170	350	600$^{\$}$
Children	1–3y	180	390	600$^{\$}$
	4–6y	240	510 300)	900$^{\$}$
	7–9 y	290	630 (350)	900$^{\$}$
Boys	10–12y	360	770	1700
Girls	10–12y	370	790	1700
Boys	13–15y	430	930	2800
Girls	13–15y	420	890	2800
Boys	16–18y	480	1000	2800
Girls	16–18y	400	860	2800

RE: Retinol Equivalents (µg/d); GWG: Gestational weight gain

* Adequate intake; Extrapolated from infant and adult values; $^{\$}$Adopted from IOM;

π Additional EAR required for lactating women: 325 (µg /day)

Vitamin D: The Committee, after considering the available evidence of vitamin D status, decided to increase recommended intakes for vitamin D compared to earlier revision of 2010. Accordingly, an EAR of 400 IU and an RDA of 600 IU is recommended while emphasizing the importance of outdoor physical activity as a means of achieving adequate vitamin D status in a tropical country like India. The increased requirement is attributed to progressive decrease in sunlight exposure necessitating dietary sources to meet the requirement (Table 24).

Table 24. EAR and RDA of vitamin D in case of minimal sun exposure

Category	Age group	EAR Unit/day (10 µg)	RDA Unit/day (15 µg)
Adult men	>18 y	400 IU	600 IU
Adult women	>18 y	400 IU	600 IU
Pregnant	-	400 IU	600 IU
Lactating	-	400 IU	600 IU
Infants	0–6 m	-	400 IU AI
	6–12m	-	400 IU AI
Children	1–3y	400 IU	600 IU
	4–6y	400 IU	600 IU
	7–9 y	400 IU	600 IU
Boys	10–12y	400 IU	600 IU
Girls	10–12y	400 IU	600 IU
Boys	13–15y	400 IU	600 IU
Girls	13–15y	400 IU	600 IU
Boys	16–18y	400 IU	600 IU
Girls	16–18y	400 IU	600 IU

Reference from Institute of medicine

Vitamin E: The requirement of alpha tocopherol suggested is 0.8mg/g of dietary essential fatty acids. This roughly works out to 7.5–10mg tocopherol per day, similar to FAO/WHO recommendations depending on the edible oil used. The recommendation for vitamin K is 55µg for adults and is in tune with recommendations of FAO/WHO.

10. WATER

The requirement of water was estimated based on a factorial approach, utilizing the existing literature of the fluid guidelines, with corrections made for body mass and energy requirement to suit the Indian context. The water required from beverages for adult man ranges from 32–58ml per kg body mass and for woman, it ranges from 27–52ml per kg body mass, with sedentary working group at lower end and the heavy working group at higher end of the range. For children, the requirement is greater than 60 ml per kg body mass and for adolescent boys it ranges from 47–60 ml per kg body mass, while, for girls it is 39–49ml per kg body mass. For pregnant woman, based on the working intensity, the water required from beverages ranges

from 2.1–3.2 liters per day. For old-age, irrespective of gender, the present consensus for water requirement from beverages is 33ml per kg body mass for sedentary activity and 38ml per kg body mass for moderate activity.

11. ANTIOXIDANTS

Realizing the importance of dietary antioxidants, the committee deliberated on the information on consumption of antioxidants and recommended a minimum of 500g/day of fruits and vegetables to obtain sufficient amounts of antioxidant nutrients such as beta-carotene, vitamin C and certain non-nutrients like polyphenols and flavonoids which may protect against chronic diseases. This should be complemented with sufficient amount of vegetable oil so as to obtain vitamin E.

