IMPACT OF FEMALE EDUCATION ON FAMILY HEALTH AND SOCIO-ECONOMIC STATUS

A THESIS SUBMITTED IN PARTIAL FULFILLMENT FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN ECONOMICS

IN THE GOA BUSINESS SCHOOL

GOA UNIVERSITY



By

PHADTE MANISHA MANOHAR

CLUSTER RESEARCH CENTRE IN ECONOMICS

GOVERNMENT COLLEGE OF ARTS, SCIENCE AND COMMERCE

SANQUELIM-GOA

APRIL, 2026

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SANQUELIM - GOA

APRIL, 2026

DECLARATION

I, Manisha Phadte, hereby declare that the thesis titled **"Impact of Female Education on Family Health and Socio-economic Status"** submitted to the Goa University, represents work which has been carried out by me and that it has not been submitted, either in part or full, to any other University or Institution for the award of any research degree.

Place: Goa University, Taleigao- Goa Phadte Manisha Manohar

Date: 10.04.2026

CERTIFICATE

I hereby certify that the thesis titled **"Impact of Female Education on Family Health and Socio-economic Status"** for the award of Doctor of Philosophy in Economics submitted to Goa University is a bonafide record of the research work carried out by Ms. Phadte Manisha Manohar herself under my supervision and may be placed for evaluation.

Name of the Guide

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Manisha Phadte

Ph.D. Scholar

TABLE OF CONTENTS

Declaration I
Certificate I
Acknowledgement II
List of Tables IX
List of Figures XI
List of Abbreviations XIV
CHAPTER I INTRODUCTION 1
1.1 Introduction- Human Capital: A Theoretical Overview 2
1.1.1 The Role of Education 2
1.1.2 The Role of Female Education 3
1.2 Research Problem 4
1.2.1 Research Questions 5
1.3 Importance of the Study 6
1.4 Objectives 6
1.5 Research Hypotheses 6
1.6 Research Methodology 7
1.7 Chapter Scheme 8
CHAPTER II REVIEW OF LITERATURE 10
2.1 Introduction 11
2.2 Female Education and Economic Development 11
2.3 Female Education and Socio-economic Status 12
2.3.1 Educational Status of Women and Place of Residence 12
2.3.2 Educational Status of Women and Social Category 12
2.3.3 Female Education and Family Income 13
2.3.4 Female Education and Income Earned by Her 13
2.4 Female Education and Participation in the Workforce 14
2.5 Education and Health 15
2.6 Female Education and Health Status 16
2.6.1 Education and the Prevalence of Obesity 17
2.6.2 Female Education and the Prevalence of Obesity 18
2.7 Female Education and Husbands' and Households' Health Status 19
2.8 Mother's Education and Child's Nutritional Status 19
2.8.1 Mother's Education and Height of Children 20

2.8.2 Mother's Education and Children's Weight 21
2.8.3 Mother's Education and Obesity among Children 21
2.9 Education and Noncommunicable Diseases and Risk Factors 22
2.9.1 Education and Hypertension 22
2.9.2 Education and Diabetes 22
2.10 Female Education and Lifestyle Patterns 23
2.10.1 Education and Vegetable Fruit (VF) Consumption 24
2.10.2 Education and Consumption of Milk /Dairy Products 25
2.10.3 Education and Fish /Chicken /Meat Intake 25
2.10.4 Education and Consumption of Unhealthy Diets 26
2.10.5 Education and Alcohol Intake /Tobacco Use 26
2.10.6 Education and Physical Activity 27
2.10.7 Education and TV Viewing Time 28
2.10.8 Education and Sleeping Pattern 28
2.11 Summary of Review 29
2.12 Research Gap 33
CHAPTER III RESEARCH DESIGN 35
3.1 Introduction 36
3.2 Sources of Data 36
3.2.1 Secondary Sources 36
3.2.2 Primary Sources 36
3.3 Sampling Design 37
3.3.1 Selection of the Sample Talukas 37
3.3.2 Selection of Villages and Towns 38
3.4 Measurements 43
3.4.1 Socio-economic and Demographic Variables 43
3.4.2 Body Mass Index (BMI) and Lifestyle Patterns 44
3.5 Statistical Tools and Techniques 46
3.6 Operational Definitions of Term/s Used in the Study 54
CHAPTER IV AN OVERVIEW OF EDUCATIONAL AND HEALTH STATUS OF GOA, INDIA 57
4.1 Introduction 58
4.2 Brief Profile of Goa 58
4.2.1 Socio-economic and Demographic Characteristics 60
4.3 Education, Employment, and Health Status 62

