## Contents

1. **History and Evolution of Pigmentary Disorders in Human**  
   *Amiya Kumar Mukhopadhyay*  
   - History and Evolution of Pigmentary Disorders in Modern Dermatology 5

2. **Evolution of Skin Color in Human: An Anthropological Overview**  
   *Amiya Kumar Mukhopadhyay*  
   - Evolutionary Timeline of Human Being 7  
   - Evolution of Various Colors: Various Opinions, Various Theories 8  
   - Effect of Climate and Change of Lifestyle 8  
   - Pigment and Folate Metabolism 9  
   - Pigment and Vitamin D 10  
   - Fair Sex, Fair Color and Sexual Selection 10  
   - Skin, Gene and Color 11  
   - Influence of Culture on Pigmentation 11

3. **Melanocyte**  
   *Ravinder Kumar, Davinder Parsad*  
   - Development of Melanocytes 14  
   - Melanocyte Signaling Pathways 14  
   - Formation of Melanosomes 15  
   - Melanin-producing Enzymes 16  
   - Melanin Synthesis 16  
   - Epidermal Melanin Unit 16  
   - Melanosome Transfer from Melanocyte to Keratinocyte 17  
   - Melanocyte Functions 18  
   - Extracutaneous Melanocytes 18

4. **Systemic Disorders with Cutaneous Pigmentary Alterations**  
   *Keshavmurthy A Adya, Arun C Inamadar*  
   - Pigmentary Derangements in Endocrine Disorders 22  
   - Pigmentary Derangements in Metabolic Disorders 26  
   - Pigmentary Derangements in Nutritional Disorders 31  
   - Pigmentary Derangements in Gastrointestinal Disorders 32  
   - Pigmentary Derangements in Hepatobiliary Disorders 32  
   - Pigmentary Derangements in Pancreatic Disorders 34  
   - Pigmentary Derangements in Renal Disorders 34  
   - Pigmentary Derangements in Cardiac Disorders 35  
   - Pigmentary Derangements in Disorders of the Respiratory System 35

5. **Developmental, Neviod, Genetically Determined and Neurocutaneous Pigmentary Disorders**  
   *Nilendu Sarma*  
   - Hypopigmented Disorders 41  
   - Hyperpigmented Disorders 46

6. **Metabolic Disorders of Pigmentation**  
   *Imran Majid*  
   - Hypopigmentation 53  
   - Hyperpigmentation 55

7. **Endocrinal Pigmentary Disorders**  
   *Raghunatha Reddy R, Shashikumar BM*  
   - Role of Melanocortins, Acth, and Melanocortin Receptors in Melanogenesis 60  
   - Addison’s Disease 61  
   - Acromegaly 62  
   - Hyperthyroidism 63  
   - Pheochromocytoma 63  
   - Diabetes Mellitus 63  
   - Carcinoid Syndrome 63  
   - Pigmentary Changes in Pregnancy 64

8. **Chemical Occupational and Drug-induced Pigmentary Disorders**  
   *Sanjay Ghosh, Saurav Kundu*  
   - Chemical Occupational and Drug-induced Hypopigmentation 66  
   - Chemical Occupational and Drug-induced Hyperpigmentation 72
9. **Infective and Post-inflammatory Pigmentary Disorders**
   Sunil Dogra, Rahul Mahajan
   - Infective 83  •  Pityriasis Versicolor 83  •  Tinea Nigra 85  •  Leprosy 85
   - Post-kala-azar Dermal Leishmaniasis 86  •  Treponematoses: Syphilis and Pinta 87
   - Onchocerciasis 88  •  Post-inflammatory 88  •  Post-inflammatory Hyperpigmentation 89
   •  Post-inflammatory Hypopigmentation 92

10. **Neoplasms with Pigmentary Changes or Discoloration**
    Prasad Kumarasinghe, Daniel Hewitt
    - Hyperchromic Neoplastic Conditions 95  •  Hypochromic Neoplastic Conditions 96
    - Mimics of Neoplastic Dyschromic Lesions 96  •  Diagnosis and Management 96
    - Malignant Melanoma 96  •  Pigmented Basal Cell Carcinoma 101  •  Mycosis Fungoides 101
    •  Some Common Benign Neoplastic Conditions with Pigmentary Changes 102

11. **Nutritional Pigmentary Disorders**
    Vineet Relhan, Khushboo Goel Mahajan
    - Vitamin Deficiencies Associated with Pigmentary Changes 107  •  Trace Elements
    and Skin Pigmentation 109  •  Pigmentary Changes Secondary to Protein Energy
    Malnutrition 110  •  Vitiligo and Nutrients 110  •  Pigmentation Disorders due to
    Nutrition Excess 111  •  Work-up of a Patient with Nutritional Pigmentary Disorder 111

