# Table of Contents

[List of Figures v](#_Toc151218266)

[List of tables vii](#_Toc151218267)

[Acronyms viii](#_Toc151218268)

[Table of Contents x](#_Toc151218269)

[Abstract xiv](#_Toc151218270)

[1 Introduction 1](#_Toc151218271)

[1.1 Origins of Pharmaceutical Industry 1](#_Toc151218272)

[1.2 Elaboration of Clinical Trials: Origin of RCT Blinded Trials 1](#_Toc151218273)

[1.3 Modern Hospitals, Everyday Clinical Practice and Healthcare Environment 3](#_Toc151218274)

[1.4 Real world evidence and observational studies 4](#_Toc151218275)

[1.5 EHR across the globe 5](#_Toc151218276)

[1.6 Role of Statistics, Analyst, Programmer 5](#_Toc151218277)

[1.7 Traditional Chinese Medicine history and philosophy 6](#_Toc151218278)

[1.8 The Indian context 8](#_Toc151218279)

[1.9 National level efforts AYUSH 9](#_Toc151218280)

[1.10 Science of ayurveda 11](#_Toc151218281)

[1.11 Potential opportunities for Real World Data analysis within Ayurveda 12](#_Toc151218282)

[1.12 What this study aims to contribute to 13](#_Toc151218283)

[1.12.1 Hospital management 13](#_Toc151218284)

[1.12.2 Clinicians or treating doctors 13](#_Toc151218285)

[1.12.3 Universities and students 14](#_Toc151218286)

[1.12.4 Policy makers – AYUSH and relevant ministries, insurance sector: 14](#_Toc151218287)

[1.13 Introduction to real life data 14](#_Toc151218288)

[1.14 Introduction to clinical data understanding 16](#_Toc151218289)

[1.15 Introduction to study of demographics and patient characteristics 16](#_Toc151218290)

[1.16 Introduction to study of diagnostics and interventions 17](#_Toc151218291)

[1.17 Structure of the thesis document 17](#_Toc151218292)

[2 Methods 19](#_Toc151218293)

[2.1 Study design 19](#_Toc151218294)

[2.2 Data analysis design 19](#_Toc151218295)

[2.3 Converting real life clinical data into analyzable format 21](#_Toc151218296)

[2.3.1 Data access 21](#_Toc151218297)

[2.3.2 Data preparation 22](#_Toc151218298)

[2.3.3 Data derivation 26](#_Toc151218299)

[2.4 Clinical data understanding 35](#_Toc151218300)

[2.4.1 Broad checks on the datasets 35](#_Toc151218301)

[2.4.2 Contents checks 35](#_Toc151218302)

[2.4.3 Visit pattern analysis 35](#_Toc151218303)

[2.4.4 Patient disease and treatment journey view 35](#_Toc151218304)

[2.5 Studying demographics and patient specific factors 36](#_Toc151218305)

[2.6 Studying diagnostics and interventions 38](#_Toc151218306)

[2.7 Summary of methods section 43](#_Toc151218307)

[3 Results 58](#_Toc151218308)

[3.1 Converting real life clinical data into analyzable format 58](#_Toc151218309)

[3.1.1 Details of the database 58](#_Toc151218310)

[3.1.2 Data Extracted from Hospital Database 59](#_Toc151218311)

[3.2 Clinical data understanding 59](#_Toc151218312)

[3.2.1 Broad checks on the datasets 59](#_Toc151218313)

[3.2.2 Contents checks 61](#_Toc151218314)

[3.2.3 Visit pattern analysis 63](#_Toc151218315)

[3.2.4 Patient disease and treatment journey view 63](#_Toc151218316)

[3.3 Studying demographics and patient specific factors 64](#_Toc151218317)

[3.4 Studying diagnostics and interventions 72](#_Toc151218318)

[4 Discussions 100](#_Toc151218319)

[4.1 Converting real life clinical data into analyzable format 100](#_Toc151218320)

[4.2 Clinical data understanding 100](#_Toc151218321)

[4.2.1 Visit pattern analysis 100](#_Toc151218322)

[4.2.2 Vital sign dataset 100](#_Toc151218323)

[4.2.3 Lab dataset 101](#_Toc151218324)

[4.2.4 Treatment dataset 101](#_Toc151218325)

[4.2.5 Medical coding 103](#_Toc151218326)

[4.2.6 Classification and Sub-classification of the Doshas / Diseases 103](#_Toc151218327)

[4.2.7 Patient profile module 104](#_Toc151218328)

[4.2.8 Improvements to the system architecture 107](#_Toc151218329)

[4.3 Studying demographics and patient specific factors 108](#_Toc151218330)

[4.4 Studying diagnostics and interventions 109](#_Toc151218331)