12. ANNEXURES

A1. Summary of Estimated Average Requirements (EAR) of Nutrients for Indians

Category/ Age group	Physical activity level	Body Wt (kg)	Energy (**) (Kcal/d)	Energy (**) (Kcal/ kg/d)	Protein (g/d)	Protein (g/kg/d)	Cal cium (mg/d)	Mag nesium (mg/d)	Iron (mg/d)	Zinc (mg/d)	Iod ine (µg/d)	Thia mine (mg/d)	Ribo flavin (mg/d)	Niacin (mg/d)	Vit B6 (mg/d)	Folate (µg /d)	Vit B12 (µg/d)	Vit C (mg/d)	Vit A (µg/d)	Vit D (IU/d)
Adult Men >18y	Sedentary	65	2110	32	43.0	0.66	800	370	11	14.1	95	1.2	1.6	12	1.6	250	2	65	460	400
	Moderate		2710	42								1.5	2.1	15	2.1					
	Heavy		3470	53								1.9	2.7	19	2.6					
Adult Women >18y	Sedentary	55	1660	30	36.0	0.66	800	310	15	11.0	95	1.1	1.6	9	1.6	180	2	55	390	400
	Moderate		2130	39								1.4	2.0	12	1.6					
	Heavy		2720	49								1.8	2.6	15	2.1					
Pregnant[#]	--	55 + 10 GWG	Addl. Calories required 350		44.0 54.0	0.66 (2nd trimester, addl 7.6g/day) 0.66 (3rd trimester, addl. 17.6g/day)	800	370	21	12.0	160	1.6	2.3	11	1.9	480	2.2	65	406	400
Lactation# 0–6m	--	55	Addl. Calories required 600		50.0	0.66 (addl. 13.6g/day)	1000	335	16	11.8	200	1.7	2.5	13	1.82	280	2.8	95	720	400
7–12m			520		47.0	0.66 (addl. 10.6g/day)							2.4		1.76					
Infants 0–6 m*	--	5.8	530	90	7.0	1.16	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6–12m		8.5	680	80	9.0	1.04			2	2.1					0.5	71	1		170	
Children 1–3y	--	12.9	1110	83	10.0	0.79	400	73	6	2.8	65	0.6	0.8	6	0.8	97	1	24	180	
4–6y		18.3	1360	74	13.0	0.70	450	104	8	3.7	65	0.8	1.1	8	1.0	111	2	27	240	
7–9 y		25.3	1700	67	19.0	0.75	500	144	10	4.9	65	1.0	1.3	10	1.3	142	2	36	290	400
Boys 10–12y	--	34.9	2220	64	27.0	0.75	650	199	12	7.0	70	1.3	1.7	12	1.7	180	2	45	360	400
Girls 10–12y	--	36.4	2060	57	27.0	0.73	650	207	16	7.1	70	1.2	1.6	12	1.6	186	2	44	370	400
Boys 13–15y	--	50.5	2860	57	36.0	0.72	800	287	15	11.9	100	1.6	2.2	16	2.2	238	2	60	430	400
Girls 13–15y	--	49.6	2400	49	35.0	0.70	800	282	17	10.7	100	1.3	1.9	13	1.8	204	2	55	420	400
Boys 16–18y	--	64.4	3320	52	45.0	0.70	850	367	18	14.7	100	1.9	2.5	19	2.5	286	2	70	480	400
Girls 16–18y	--	55.7	2500	45	37.0	0.67	850	317	18	11.8	100	1.4	1.9	14	1.9	223	2	57	400	400

Note: The energy required indicated for different age groups is for specific body weight, gender and physical activity.

The energy required for an individual may be varying depending on his/her body weight and physical activity. Refer Tables 2 and 3.

* Adequate Intake (AI); ** There is no RDA for energy, the EAR for energy is equivalent to the Estimated Energy Requirement (EER).

For adequate intake of Biotin and Pantothenic acid, refer to the text on summary of recommendations.

[#]Apart from the daily requirement of Energy per kg body weight, a pregnant women should take additional energy allowance of 350Kcals/day, while lactating women require an additional energy allowance of 600 kcals and 520 kcals respectively.

[$] Protein requirement: additional 7.6g and 17.6g during 2nd and 3rd trimester for pregnant women, and 13.6g & 10.6g for lactating women respectively.

Additional requirement of protein is for 10kg gestational weight gain (GWG).