12. **Morphological Types of Pigmentation**
    Biju Vasudevan, Manas Chatterjee, Rajesh Verma
    •  Types of Morphological Pigmentation 113

13. **Pigmented Variants of Skin Disorders**
    Biju Vasudevan, Rajesh Verma, Ruby Venugopal
    - Hyperpigmented Variants 121  •  Hypopigmented Variants Hypopigmented
    Mycosis Fungoides 126  •  Other Pigmentary Variants 127

14. **Vitiligo and Melanocyte Reservoir**
    Rafael Falabella, Maria I Barona
    - Historical Highlights on Skin Pigmentation 130  •  Concept of a Melanocyte Reservoir 130
    - Hair Follicle and the Melanocyte Reservoir 131  •  Melanocyte Reservoir Unrelated
    to Hair Follicles 133  •  Leukotrichia and a Depleted Melanocyte Reservoir 133

15. **Clinical, Biochemical and Immunological Aspects of Vitiligo**
    Manoj Kumar Tembhre, Alpana Sharma, Rehan Khan, Somesh Gupta
    - Clinical Aspects of Vitiligo 135  •  Pathogenesis of Vitiligo 136  •  Biochemical Theory
    of Vitiligo 136  •  Immunological Aspects of Vitiligo: Role of Autoimmunity 137

16. **Measuring Disease Severity in Vitiligo**
    Vishal Gupta, M Ramam
    - Measures of Extent of Skin Involvement and Intensity of Depigmentation 141  •  Measures
    of Disease Activity/Progression of Disease/Disease Stability 145  •  Measures of the Potential
    for Repigmentation 147  •  Disfigurement 148  •  Psychosocial Impact of Vitiligo 148
    - Generic Quality of Life Instruments 149  •  Dermatology Quality of Life Instruments 150
    •  Vitiligo Specific Quality of Life Instruments 152

17. **Epidemiology of Vitiligo**
    Iffat Hassan, Parvaiz Rather
    •  Associations of Vitiligo 159
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Classification of Vitiligo</td>
<td>161</td>
</tr>
<tr>
<td>19</td>
<td>Segmental Vitiligo</td>
<td>167</td>
</tr>
<tr>
<td>20</td>
<td>Vitiligo in Children</td>
<td>181</td>
</tr>
<tr>
<td>21</td>
<td>Concept of Stability of Vitiligo</td>
<td>186</td>
</tr>
<tr>
<td>22</td>
<td>Phototherapy in Vitiligo</td>
<td>194</td>
</tr>
<tr>
<td>23</td>
<td>Medical Management of Vitiligo</td>
<td>201</td>
</tr>
<tr>
<td>24</td>
<td>Oral and Systemic Corticosteroids in Management of Vitiligo</td>
<td>205</td>
</tr>
<tr>
<td>26</td>
<td>Alternative Treatment for Vitiligo</td>
<td>223</td>
</tr>
<tr>
<td>27</td>
<td>Surgical Management of Vitiligo</td>
<td>227</td>
</tr>
</tbody>
</table>

**Chapter 18. Classification of Vitiligo**

**Tarun Narang, Davinder Parsad**

- Epidemiology 167
- Pathogenesis 167
- Clinical Features 171
- Differences between Segmental and Non-segmental Vitiligo 174
- Diagnosis 175
- Differential Diagnosis 175
- Management 176

**Chapter 19. Segmental Vitiligo**

**Binod K Khaitan, Sushruta Kathuria, Priyanka**

- Epidemiology 167
- Pathogenesis 167
- Clinical Features 171
- Differences between Segmental and Non-segmental Vitiligo 174
- Diagnosis 175
- Differential Diagnosis 175
- Management 176

**Chapter 20. Vitiligo in Children**

**Sandipan Dhar, Raghubir Banerjee, Rajib Malakar**

- Etiopathogenesis 181
- Classification 181
- Clinical Manifestations 182
- Associated Conditions 182
- Prognosis and Outcome 183
- Management 183

**Chapter 21. Concept of Stability of Vitiligo**

**Koushik Lahiri, Subrata Malakar**

- Period of Stability 186
- Area Based Variable Status of Stability 187
- Assessment of Stability 187
- How Stable is Stability? 189
- Understanding Stability from Within 190

**Chapter 22. Phototherapy in Vitiligo**

**Prescilia N Isedeh, Iltefat Hamzavi**

- Psoralen Plus Ultraviolet A Therapy 194
- Narrowband Ultraviolet B 195
- Targeted Phototherapy 196
- Adjuvant Therapy with Phototherapy 197
- Phototherapy in Children 197

**Chapter 23. Medical Management of Vitiligo**

**Torello Lotti, Angelo Massimiliano D’Erme**

- Classification of Vitiligo 201
- Clinical Management 201
- Therapeutical Management 202
- Medical Treatment 202
- Management Algorithm 203

