Contents

SECTION 1: BASIC NUTRITION

Chapter 1: Functions of Food 1

- *Balanced Diet 3*
  - *Principles of Planning a Balanced Diet 5*

Chapter 2: Nutrient Requirements 7

- *Nutritional Requirements During Pregnancy and Lactation 7*
  - *Energy 7*
  - *Protein 7*
  - *Calcium 10*
  - *Iron 10*
  - *Folic Acid 10*
  - *Iodine 10*
  - *Vitamins 10*
- *Nutritional Requirements of Infants, Children and Adolescents 11*
  - *Fluids 11*
  - *Energy 11*
  - *Proteins 12*
  - *Fats 13*
  - *Vitamins 14*
  - *Calcium and Phosphorus 14*
  - *Iron 15*

Chapter 3: Nutritional Assessment of Children 16

- *Anthropometry 16*
- *The IAP Growth Monitoring Guidelines (2006) 30*
- *Dietary Assessment 30*
  - *24-Hour Dietary Recall Method 30*
- *Clinical Assessment 39*
  - *Dietary Assessment of Infants and Toddlers 40*

Chapter 4: Maternal Nutrition in Pregnancy and Lactation 42

- *Preconception Nutrition 42*
- *Nutrition During Pregnancy 43*
  - *Nutritional Recommendations During Pregnancy 43*
- *Micronutrients in Pregnancy 44*
  - *Vitamins 44*

Dietary and Environmental Hazards During Pregnancy 44
Special Considerations During Pregnancy 46
Lactation Period 46

Chapter 5: Nutrition for Premature Infants 49

- *Management of the Premature Infant 50*
  - *Goal 50*
  - *Enteral Nutrition 51*
  - *Contraindications for Feeding the Premature Infant 51*
  - *Feeding Protocol 51*
  - *Breastfeeding 52*
  - *Enteral Feeds 52*
  - *Intolerance to Feeding 53*
- *Nutritional Assessment 54*
- *Anthropometric Measurements 54*
  - *Assessing Feed Intolerance 54*
- *Discharge of the Premature Infant 55*

Chapter 6: Feeding of Infants (0–6 Months).....56

- *Advantages of Breastfeeding 56*
- *Colostrum 57*
- *Factors Causing Lactational Failure 57*
- *Early Introduction of Top Feeds 59*
  - *Mother's Employment 59*
  - *Mother's Problem of the Breast 59*
- *Role of Prelacteals 61*
  - *Frequency and Duration of Exclusive Breastfeeding 61*
  - *Artificial/Formula Feeding 61*
  - *Adverse Affects of Bottle Feeding 62*
  - *Burping after Feeding 63*
  - *Duration of Breastfeeding 63*
  - *Breastfeeding During Illness 63*
  - *Breastfeeding Promotion Network of India (BPNI) 64*
  - *The Infant Milk Substitute Act (IMS Act) 64*

Chapter 7: Nutrition for Older Children 66

- *Building Good Food Habits 66*
  - *Diet for the Preschool Child (2–5 Years) 66*
- *Recommended Nutrients and Food Groups 67*
  - *Diet for School Children (6–12 Years) 68*
- *What are Food Fads 68*
- *How to Meet the Requirements (Right Selection) 68*
- *Annexure 69*
  - *Low Cost Nutritious Recipes 69*

Chapter 8: Nutrition for the Adolescent 72

- *Factors Affecting Adolescent Eating Pattern 76*
  - *Adolescent Related Nutritional Disorders 78*
- *Stunting and Malnutrition 78*
- *Iron Deficiency Anemia 78*
- *Calcium Deficiency 78*
- *Nutrition Related Dental Decay 79*
- *Diet and Violence—A New Dimension 79*
  - *High Calorie (Junk) Malnutrition 79*
  - *Vitamin and Mineral Deficiencies 79*
- *Eating Disorders 80*
  - *Summary of Recommendations in Eating Disorders 81*
  - *High-Risk Groups of Adolescents 81*

Chapter 9: Nutrition for the Athlete Child 85

- *Physiological Effects of Exercise 85*
- *Nutritional Recommendations 85*
  - *Principles of Healthy Diet for a Sports Child 86*
  - *Energy 86*
  - *Carbohydrates 86*
  - *Proteins 88*
  - *Fats 88*
  - *Vitamins and Minerals 88*
  - *Fluids 89*
  - *Exercise Recommendations in Specific Age Groups 89*
  - *Ergogenic Aids 90*