Protein recommendation is for quality protein

A2. Summary of Recommended Dietary Allowances (RDA) of Nutrients for Indians

Category/ Age group	Physical activity level	Body Wt	Protein		Dietary Fibre*	Cal cium	Mag nesium	Iron	Zinc	Iod ine	Thia mine	Ribo flavin	Niacin	Vit B6	Fola te	Vit B12	Vit C	Vit A	Vit D
		(kg)	(g/d)	(g/kg/d)	(g/d)	(mg/ d)	(mg/d)	(mg/d)	(mg/d)	(µg/d)	(mg/d)	(mg/d)	(mg/d)	(mg/d)	(µg/d)	(µg/d)	(mg/d)	(µg/d)	(IU/d)
Adult Men >18y	Sedentary	65	54 0	0.83	30	1000	440	19	17	140	1 4	2.0	14	1.9	300	2.2	80	1000	600
	Moderate				40						1.8	2.5	18	2.4					
	Heavy				50						2.3	3.2	23	3.1					
Adult Women >18y	Sedentary	55	46.0	0.83	25	1000	370	29	13.2	140	1.4	1.9	11	1.9	220	2.2	65	840	600
	Moderate				30						1.7	2.4	14	1.9					
	Heavy				40						2.2	3.1	18	2.4					
Pregnant woman**	--	55 + 10 GWG	55.5 68.0	0.83 (2nd trimester, addl. 9.5g/day) 0.83 (3rd trimester, addl. 22g/day)	-	1000	440	27	14.5	220	2.0	2.7	13	2.3	570	2.45	80	900	600
Lactation 0–6m	--	55	63.0	0.83 (addl. 17g/day)	-	1200	400	23	14.1	280	2.1	3.0	16	2.16	330	3.2	115	950	600
7–12m			59.0	0.83 (addl. 13g/day)								2.9		2.07					
Infants 0–6 m*	--	5.8	8.0	1.40	-	300	30	-	-	100	0.2	0.4	2	0.1	25	1.2	20	350	400
6–12m		8.5	10.5	1 23	-	300	75	3	2 5	130	0 4	0 6	5	0 6	85	1.2	30	350	400
Children 1–3y	--	12.9	12.5	0.97	15	500	90	8	3.3	90	0.7	1.1	7	0.9	120	1.2	30	390	600
4–6y		18.3	16.0	0.87	20	550	125	11	4.5	90	0.9	1.3	9	1.2	135	2.2	35	510	
7–9 y		25.3	23.0	0.92	26	650	175	15	5.9	90	1.1	1.6	11	1.5	170	2.2	45	630	
Boys 10–12y	--	34.9	32.0	0.91	33	850	240	16	8.5	100	1.5	2.1	15	2.0	220	2.2	55	770	600
Girls 10–12y	--	36.4	33.0	0.90	30	850	250	28	8.5	100	1.4	1.9	14	1.9	225	2.2	50	790	600
Boys 13–15y	--	50.5	45 0	0.89	43	1000	345	22	14.3	140	1.9	2.7	19	2.6	285	2.2	70	930	600
Girls 13–15y	--	49.6	43.0	0.87	36	1000	340	30	12.8	140	1.6	2.2	16	2.2	245	2.2	65	890	600
Boys 16–18y	--	64.4	55.0	0.86	50	1050	440	26	17.6	140	2.2	3.1	22	3.0	340	2.2	85	1000	600
Girls 16–18y	--	55.7	46.0	0.83	38	1050	380	32	14.2	140	1.7	2.3	17	2.3	270	2.2	70	860	600

* Adequate Intake (AI)

Note: For adequate intake of Biotin and Pantothenic acid, refer to the text on summary of recommendations.

Protein requirement: additional 9.5g and 22.0g during 2nd and 3rd trimester for pregnant women, and 17.0g & 13.0g for lactating women respectively.

** Additional requirement of protein is for 10kg gestational weight gain (GWG).

Protein recommendation is for quality protein.