**Chapter 24. Oral and Systemic Corticosteroids in Management of Vitiligo**

**Binod K Khaitan, Sushruta Kathuria**

- Structure and Classification of Systemic Corticosteroids 206
- Mechanism of Action of Corticosteroids in Vitiligo 207
- Efficacy of Corticosteroids in Vitiligo 209


**Ahmad Reza Hossani-Madani, Rebat M Halder**

- Topical Treatment of Vitiligo 213

**Chapter 26. Alternative Treatment for Vitiligo**

**Torello Lotti, Angelo Massimiliano D’Erme**

- Antioxidant 223
- L-Phenylalanine 224
- Khellin 224
- Homeopathy and Ayurvedic Medicine 224
- Psychotherapy 225
- Climatological and Balneological Therapies 225

**Chapter 27. Surgical Management of Vitiligo**

**T Salim**

- Principle of Surgical Treatments 227
- Indications for Surgery and Patient Selection 228
- Contraindications 228
- Preoperative Counseling 228
- Methods of Surgery 229
- Approach to Surgical Management of Vitiligo 238
28. Autologous Mini Punch Grafting in Vitiligo
   Koushik Lahiri
   • Historical Perspective 241 • Punch Instrument 241 • Evolution of Mini
     Punch Grafting 242 • Test Grafting 243 • Procedure of Minigrafting 243
   • Follow-up and Course of Events 245 • Complications 245 • Analysis of
     Special Features 245

29. Meshed Split Skin Graft for Extensive Vitiligo
   CR Srinivas, Reena Rai
   • Technique 251 • Procedure 251

30. Therapeutic Guidelines in Vitiligo
   Shyamanta Barua
   • Topical Therapy 253 • Systemic Therapy 255 • Phototherapy 256
   • Surgery 259 • Miscellaneous Therapy 261 • Other Interventions 262

31. Pigmentary Changes in Pregnancy
   M Sendhil Kumaran, Amrinder Jit Kanwar
   • Pathogenesis 270 • Melasma 272

32. Quality of Life in Pigmentary Disorders
   Sudhir Nayak UK, Smitha Prabhu, Shrutakirthi D Shenoi
   • Quality of Life in Disorders of Hyperpigmentation 274 • Other Related QoL Indices 275
   • Quality of Life in Disorders of Depigmentation 275 • Stigmatization in Vitiligo 276
   • Psychological and Psychiatric Co-morbidity 276 • Stress Precipitating Vitiligo 276
   • Psychosocial Assessment Scales 276 • Vitiligo Specific Scales 276 • Predictors of
     Increased Severity in Various Scales 276 • Quality of Life in Children and Adolescents
     with Vitiligo 277 • Effectiveness of Therapeutic Interventions in QoL in Vitiligo Patients 277
   • Routine Psychological Assessment in Vitiligo 277 • Overcoming Quality of Life Issues
     in Vitiligo 277 • Limitations of QoL Studies 277

33. Epidemiology of Melasma
   Sanjay K Rathi, Paschal D’Souza

34. Etiopathogenesis of Melasma
   Hee Young Kang
   • Sun Exposure and Melasma 282 • Role of Dermal Factors in the Development
     of Melasma 283 • Basement Membrane Perspective 284 • Transcriptomics
     of Melasma 285

35. Histopathological Evaluation of Melasma and Other Facial Hyperchromias
   Asha Kubba, Meenakshi Batrani
   • Definition of Terms 287 • Hyperchromia and Hyperpigmentation 287
   • Facial Hyperchromia 288 • Melasma 288 • Differential Diagnosis
     of Melasma 290 • Practical Approach in Diagnosing Facial Hyperchromia 296

36. Update Scoring Methods and Non-invasive Measurement Methods in
    Melasma (Reliability Assessment and Validation of the Melasma Area
    and Severity Index and a New Modified MASI Scoring Method)
   Jean-Paul Ortonne
   • Melasma Area and Severity Index 299 • Measuring the Impact of Melasma 300
   • Reflectance Confocal Microscopy for Pigmentary Disorders 302 • Visualization
of Melanin and Melanocytes by Reflectance Confocal Microscopy 303  •  In Vivo
Reflectance Confocal Microscopy Detects Pigmentary Changes in Melasma at a
Cellular Level Resolution 304  •  Histological Classification of Melasma with
Reflectance Confocal Microscopy: A Pilot Study in Chinese Patients 309

37. Cutaneous Biophysical Characteristics of Melasma 314
Jean-Paul Ortonne
•  Defective Barrier Function in Melasma Skin 314  •  Material and Methods 314
•  Melanin Index and Erythema Index 314  •  Basal Stratum Corneum Properties 315
•  Sebum Content 315  •  Sebum Content Thickness and Expression of Ppar-A
and Alox15b 315  •  Discussion 315