4.3.1 Educational Status 62
4.3.2 Employment Status 68
4.3.3 Health Status 70
4.3.3a Nutritional and Health Status by Women's Education 71
4.3.3b Nutritional and Health Status of Men 74
4.3.3c Nutritional and Health Status of Children 76
4.4 An Overview of the Findings 81
4.5 Concluding Observations 82
CHAPTER V IMPACT OF FEMALE EDUCATION ON SOCIO-ECONOMIC STATUS AND FAMILY HEALTH: AN EMPIRICAL ANALYSIS 83
5.1 Introduction 84
5.2 The Socio-economic and Demographic Profile of Respondents 84
5.3 Objective-wise Results and Analysis 88
5.3.1 Inter-relationship between the Level of Female Education and their Socio-economic Status 88
5.3.1a Women's Education Level by Place of Residence 88
5.3.1b Women's Level of Education by the Social Category 89
5.3.1c Monthly Family Income by Level of Female Education 90
5.3.1d Economic Status by the Level of Female Education 93
5.3.1e Discussion 95
5.3.2 The Workforce Participation of Women with respect to their Levels of Education by Social Category. 97
5.3.2a Employment Status of Women by their Educational Level 97
5.3.2b Employment Status of Women by Education and Social Category 98
5.3.2c Discussion 103
5.3.3 Impact of Female Education on Health by Employment Status and Social Category. 104
5.3.3a Women's Self-reported Health Status by Educational Level 106
5.3.3b Self-reported Health Status of Women by Education and Social Category 108
5.3.3c Self-reported Health Status of Women by Education and Employment Status 109
5.3.3d Discussion 113
5.3.4 Impact of Female Education on the Health of her Husband and Children. 115
5.3.4a The Impact of Female Education on her Husband's Health Status and being Overweight /Obese 115
5.3.4b Impact of Mothers' Education on the Nutritional Status of their Children 118
5.3.4c Discussion 126

5.3.5 The Lifestyle Patterns and Prevalence of NCDs among Households by Level of Female Education. 127

5.3.5a The Lifestyle Patterns and Prevalence of NCDs among Women by their Education Level 128

5.3.5b The Lifestyle Patterns and Prevalence of NCDs among Husbands by Women's Educational Level 132