Chapter 10: Interaction of Nutrition and Infection in Children....92

- *Synergism and Antagonism 93*
  - *Metabolism and Infection 93*
  - *Effect of Malnutrition on Infection 93*
  - *Micronutrients and Immunity 94*
  - *Effect of Infection on Malnutrition 95*

Chapter 11: Vegetarianism in Children 98

- *Adequacy of Vegetarian Diets 98*
- *Nutritional Risks 99*
  - *Energy 99*
  - *Proteins 99*
  - *Calcium 100*
  - *Vitamin D 100*
  - *Iron 101*
  - *Zinc 101*
  - *Cobalamin (B_{12}) 101*
  - *Meal Planning for a Vegetarian Child 102*

Chapter 12: Food Allergies and Intolerances 104

- *Pathogenesis 104*
- *Common Food Allergens 105*
  - *Skin Manifestations of Food Allergy 105*
  - *Respiratory Manifestation of Food Allergy 105*
  - *Manifestations of GIT 107T*
  - *Diagnosis of Food Allergy 107*
- *Maintenance of Food Diary 107*
  - *Elimination Diet 107*
  - *Oral Food Challenges 107*
- *Prick Puncture Skin Testing 107*
  - *In Vitro Testing (RAST) 107*
  - *Tests are Positive 107*
  - *Oral Allergy Syndrome 108*
- *Chinese Restaurants Syndrome 108*
- *Sulphite Sensitivity 108*
- *Auriculotemporal Syndrome (Frey Syndrome) 108*
- *Heiner Syndrome 108*
- *Anaphylaxis 108*
- *Celiac Disease 108*
- *Allergic Eosinophilic Gastroenteritis 108*
- *Infantile Proctocolitis 109*
- *Migraine 109*
- *Treatment/Management 109*
- *Recognizing Allergies in Children 110*

Chapter 13: Vitamin a Deficiency in Children 111

- *Functions of Vitamin A 112*
  - *Growth 112*
  - *Role in Monitoring Healthy Epithelial Tissues 112*
  - *Red Cell Production 112*
  - *Antioxidant or Immune Functions 112*
  - *Pathogenesis 113*
- *Deficiency Signs of Vitamin A 113*
  - *Night Blindness (XN) 114*
  - *Conjunctival Xerosis (XIA) 114*
  - *Bitot's Spots (XIB) 114*
  - *Corneal Xerosis (X2) 114*
  - *Keratomalacia (X3B) 114*
- *Hypervitaminosis A 115*
  - *Target Group for Vitamin A Supplementation 115*
  - *Prevention of Vitamin A Deficiency 116*
- *Treatment 117*
  - *Some Controversies About Vitamin A 117*

Chapter 14: Nutritional Anemia in Children 119

- *Iron Deficiency Anemia (IDA) 119*
  - *Functions of Iron in the Body 119*
  - *Definition 120*
  - *Clinical Features of Iron Deficiency Anemia 120*
  - *Implications of Iron Deficiency Anemia 120*
  - *Etiology of Iron Deficiency 121*
- *Treatment of IDA 122*
  - *Meat, Fish and Amino Acids 122*
  - *Prevention of Iron Deficiency 123*
  - *Folate and B_{12} Deficiency—Megaloblastic Anemia 124*
- *Clinical Manifestation 125*
  - *Vitamin B_{12} Deficiency/Cobalamin (Pernicious Anemia) 125*

Chapter 15: Iodine Deficiency Disorders in Children.....127

- *Functions of Iodine 127*
- *In Energy Metabolism 127*
- *Growth and Development 127*
- *In Pregnancy and Lactation 128*
  - *Metabolism of Iodine 128*
  - *Spectrum of IDD 128*
  - *Goiter 128*
  - *Cretinism 129*
  - *Hypothyroidism 129*
  - *Assessment of IDD in a Community 129*
  - *Classification of IDD 129*
  - *Causes of IDD (Antithyroid Factors) 130*
  - *Prevention of IDD 130*
- *Iodine Fortification 130*
  - *Certain Points to be Considered While Using Iodized Salt 131*
  - *Iodised Oil Injecions 131*
  - *Iodine Tablets 131*
  - *Iodized Water 131*
  - *IDD the Indian Scenario 131*
- *Dietary Sources of Iodine 132*

Chapter 16: Zinc in Infant Nutrition 134

- *Metabolism 135*
  - *Zinc Requirements 135*
  - *Implications of Zinc Deficiency 135*
  - *Zinc Status in Pregnancy 135*
  - *Zinc and Childhood Infections 136*
  - *Zinc Toxicity 137*