A3. Daily nutrient recommendations for the elderly in India

Nutrients		Energy (Kcal)	Dietary Fibre	Protein (g)	Vit-A (µg)	Thiamin B_1(mg)	Ribo flavin B_2 (mg)	Niacin (mg)	Vit-C (mg	Vit-B_6 (mg)	Folate (µg)	Vit-B_{12} (µg)	Vit-D (IU)	Cal cium (mg)	Magne-sium (mg)	Iron (mg)	Zinc (mg)	Iodine (µg)
Men ≥60 yrs	EAR	1700	-	43.0	460	1.2	1.6	12	65	1.6	250	2.0	400	1000	370	11	14	95
	RDA	-	30	54.0	1000	1.4	2.0	14	80	1.9	300	2.2	800	1200	440	19	17	140
Women ≥60 yrs	EAR	1500	-	36.3	390	1.1	1.6	9	55	1.6	180	2.0	400	1000	310	11	11	95
	RDA	-	25	46.0	840	1.4	1.9	11	65	1.9	200	2.2	800	1200	370	19	13.2	140

A4. Percent total energy from different macronutrients Acceptable macronutrient distribution range (AMDR)

Nutrients Energy (E)	Age group			Pregnant & lactating women
	1–2 years	3–18 years	Adults	
Protein, %E * (PE ratio)	5–15	5–15	7.5–20	7.5–20
Total Fat, %E	35–40	30–35	20–30	20–30
# n-6 PUFA, %E	4–10	4–10	4–10	4–10
n-3-PUFA, %E	0.5–1	0.5–1	0.5–1	0.5–1
##EPA+DHA, mg/day	100	250	300	300 to 500
Carbohydrate, %E	50–60	50–60	50-60	50-60

n-6 to n-3 ratio should be between 5-10:1; ##EPA & DHA (long chain n-3) can be obtained from an intake of 250g marine fish (fatty fish) per week or by consuming n-3 rich plant foods with an optimal dietary n-6 to n-3 fat ratio of between 5-10:1

Note: For good health, adults should consume a minimum of 100 to 130g of carbohydrates and at least 20g fats (food sources).

*The PE ratio is for quality protein.

A5. Summary of recommended intakes for other minerals and trace elements in adults

S.No.	Minerals/ Trace Element	Recommended intake (per day)
1	**Phosphorus**	600 mg (AI)
2	**Sodium**	2000 mg
3	**Potassium**	3500 mg
4	**Copper**	1.7 mg
5	**Manganese**	4 mg
6	**Chromium**	50 µg
7	**Selenium**	40 µg

AI-Adequate intake

A6. Tolerable Upper Limit (TUL) for nutrients

Category/ Age group	Physical activity level	Protein (PE ratio)	Calcium (mg/d)	Magnesium* (mg/d)	Iron (mg/d)	Zinc (mg/d)	Iodine (µg/d)	Niacin (mg/d)	Vit. B6 (mg/d)	Folate (µg/d)	Vit. C (mg/d)	Vit. A (µg/d)	Vit. D (IU/d)
Adult Men >18y	Sedentary Moderate Heavy	**<40%**	2500	350	45	40	1100	35	100	1000	2000	3000	4000
Adult Women >18y	Sedentary Moderate Heavy	<40%	2500	350	45	40	1100	35	100	1000	2000	3000	4000
Pregnant woman	--	<30%	2500	350	45	40	1100	-	-	1000	2000	3000	4000
Lactation 0–6m 7–12m	--	<40%	2500	350	45	40	1100	-	-	1000	2000	3000	4000
Infants **0–6 m** **6–12m**	--	<15% <15%	– –	- -	40 40	4 5	- -	- -	- -	- -	- -	600 600	1000 1500
Children 1–3y 4–6y 7–9 y	--	<15% <15% <15%	1500 2500 2500	65 110 110	40 40 40	7 12 12	200 300 400	- -	- -	- - 300	350 550 800	600 900 900	2500 3000 3000
Boys 10–12y	--	<15%	3000	350	40	23	600	-	-	600-800	1050	1700	4000
Girls 10–12y	--	<15%	3000	350	40	23	600	-	-	600-800	1300	1700	4000
Boys 13–15y	--	<15%	3000	350	45	34	900	-	-	600-800	1550	2800	4000
Girls 13–15y	--	<15%	3000	350	45	34	900	-	-	600-800	1800	2800	4000
Boys 16–18y	--	<15%	3000	350	45	34	1100	-	-	600-800	1950	2800	4000
Girls 16–18y	--	<15%	3000	350	45	34	1100	-	-	600-800	2000	2800	4000