5.3.5c Discussion 136

CHAPTER VI CONCLUSION AND SUGGESTIONS 138

6.1 Introduction 139

6.2 Major Findings 139

6.2.1 Educational and Health Status of Goa and India 140

6.2.2 Women's Educational Level and Socio-economic Status 140

6.2.3 Women's Educational Level and Workforce Participation by Social Category 141

6.2.4 Impact of Women's Education on their Health by Employment Status and Social Category 141

6.2.5 Impact of Female Education on the Health of her Husband and Children 142

6.2.6 The Lifestyle Patterns and Prevalence of NCDs among Households by Level of Female Education 142

6.3 Conclusion 142

6.4 Recommendations 145

6.5 Limitations of the Study 149

6.6 Scope for Further Research 150

REFERENCES AND BIBLIOGRAPHY 151

ANNEXES XV

List of Tables

Table Number	Table Name	Page No.
3.1	Town-wise Selection of Sample Households from Ponda Taluka	39
3.2	Village-wise Selection of Sample Households from Ponda Taluka	40
3.3	Town-wise Selection of Sample Households from Tiswadi Taluka	41
3.4	Village-wise Selection of Sample Households from Tiswadi Taluka	42
3.5	Variables Used to Develop the Economic Status (ES) Index	43
3.6	Variables Used for the Construction of HLI	45
4.1	Literacy Level of Scheduled Tribes and Scheduled Caste Populations in Goa and India (in percentages)	65
4.2	Population Distribution by Educational Level in Goa (in percentages)	66
4.3	Distribution of Workers and Non-Workers in Goa (in percentages)	69
5.1	Descriptive Statistics of the Female Respondents	85
5.2	Distribution of Sample Respondents on the basis of Education and Place of Residence (in percentages)	89
5.3	Results of the Chi-Square Test for Women's Education and Social Category	90
5.4	Results of the Kruskal-Wallis Test for Female Education and Monthly Family Income	91
5.5	Results of the Multinomial Logistic Regression Model for Female Education and Family Income Quartiles	93
5.6	Results of Linear Regression Analysis for Female Education and Economic Status	95
5.7	Chi-Square Test Results for Association of Women's Education with Employment Status and Social Category	99
5.8	Results of Stratified Logistic Regression Analysis for Employment Status by Education Level and Social Category	99
5.9	Hierarchical Logistic Regression Model for Women's Education and Employment Status along with Control Variables	101
5.10	Chi-square Test Results for Self-reported Health Status of Women by their Education Level	107
5.11	Results of the Chi-square Test for Self-reported Health Status by Education and Social Category	108
5.12	Results of the Chi-square Test for Self-reported Health by Education and Employment Status	109
5.13	Results of the Structural Equation Modelling	111
5.14	Chi-square Test Results for Husband's Self-reported Health by Wife's Education Level	116

Table Number	Table Name	Page No.
5.15	Results of the Binary Logistic Regression Model for Wife's Education and Husband being Overweight/Obese	117
5.16	Results of the Binary Logistic Regression Model for Mother's Education and Adolescents aged 15-21 Years being Overweight or Obese	124
5.17	Results of the Binary Logistic Regression Model for Women's Education and Presence of Diabetes or High Blood Pressure	130
5.18	Results of the Ordinal Logistic Regression Model for Women's Education and HLI	131
5.19	Results of the Binary Logistic Regression Model for Women's Education and the Prevalence of Diabetes or High Blood Pressure among Husbands	133
5.20	Results of the Ordinal Logistic Regression Model for Women's Education and Husband's HLI	135

List of Figures

Figure Number	Figure Name	Page No.
3.1	Map of the Tiswadi Taluka	37
3.2	Map of the Ponda Taluka	38
4.1	Map of Goa	59
4.2	Trends in Literacy in Goa and India by Gender, 1991- 2011 (in percentages)	63
4.3	Rural-Urban Literacy Trends among Females in Goa and India, 1991-2011 (in percentages)	64
4.4	Median Number of Years of Schooling Completed by Women in Goa and India	67
4.5	Distribution of Female Respondents Aged 15-49 Years by Number of Years of Schooling Completed in Goa and India, 2019-21 (in percentages)	68
4.6	Employment Status of Women and Women with ≥10 Years of Schooling in Goa and India (in percentages)	70
4.7	The Prevalence of Anaemia among Women and Women with ≥10 Years of Schooling in Goa and India (in percentages)	72
4.8	Women who are Underweight and Women with ≥10 Years of Schooling in Goa and India (in percentages)	73
4.9	Overweight or Obesity among Women and Women with ≥10 Years of Schooling in Goa and India (in percentages)	73
4.10	Prevalence of Anaemia among Men and Women with ≥10 Years of Schooling in Goa and India (in percentages)	74
4.11	Men with BMI below Normal Level and Women with ≥ 10 Years of schooling in Goa and India (in percentages)	75
4.12	Overweight or Obesity among Men and Women with ≥ 10 Years of Schooling in Goa and India (in percentages)	76
4.13	Infant Mortality Rate and Women with ≥10 Years of Schooling in Goa and India (in percentages)	76
4.14	Under-five Mortality Rate and Women with ≥10 Years of Schooling in Goa and India (in percentages)	77
4.15	Children aged 6-59 Months being Anaemic and Women with ≥10 Years of Schooling in Goa and India (in percentages)	78
4.16	Stunting among Children Under 5 Years and Women with ≥10 Years of Schooling in Goa and India (in percentages)	79
4.17	Children Under 5 Years being Wasted and Women with ≥10 Years of Schooling in Goa and India (in percentages)	79