Chapter 17: Role of Other Micronutrients in Children 139

- *Potassium 139*
  - *Functions 139*

Potassium Deficiency 139
Signs and Symptoms of Potassium Deficiency 139
Requirements 140
Sources of Potassium 140
- *Calcium 140*
Functions of Calcium 140
Risk Factors of Calcium Deficiency 140
Role in Infants 140
Role in Children 141
Role in Preadolescence and Adolescence 141
Calcium Requirements 141
Dietary Sources of Calcium 141
- *Magnesium 141*
Deficiency of Magnesium 142
Signs and Symptoms of Magnesium Deficiency 142
Requirements 142
Dietary Sources of Magnesium 142
- *Vitamin D 142*
Functions of Vitamin D 143
Vitamin D Deficiency 143
Requirements of Vitamin D 143
Sources of Vitamin D 144

Chapter 18: Nutrition Counseling—Role in Children 145
- *Goal 145*
Nutrition Counseling Characteristics 145
Learning Process in Children 145
Counseling Techniques 146
Principles of Counseling 147
The Counseling Process 147
Counseling the Child 148
Role of the Parent 149
Cultural Influence 149
Feeding Relationships 149
Psychosocial Relationship with the Child 149
Model Behavior 149
Counseling the Child with Special Needs 149

Chapter 19: Probiotics—Role in Child Health 151
Source of Probiotics 152
Probiotics—Criteria 152
Mechanism of Action 152
Clinical Uses 153
Allergy 154
Lactose Intolerance 154
Probiotic Food Supplements 154
Disadvantages of Probiotics 154

Chapter 20: Nutrition for Dental Health in Children 156

- ❖ *Tooth Development and Structure 156*
- ❖ *Nutritional Influence on the Pre-erupted Teeth 157*
- ❖ *Role of Specific Nutrients on Tooth Maturation 157*
  - *Demineralization and Remineralization—Role of Fluoride 157*
  - *Dental Caries 157*
  - *Dental Erosion 158*
  - *Prevention of Dental Caries 158*

SECTION 2: NUTRITION IN DISEASE

Chapter 21: Diet in Fever and Infections.....163

- ❖ *Pathogenesis 163*
  - *Dietary Management 163*
  - *Factors Involved in Feeding 164*
  - *Diets in Specific Conditions 164*
  - *Viral Hepatitis 165*

Chapter 22: Enteral Nutrition in Hospitalized Patient 166

- ❖ *Indications for Enteral Nutrition Support in Children 166*
  - *Nutritional Requirements in Enteral Nutrition 167*
  - *Properties of an Enteral Feed 167*
  - *Nitrogen : Calorie Ratio 168*
- ❖ *Uniformity 168*
  - *Osmolality 168*
  - *Contraindications of Enteral Nutrition 168*
  - *Routes of EN 169*
  - *Methods of Administration of EN 169*
  - *Initiation of Advancement of Feeding 170*
  - *General Considerations 170*
  - *Complications of EN 171*
  - *Mechanical Complications 172*
  - *GI Complications 172*
  - *Metabolic Complications 172*

Chapter 23: Protein Energy Malnutrition.....174

- *Pathogenesis of PEM 175*
- *Classification of PEM 175*
- *Spectrum of PEM 175*
- *Kwashiorkor 176*
- *Marasmus 177*
- *Marasmic Kwashiorkar 177*
- *Management of PEM 177*

Chapter 24: Childhood Obesity 183

- *Definition of Childhood Obesity 183*
  - *What is BMI 184*
  - *What is a BMI Percentile 184*
  - *Pathogenesis of Childhood Obesity 185*
  - *Assessment of Obesity 186*
  - *Management of Childhood Obesity 186*

Chapter 25: Management of Severe Acute Malnutrition 191

- *Diagnosis of SAM 191*
- *Admission 193*
  - *In Patient Treatment 193*
- *Discharge 194*
- *Follow-Up 194*
- *Failure to Respond 194*
  - *Problems of Individual Children 194*
- *Criteria to Assess Failure to Respond 195*

Chapter 26: Nutrition in Diarrheal Diseases 197

- *Interaction Between Diarrheal Diseases and Malnutrition 197*
  - *Oral Rehydration Therapy (ORT) 198*
  - *Dietary Management 198*
  - *Nutritional Management of Persistent Diarrhea 199*
  - *Pathogenesis of Persistent Diarrhea 199*
- *Dietary Management 200*

Chapter 27: Diet in Constipation 203

- *Idiopathic/Functional Constipation 203*
- *Management 203*
  - *Medical Causes of Constipation 204*
  - *Surgical Causes of Constipation 204*
  - *Management of Constipation 204*
- *Disimpaction 205*
- *Maintenance Therapy 205*
- *Behavioral Therapy 205*
- *Follow-Up 206*