The TUL is the maximum level of habitual intake from all sources of a nutrient or related substance judged to be unlikely to lead to adverse health effects in humans.

*Note: For Magnesium the TUL values are only for non-dietary pharmacological doses.

A7. Suggested food groups for a balanced diet to meet the EAR of different nutrients

Category/ Age group	Physical activity level	Body wt	Cereals /Millets (g)**	^Pulses & Beans (g)	GLV (g)	Vege tables (g)	Roots & Tubers (g)	Fruits (g)	Nuts (g)	Milk (ml)	Fats & oils (g)	Energy (Kcal) obtained from these food groups	Crude protein (g) Obtained from these food groups
Adult Men >18y	Sedentary	65	260	85	100	200	100	100	40	300	30	~2080	72
	Moderate		370	120	100	200	100	100	45	300	40	~2680	90
Adult Women >18y	Sedentary	55	190	60	100	200	100	100	30	300	25	~1660	57
	Moderate		270	90	100	200	100	100	40	300	30	~2125	72
Pregnant women	--	55+ 10	220	75	150	200	100	150	40	400	30	~2020	72
Lactating	--												
0–6m			260	85	150	200	100	150	40	400	35	~2245	77
7–12m			250	85	150	200	100	150	40	400	35	~2200	78
Infants	--	5.8	Exclusive breastfeeding										
0–6m		8.5											
7–12m			25	12	20	25	20	50	7	*milk	10		
Children	--												
1–3yrs		12.9	100	50	50	100	50	50	10	350	20	~1110	38
4–6yrs		18.3	160	60	50	100	50	75	15	350	20	~1370	46
7–9yrs		25.3	200	65	100	150	100	100	20	400	25	~1710	59
Boys 10–12yrs	--	34.9	280	90	100	200	100	100	30	400	35	~2230	76
Girls10–12yrs	--	36.4	250	85	100	200	100	100	30	400	30	~2060	70
Boys 13–15yrs	--	50.5	390	130	100	200	100	100	40	400	45	~2860	95
Girls 13–15yrs	--	49.8	300	100	100	200	100	100	35	400	40	~2410	81
Boys 16–18yrs	--	64.4	450	150	100	200	100	150	50	400	55	~3300	107
Girls 16–18yrs	--	55.7	315	105	100	200	100	150	40	400	40	~2490	85
Elderly >60yrs	--	Man	170	75	100	200	100	150	30	400	25	~1740	62
		Woman	140	70	100	200	100	150	30	400	15	~1530	56

** 30% or more Cereals (weight in raw) can come from millets. Furthermore, atleast 50% of the cereals consumed should be whole grains.

^ For non-vegetarians, 30g of pulses may be substituted with meat.

* Continue breast milk, which is roughly 580ml per day.

- Sugar should be less than 5% of the total energy requirements.
- No added sugar for children <2 years old
- These suggested food groups are for children who are growing normally and for adults with normal BMI (18.5 to 23).
- The suggested diets provide around 30% energy from total fats and ~15% from protein.