[4.5 Use cases with in-depth illustrations 111](#_Toc151218332)

[4.5.1 Illustration 1: In-depth review of Visit pattern analysis 111](#_Toc151218333)

[4.5.2 Illustration 2: In-depth review of summary statistics of number of diseases 112](#_Toc151218334)

[4.5.3 Illustration 3: In-depth review of disease table by gender 113](#_Toc151218335)

[4.5.4 Illustration 4: In-depth review of individual patient disease journey 114](#_Toc151218336)

[5 Conclusion 117](#_Toc151218337)

[6 Appendix 123](#_Toc151218338)

[6.1 Approval from the hospital management to carry out the retrospective study 123](#_Toc151218339)

[6.2 Details of analysis dataset 124](#_Toc151218340)

[6.3 All variables in the source database 136](#_Toc151218341)

[6.4 Details of analysis 137](#_Toc151218342)

[6.5 Programs for the different parts of analysis 149](#_Toc151218343)

[6.5.1 Data extraction from SQL database: 01adsl.sql 149](#_Toc151218344)

[6.5.2 Primary dataset creation program: 100\_adsl.R 154](#_Toc151218345)

[6.5.3 R and SQL programs for other datasets from SQL database: 02other\_data.R 163](#_Toc151218346)

[6.5.4 Analysis program for Figure 3-1 170](#_Toc151218347)

[6.5.5 Analysis program for Figure 3-2 170](#_Toc151218348)

[6.5.6 Analysis program for Figure 3-3 178](#_Toc151218349)

[6.5.7 Analysis program for Figure 3-4 178](#_Toc151218350)

[6.5.8 Analysis program for Figure 3-5 178](#_Toc151218351)

[6.5.9 Analysis program for Figure 3-6 178](#_Toc151218352)

[6.5.10 Analysis program for Figure 3-7 186](#_Toc151218353)

[6.5.11 Analysis program for Figure 3-8 186](#_Toc151218354)

[6.5.12 Analysis program for Figure 3-9 186](#_Toc151218355)

[6.5.13 Analysis program for Figure 3-10 187](#_Toc151218356)

[6.5.14 Analysis program for Figure 3-11 187](#_Toc151218357)

[6.5.15 Analysis program for Figure 3-12 187](#_Toc151218358)

[6.5.16 Analysis program for Figure 3-13 201](#_Toc151218359)

[6.5.17 Analysis program for Figure 3-14 201](#_Toc151218360)

[6.5.18 Analysis program for Figure 3-15 201](#_Toc151218361)

[6.5.19 Analysis program for Figure 3-16 201](#_Toc151218362)

[6.5.20 Analysis program for Figure 3-17 207](#_Toc151218363)

[6.5.21 Analysis program for Figure 3-18 214](#_Toc151218364)

[6.5.22 Analysis program for Figure 3-19 214](#_Toc151218365)

[6.5.23 Analysis program for Figure 3-20 215](#_Toc151218366)

[6.5.24 Analysis program for Figure 3-21 215](#_Toc151218367)

[6.5.25 Analysis program for Figure 3-22 215](#_Toc151218368)

[6.5.26 Analysis program for Figure 3-23 216](#_Toc151218369)

[6.5.27 Analysis program for Figure 3-24 216](#_Toc151218370)

[6.5.28 Analysis program for Figure 3-25 217](#_Toc151218371)

[6.5.29 Analysis program for Figure 3-26 219](#_Toc151218372)

[6.5.30 Analysis program for Figure 3-27 226](#_Toc151218373)

[6.5.31 Analysis program for Figure 3-28 245](#_Toc151218374)

[6.5.32 Analysis program for Figure 3-29 245](#_Toc151218375)

[6.5.33 Analysis program for Figure 3-30 245](#_Toc151218376)

[6.5.34 Analysis program for Figure 3-31 248](#_Toc151218377)

[6.5.35 Analysis program for Figure 3-32 253](#_Toc151218378)

[6.5.36 Analysis program for Figure 3-33 253](#_Toc151218379)

[6.5.37 Analysis program for Figure 3-34 253](#_Toc151218380)

[6.5.38 Analysis program for Figure 3-35 253](#_Toc151218381)

[6.5.39 Analysis program for Figure 3-36 253](#_Toc151218382)

[6.5.40 Analysis program for Figure 3-37 253](#_Toc151218383)

[6.5.41 Analysis program for Figure 3-38 258](#_Toc151218384)

[6.5.42 Analysis program for Figure 3-39 258](#_Toc151218385)

[6.5.43 Analysis program for Figure 3-40 269](#_Toc151218386)

[6.5.44 Analysis program for Figure 3-41 273](#_Toc151218387)

[6.5.45 Analysis program for Figure 3-42 279](#_Toc151218388)

[7 References 284](#_Toc151218389)