Chapter 28: Diet in Inflammatory Bowel Disease 207

- *Crohn's Disease (CD) 207*
  - *Ulcerative Colitis (UC) 207*
- *Incidence 207*
- *Age of Onset of Inflammatory Bowel Disease 208*
- *Pathogenesis 208*
- *Nutritional Implications of IBD in Children 208*
- *Nutritional Management of IBD 209*

- *Goals of Management of Crohn's Disease and Ulcerative Colitis 209*
  - *Crohn's Disease 209*
- *Nutritional Deficiencies 210*
  - *Ulcerative Colitis (UC) 211*
  - *Summary of Dietary Support for IBD in Children 211*
  - *Sample Menu for Children with IBD 211*

Chapter 29: Nutrition Support in Short Bowel Syndrome 213

- *Etiology 213*
- *Pathophysiology 213*
  - *Nutritional Management in Short Bowel Syndrome 214*
  - *Role of Breast Milk 216*
  - *Electrolytes, Vitamins and Mineral Supplementation 216*
  - *Role of Fiber and Glutamine 216*
  - *Nutritional Complications in SBS 217*

Chapter 30: Nutritional Management in Celiac Disease 219

- *Incidence 219*
- *Pathogenesis—What is Gluten? 219*
- *Clinical Features of CD 220*
- *Diagnostic Criteria 221*
- *Age of Presentation 221*
- *Management of GFD 221*
- *Goals of Nutritional Therapy 222*
- *Compliance on GFD 223*
  - *Duration of Treatment/Follow-Up 224*
- *Gluten Challenge 224*
- *Factors Affecting Gluten Sensitivity 224*
- *Complications of Celiac Disease 226*
  - *Celiac Crisis 226*
- *Recipes for Gluten Free Diet 226*
  - *Gram Laddoo 226*
  - *Chidwa Barfi 227*
  - *Chidwa Laddoo 227*
  - *Dosa 227*
  - *Sago Kheer 227*
  - *Rice Pura 227*
  - *Idli 227*
- *Sample Menu for Glutenfree Diet 228*
  - *Breakfast 228*
  - *Midmorning 228*
  - *Lunch 228*
  - *Evening 228*
  - *Dinner 228*
  - *Bedtime 228*

Chapter 31: Nutritional Support in Cystic Fibrosis 230

- *Clinical Presentation 230*
  - *Pancreatic Insufficiency 230*
  - *Chronic Respiratory Involvement 231*
  - *Gastroesophageal Reflux 231*
  - *Growth Failure 231*
- *Causes of Malnutrition 231*
  - *Nutrition: A Risk Factor 231*
  - *Energy Losses 231*
  - *Increased Energy Expenditure 232*
  - *Low Energy Intake 232*
- *Goals of Nutritional Management 232*
  - *Nutritional Support 232*
- *Feeding of Infants 233*
  - *Breast Milk 233*
  - *Feeding of Older Children 233*
  - *Electrolyte Supplementation 233*
  - *Vitamin and Mineral Supplements 234*
  - *Trace Elements 234*
  - *Route of Feeding 235*
  - *Pancreatic Enzyme Supplementation 235*
  - *Dosage of PES 235*
  - *Infants 235*
  - *Older Children 236*
  - *Administration of PES 236*
  - *General Guidelines for Use of PES 236*
- *Complications of Cystic Fbrosis 237*
  - *Diabetes Mellitus 237*
  - *Celiac Disease 237*
- *Role of Functional Foods in Cystic Fibrosis 237*
  - *Fish Oil 237*
  - *Turmeric 238*

Chapter 32: Diet in Liver Diseases.....240

- *Hepatitis 240*
  - *Management 240*
- *Cirrhosis of Liver 242*
- *Indian Childhood Cirrhosis 243*
  - *Etiology/Source 244*
  - *Management 244*
  - *Prevention 244*

Chapter 33: Diet in Kidney Diseases 246

- *Nephrotic Syndrome 246*
  - *Manifestation 246*
  - *Dietary Modifications in Nephrotic Syndrome 246*

- *Acute Renal Failure 248*
  - *Nutritional Management 248*
- *Chronic Renal Failure 249*
  - *Nutritional Management 249*
- *Dialysis 251*
- *Nutritional Management of Transplant Patients 253*