A8. Suggested food groups for a balanced diet for a sedentary man

(Weighing 65 kg)

Food Composition	Cereals & Millets*	Pulses & Beans/ flesh foods**	Green leafy vegetables	Other Vegetables	Roots & tubers (excluding potatoes)	Fruits	Milk	Fats & Oils	Oil seeds & Nuts (gingely seeds & Pea nuts)	Spices
Amount (g/day)	270	90	100	200	100	100	300	30	40	10

Nutrients from the above suggested balanced diet for a sedentary man

Nutrients	Vegetarian diet	Non-vegetarian diet	EAR	RDA
Energy (Kcal)	2103	2089	2110	-
Protein (g)	72.6	77.6	43	54
Visible fat (g)	30	30	25	25
Calcium (mg)	1016	1125	800	1000
Iron (mg)	27.9	26.0	11.0	19.0
Zinc (mg)	9.7	9.2	14.1	17.0
Magnesium (mg)	956	623	370	440
Vitamin A (µg)#	569	784	460	1000
B-carotene (µg)	2159	2128	2760	6000
Thiamine (mg)	1.65	1.45	1.2	1.4
Riboflavin (mg)	0.9	0.9	1.6	2.0
Niacin (mg)	11.5	12.0	12	14
Vitamin B_6 (mg)	1.2	1.2	1.6	1.9
Vitamin C (mg)	147	149	65	80
Total Folates (µg)	345	357	250	300
Vitamin B_{12} (µg)	1.5	2.0	2.0	2.2

*30% or more grains (raw weight) can come from millets. Furthermore, at least 50% of the cereals consumed should be whole grains.

**a portion of pulses can be replaced with animal foods (egg, meat, fish and chicken) for non-vegetarians.

#Retinol derived from β carotene from diet was also added to the total Vitamin A.

Note: Total protein from the above vegetarian diet = 72.64g,

Digestible protein = 59.29g, PDCAAS = 93.29%

A9. Suggested food groups for a balanced diet for a moderately active man (weighing 65 kg)

Food Composition	Cereals & Millets*	Pulses & beans/ flesh foods**	Green leafy vegetables	Other Vegetables	Roots & tubers (excluding potatoes)	Fruits	Milk	Fats & Oils	Oil seeds & Nuts (gingely seeds & Pea nuts)
Amount (g/day)	390	130	100	200	100	100	300	30	45

Nutrients from the above suggested balanced diet for a moderately active man

Nutrients	Vegetarian diet	Non-vegetarian diet	EAR	RDA
Energy (Kcal)	2640	2516	2710	-
Protein (g)	91.5	99.3	43	54
Visible fat (g)	72.1	83.6	30	30
Calcium (mg)	1134.6	1819.0	800	1000
Iron (mg)	34.3	32.7	11	19.0
Zinc (mg)	13.2	11.0	14.1	17
Magnesium (mg)	728.4	580.5	370	440
Vitamin A (µg)#	559.4	697.7	460	1000
β carotene	2108	2052	2760	6000
Thiamine (mg)	2.2	1.8	1.5	1.8
Riboflavin (mg)	1.2	1.0	2.1	2.5
Niacin (mg)	15.1	13.8	15	18
Vitamin B_6 (mg)	1.5	1.3	2.1	2.4
Vitamin C (mg)	151.5	152.3	65	80
Total Folates (µg)	444.3	414.5	250	300
Vitamin B_{12} (µg)	1.5	2.4	2.0	2.2

*30% or more grains (raw weight) can come from millets. Furthermore, at least 50% of the cereals consumed should be whole grains.

**a portion of pulses can be replaced with animal foods (egg, meat, fish and chicken) for non-vegetarians.

#Retinol derived from β carotene from diet was also added to the total Vitamin A.

Note: Total protein from the above diet = 91.56g, Digestible protein = 74.08g, PDCAAS = 90.99%

A10. Suggested food groups for a balanced diet for a sedentary woman
(Weighing 55 kg)

Food Composition	Cereals & Millets*	Pulses & Beans/ flesh foods**	Green leafy vegetables	Other Vegetables	Roots & tubers (excluding potatoes)	Fruits	Milk	Fats & Oils	Oil seeds & Nuts (gingely seeds & Pea nuts)	Spices
Amount (g/day)	200	65	100	200	100	100	300	20	30	-