38. Defective Importance of Pendulous Melanocytes in Melasma 318
Jean-Paul Ortonne
•  Does Altered Basement Membrane of Melasma Lesions Affects Treatment
Outcome in the Skin? 318  •  Pendulous Melanocytes: A Characteristic Feature
of Melasma and How it Occurred 320

39. Classification and Clinical Features of Melasma 323
Kiran Godse, Shweta Agarwal
•  Clinical Features 323  •  Classification 323

40. Medical Management of Melasma 326
Rashmi Sarkar, Shivani Bansal
•  Hydroquinone 327  •  Retinoids 327  •  Topical Steroids 327  •  Triple Combination
Therapy 327  •  Other Retinoids 328  •  Kojic Acid 328  •  Azelaic Acid 328
•  Glycolic Acid 328  •  Arbutin 329  •  Other Agents 329

41. Photoprotection for Melasma 333
Narendra Gokhale
•  Electromagnetic Radiation 333  •  Photoprotection 334  •  Sunscreens 334
•  Protective Clothing 338

42. Chemical Peeling for Melasma 340
Annyce Treherne, Valerie D Callender
•  Chemical Peels 340  •  Technique 342  •  Post-peel Instructions 343

43. Cosmetics, Cosmeceuticals and Camouflage for the Treatment of Melasma 345
Vic A Narurkar
•  Non-hydroquinone Prescription Agents 345  •  Cosmeceutical Agents 345
•  Energy Based Devices 346  •  Chemical Peeling 347  •  Combination Treatments 347
•  Camouflage Treatments 347

44. Recent Trends and Future Treatment Paradigms of Melasma Based
on Current Understanding of Pathophysiology 349
Saumya Panda
•  The Old Classification Scheme is not Valid 349  •  Is there a True Dermal Melasma? 350
•  Role of Epidermal Melanin in Melasma 350  •  Hyperactive Melanocytes 351
•  Pendulous Melanocytes and Spectrum of Radiation Responsible in Melasma 351
•  Defective Barrier Function in Melasma Skin 352  •  Dermal-epidermal Interaction and
Paracrine Regulation 353  •  Role of Vascular Endothelium 354  •  Endocrine Correlates
of Melasma 354  •  Depigmenting Agents with Novel Mechanisms of Action 355
45. Exogenous Ochronosis
Vijay Zawar, SK Tan
- Historical Aspects 362
- Epidemiological Aspects 362
- Predisposing Factors 362
- Clinical Features and Staging 362
- Diagnosis 363
- Treatment of Exogenous Ochronosis 364

46. Periocular Pigmentation
Manas Chatterjee
- Epidemiology 366
- History 367
- Etiology and Diagnostic Considerations 367
- Treatment 373

47. Physical Therapies for Periorbital Hyperpigmentation, Chemical Peels and Lasers
Bhavesh Shantilal Devani
- Prevalence 377

48. Progressive Macular Hypomelanosis
Prasad Kumarasinghe, Steven Thng
- History 383
- Epidemiology 383
- Clinical Features 384
- Differential Diagnoses and Pitfalls in Diagnosis 385
- Relevant Investigations 385
- Diagnosis 385
- Microscopy and Electron Microscopy 385
- Etiology 386
- Management 387
- Future Directions 388

49. Non-melasma Facial Melanoses
Gautam Kumar Singh
- Well-defined Facial Melanoses 390
- Acquired Melanoses which also Involve Face 394
- Miscellaneous 396
- Management of Non-melasma Facial Melanosis 397

50. Pigmentary Abnormalities of Nail
Archana Singal, Namrata Chhabra
- Melanonychia 403
- Leukonychia (White Nail) 407
- Splinter Hemorrhages 410
- Yellow Nail 410
- Greenish-black Discoloration 410
- Abnormality in Color of Lunula 410

51. Macular Amyloidosis
Latika Arya
- Epidemiology 412
- Pathogenesis 412
- Etiological Factors 413
- Pathology 414
- Dermoscopy 414
- Clinical Features 415
- Treatment 416

52. Lichen Planus Pigmentosus
M Sendhil Kumaran, Amrinder Jit Kanwar
- Epidemiology 421
- Pathogenesis 421
- Risk Factors 422
- Clinical Features 422
- Investigations 423
- Treatment 424
- Conclusion 425
- Course of Disease 425

53. Maturational Hyperpigmentation
Sidharth Sonthalia, Rashmi Sarkar
- Historical Aspects 427
- Indian Scenario 428
- Histopathology 429
- Differential Diagnosis 429
- Conclusion 429
- Future Approach 429

Index 431