Chapter 34: Inborn Errors of Metabolism.....255

- *Phenylketonuria 255*
- *Diagnosis 255*
- *Dietary Management 256*
- *Atypical Phenylketonuria 258*
  - *Green List 259*
- *Galactosemia 259*
  - *Clinical Presentation 259*
  - *Dietary Management 259*
  - *Duration of Dietary Treatment 260*
- *Fructosemia 260*
- *Fructose Free Diet 261*
- *Maple Syrup Disease 262*
  - *Dietary Management 262*
- *Homocystinuria 262*
  - *Dietary Modifications 262*
- *Wilson's Disease 262*
  - *Dietary Modifications 262*

Chapter 35: Nutritional Support in Juvenile Diabetes Mellitus.....264

- *Diagnosis/Presentation 265*
- *Medical Nutrition Therapy in Type I Diabetes Mellitus 265*
- *Goals of Nurition Therapy 266*
- *Carbohydrate Distribution for Juvenile Diabetics (Carbohydrate Counting) 267*
- *Glycemic Index 268*
  - *Fiber 269*
  - *Proteins 269*
  - *Fat 269*
  - *Sodium 269*
- *Sucrose for Diabetic Children 271*
- *Sweetners 271*
- *Insulin Regime and Diet Plan 272*
- *Exercise and Hypoglycemia 272*
- *Considerations in Different Stages of Childhood 273*
  - *Infants 273*
- *Toddlers 274*
- *School Children 274*
- *Adolescents 274*

- *Complications of Diabetes Mellitus 276*
  - *Hypoglycemia 276*
  - *Diabetic Ketoacidosis 276*
  - *Illness and Hyperglycemia 277*
  - *Hypertension 277*
- *Somogyi and Dawn Effect 277*
  - *Nutrition Counseling and Follow-Up 278*
- *Annexure 279*
  - *1000 Calories Diabetic Diet 279*
  - *1200 Calorie Diabetic Diet 279*
  - *1400 Calorie Diabetic Diet 280*
  - *1600 Calories Diabetic Diet 281*
  - *1800 Calories Diabetic Diet 281*
  - *2000 Calories Diabetic Diet 282*

Chapter 36: Dietary Management in Hypoglycemia 285

- *Glycogen Storage Disease Type I 285*
- *Glycogen Storage Disease Types III and VI 287*
  - *Debrancher Enzyme Deficiency 287*
  - *Leucine Sensitive Hypoglycemia 287*
  - *Ketotic Hypoglycemia 288*

Chapter 37: Nutritional Support of the Critically Ill Child 289

- *Nutritional Assessment 289*
- *Indications for Nutrition Support in the ICU 290*
- *General Goals and Principles 290*
  - *Goals of Nutritional Support 290*
  - *Principles of Nutritional Support 290*
  - *Administering Nutrition 291*
- *Monitoring 293*
  - *Specialized Dietary Foods in the ICU 294*

Chapter 38: Nutritional Management of Pediatric Heart Diseases 296

- *Congenital Heart Disease 296*
  - *Etiology 297*
  - *Factors Affecting Growth Failure in CHD 297*
  - *Management of CHD 297*
  - *Neonatal Period 298*
- *Pediatric Dyslipidemias 299*
  - *Management of Dyslipidemia 299*

Chapter 39: Nutrition Support in Children with HIV/AIDS 302

- *Pathophysiology 302*
- *Effect of HIV on Nutrition 302*
- *Causes of Malnutrition in HIV Infected Children 303*
- *Oxidative Stress in HIV+/AIDS Patients 303*

Immunity and Other Cofactors in AIDS 303
Role of Nutrition in HIV+/AIDS Children 304
Nutritional Requirements for HIV Infected Child 304
Protein 304
Micronutrients 304
Affect of Antiretroviral Therapy 304
Feeding of the HIV Exposed Infant 305
Breastfeeding 305
Replacement Feeding 306

Chapter 40: Nutritional Management of Cancer and Bone Marrow Transplant in Children.....308

Nutritional Implications of Cancer in Children 308
Adverse Effects of Cancer Therapy on Nutritional Status in Children 310
Nutritional Support for Children with Cancer 312
Route of Feeding 312
❖ *Marrow Transplant 315*
Post-transplant Course 315
Complications of Marrow Transplant 316

Chapter 41: The Ketogenic Diet in Management of Epilepsy.....318

❖ *History of Ketogenic Diet 318*
The Story of Charlie 318
Mechanism of Action of KD 319
Selection of Patients for Ketogenic Diet 319
Initiating Ketogenic Diet 320
Planning of Recipes 322
Considerations or Special Categories of Patients 323
Side Effects on KD 323
Long-Term Side Effects 324
Important Factors to be Considered on KD 324
The MCT Keto Diet 325
Discontinuation of Diet 325
Modified Atkins Diet 325
The Low Glycemic Index Treatment 326

Index.....329