Nutrients from the above suggested balanced diet for a sedentary woman

Nutrients	Vegetarian diet	Non-vegetarian diet	EAR	RDA
Energy (Kcal)	1645	1640	1660	-
Protein (g)	58.5	61.3	36.0	46.0
Visible fat (g)	20	20	20	20
Calcium (mg)	940	1006	800	1000
Iron (mg)	23.6	22.5	15.0	29.0
Zinc (mg)	7.4	7.2	11.0	13.2
Magnesium (mg)	542	500	310	370
Vitamin A (µg)#	565	695	390	840
B-carotene (µg)	2138	2120	-	-
Thiamine (mg)	1.3	1.2	1.1	1.4
Riboflavin (mg)	0.8	0.75	1.6	1.9
Niacin (mg)	9.2	9.5	9.0	11
Vitamin B_6 (mg)	1.0	1.0	1.6	1.9
Vitamin C (mg)	147	148	55	65
Total Folates (µg)	284	293	180	220
Vitamin B_{12} (µg)	1.5	2.0	2.0	2.2

*30% or more grains (raw weight) can come from millets. Furthermore, at least 50% of the cereals consumed should be whole grains.

**a portion of pulses can be replaced with animal foods (egg, meat, fish and chicken) for non-vegetarians.

#Retinol derived from β carotene from diet was also added to the total vitamin A.

Note: Total protein from the above diet = 58.5g, Digestible protein = 48.05g, PDCAAS = 95.96%

A11. Suggested food groups for a balanced diet for a moderately active woman

(weighing 55 kg)

Food Composition	Cereals & Millets*	Pulses & Beans / flesh foods**	Green leafy vegetables	Other Vegetables	Roots & tubers (excluding potatoes)	Fruits	Milk	Fats & Oils	Oil seeds & Nuts (gingely seeds & Pea nuts)	Spices
Amount (g/day)	280	95	100	200	100	100	300	25	40	-

Nutrients from the above suggested balanced diet for a moderately active woman

Nutrients	Vegetarian diet	Non-vegetarian diet	EAR	RDA
Energy (Kcal)	2085	2208	2130	-
Protein (g)	72.6	95.8	36.0	46.0
Visible fat (g)	61.8	65.3	25	20
Calcium (mg)	1045	1603	800	1000
Iron (mg)	28.5	32.3	15.0	29.0
Zinc (mg)	10.1	10.6	11.0	13.2
Magnesium (mg)	570.6	574.9	310	370
Vitamin A (µg) #	554.7	657.8	390	840
B-carotene (µg)	2078	2078	-	-
Thiamine (mg)	1.7	1.8	1.4	1.7
Riboflavin (mg)	1.0	1.0	2.0	2.4
Niacin (mg)	11.8	12.7	12	14
Vitamin B_6 (mg)	1.2	1.3	1.6	1.9
Vitamin C (mg)	151	152	55	65
Total Folates (µg)	361	464	180	220
Vitamin B_{12} (µg)	1.5	2.0	2.0	2.2

*30% or more grains (raw weight) can come from millets. Furthermore, at least 50% of the cereals consumed should be whole grains.

**a portion of pulses can be replaced with animal foods (egg, meat, fish and chicken) for non-vegetarians.

#Retinol derived from β carotene from diet was also added to the total Vitamin A.

Note: Total protein from the above diet=72.64g, Digestible protein=59.29g, PDCAAS=93.29%

A12. Suggested food groups for a balanced diet for a pregnant woman

(sedentary - weighing 55 kg)

Food Composition	Cereals & Millets*	Pulses & Beans/ flesh foods**	Green leafy vegetables	Other Vegetables	Roots & tubers (excluding potatoes)	Fruits	Milk	Fats & Oils	Oil seeds & Nuts (gingely seeds & Pea nuts)	Spices
Amount (g/day)	240	80	150	200	100	150	400	20	40	10

Nutrients from the above suggested balanced diet for a pregnant woman (sedentary)

Nutrients	Vegetarian diet	Non-vegetarian diet	EAR	RDA
Energy (Kcal)	1994	1973	2010	-
Protein (g)	72.9	74.4	59	68
Visible fat (g)	20	20	30	30
Calcium (mg)	1263	1325	800	1000
Iron (mg)	31.0	29.6	21	27
Zinc (mg)	9.2	8.8	12.0	14.5
Magnesium (mg)	662	614	370	440
Vitamin A (µg)#	799	928	406	900
B-carotene (µg)	2845	2824	-	-
Thiamine (mg)	1.6	1.5	1.6	2.0
Riboflavin (mg)	1.0	1.0	2.3	2.7
Niacin (mg)	11.3	11.5	14	16
Vitamin B_6 (mg)	1.24	1.2	1.9	2.3
Vitamin C (mg)	190.0	191.0	65	80
Total Folates (µg)	346.0	347.0	480	570
Vitamin B_{12} (µg)	2.0	2.4	2.2	2.5

*30% or more grains (raw weight) can come from millets. Furthermore, at least 50% of the cereals consumed should be whole grains.

**a portion of pulses can be replaced with animal foods (egg, meat, fish and chicken) for non-vegetarians.

#Retinol derived from β carotene from diet was also added to the total Vitamin A.

Note: Total protein from the above diet=72.98g, Digestible protein=60.16g, PDCAAS=97.08%

A13. Key micronutrients in different food groups

(All values are for 100g edible portion)

Micronutrients	Cereals[a]	Pulses & Beans[b]	Leafy Vegetables[c]	Other vegetables	Roots & Tubers[d]	Fruits[e]	Milk (Buffalo)[f]	Milk (cow)[f]	Egg	Chicken	Mutton	Beef	Fish	Liver (sheep, goat, lamb)
Iron (mg)	3.00	5	8.5	2.12	0.6	0.56	0.2	0.2	1.82	1.5	1.3	2.2	0.6	6.3
Zinc (mg)	2.16	2.1	0.2	0.3	0.3	0.11	0.4	0.3	1.2	1.7	3	4.6	0.6	3.6
Vitamin A(µg)	2.43	8.6	259.1	22.4	70.0	32.36	49.8	58.3	198	21.4	9	15.5	5.6	6690
Riboflavin (mg)	0.15	0.14	0.1	0.07	0.0	0.01	0.13	0.11	0.2	0.09	0.16	0.12	0.03	0.36
Folate (µg)	24.03	127.7	16.7	24.4	31.3	17.61	8.6	7	49.3	9.3	6.4	8.1	15.4	92
Vitamin B_{12} (µg)	Nil	Nil	Nil	Nil	Nil	Nil	1.5	1.5	1.8	NA	2.8	1.7	1.4	91.9

[a] Mean values of nutrients from commonly consumed cereals (67% weightage) such as rice and wheat were taken and 33% weightage was also given to millets such as Bajra, Jowar, Maiz and Ragi.

[b] Mean values of nutrients from Lentils, Tur dhal, Bengal gram, Black gram, Cowpea, Green gram, Peas, Rajmah, Red gram and Soyabean were considered.

[c] Carotenoid conversion to retinol equivalents.

[d] Mean values of nutrients from Beetroot, Carrot, Colocasia, Onion, Radish, Tapioca and Yam were considered.

[e] Mean values of nutrients from Amla, Apple, Banana, Cherries, Grapes, Guava, Jack fruit, Lemon, Lichi, Mango, Melon, Orange, Papaya, Pine apple, Pomegranate, Sapota, Custard apple, Strawberry were considered.

[f] Good source of bioavailable calcium.

NA= Not available; NR=Not reported

- Low absorption of non heme iron can be improved by consuming more vitamin C rich foods (Guava, Lemon, Oranges, Amla, etc.) in raw form as much as possible.
- Meat, poultry and liver contain high bio-available heme iron and also increases absorption (meat factor) of non-heme iron (including fish).

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ICMR-National Institute of Nutrition
Indian Council of Medical Research
Department of Health Research
Ministry of Health and Family Welfare
Government of India
Tarnaka, Hyderabad - 500 007. Telangana, INDIA
Website: http://nin.res.in; Ph: +91 40 27197200