Figure Number	Figure Name	Page No.
4.18	Underweight Children Under 5 Years and Women with ≥10 Years of Schooling in Goa and India (in percentages)	80
5.1	Distribution of Respondents by Social Category/Caste	85
5.2	Age-wise Distribution of Respondents	86
5.3	Educational Status of Sample Respondents	86
5.4	Distribution of Sample Respondents by Monthly Family Income (in Percentages)	87
5.5	Employment Status of the Sample Respondents	87
5.6	Educational Level of Female Respondents by Social Category	90
5.7	Monthly Family Income by Women's Education Level	91
5.8	Association between the Education Level and Family Income	92
5.9	Scatterplot of Clusters: Education vs. Income	94
5.10	Employment Status of Female Respondents by Education Levels (in percentages)	98
5.11	Effect of Education on Women's Workforce Participation by Social Category	100
5.12	Improvement in Pseudo R^2 across Models	102
5.13	Self-reported Health Status of the Respondents by the Level of Education (in percentages)	106
5.14	Impact of Education on the Probability of Reporting Excellent Health	108
5.15	Nutritional Status of Women	110
5.16	Simplified SEM Path Diagram	113
5.17	Husband's Self-reported Health by Wife's Education Level (in percentages)	116
5.18	Nutritional Status of Husbands	117
5.19	Nutritional Status of Children aged 5 Years or Below	120
5.20	Nutritional Status of Children aged 5 Years or Below by Mother's Education Level	121
5.21	Nutritional Status of Children aged 6-14 Years	121

Figure Number	Figure Name	Page No.
5.22	Nutritional Status of Children aged 6-14 Years by Mother's Education Level	122
5.23	Nutritional Status of Children aged 15-21 Years	123
5.24	Nutritional Status of Children aged 15-21 Years by Mother's Education Level	124
5.25	Predicted Overweight/Obesity among Adolescents aged 15-21 Years by Mother's Education Level	125
5.26	Presence of Diabetes or High Blood Pressure among Women by their Education Level	129
5.27	Healthy Lifestyle Index (HLI) among Women by their Education Level	130
5.28	Predicted Probability of Diabetes/High Blood Pressure among Women by Educational Level and Healthy Lifestyle Index (HLI)	132
5.29	Presence of Diabetes or High Blood Pressure among Husbands by Women's Education Level	133
5.30	Husband's HLI by Women's Education Level	134
5.31	Predicted Probability of Diabetes/High Blood Pressure among Husband by Healthy Lifestyle Index (HLI) and Wife's Education	135

List of Abbreviations

CVD	Cardiovascular diseases
BMI	Body Mass Index
NCDs	Noncommunicable Diseases
NFHS	National Family Health Survey
RBI	Reserve Bank of India
HDI	Human Development Index
GDP	Gross Domestic Product
HIV/AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
O.Gs	outgrowths
GSDP	Gross State Domestic Product
HF	Heart Failure
WHO	World Health Organization
ST	Scheduled Tribe
SC	Scheduled Caste
OBC	Other Backward Class
HLI	Healthy Lifestyle Index
CBR	Crude Birth Rate
CDR	Crude Death Rate
IMR	Infant Mortality Rate
U5MR	Under-five Mortality Rate
SDG	Sustainable Development Goal
AIC	Akaike Information Criterion
BIC	Bayesian Information Criterion
MPI	Multidimensional Poverty Index
ES	Economic Status
VF	Vegetable Fruit

CHAPTER I

INTRODUCTION

1.1 Introduction

1.1.1 The Role of Education

1.1.2 The Role of Female Education

1.2 Research Problem

1.2.1 Research Questions

1.3 Importance of the Study

1.4 Objectives

1.5 Research Hypotheses

1.6 Research Methodology

1.7 Chapter Scheme

CHAPTER I

Introduction

1.1 Introduction

Human Capital: A Theoretical Overview

Human capital plays a vital role in economic growth and it can also explain the prevalence of income inequalities. Human capital embodies knowledge, skills, and health that individuals acquire throughout their lives (World Bank, 2019). Investment in human capital constitutes investing in education, training, health and experience which yields a positive rate of return well above the investment in physical capital (Schultz, 1961). Therefore, investment in human capital are crucial investments (Becker, 1964) and human capital accumulation contributes to economic growth (Mincer, 1981) and plays a pivotal role in achieving sustainable growth and reducing poverty (World Bank, 2019).

1.1.1 The Role of Education

Education is one of the strongest tools for promoting equity and human development. It spurs self-confidence, enables people to easily find better employment, take part in public discussions, and put forward the societal demands, such as health care, social security, and other services, before the government (UNDP, 2013). Investment in education yields significant returns as it increases the productivity and earnings of those who invest in it (Schultz, 1961). Education level has a significant impact on a country's economic development (WHO, 2011a; Dudzeviciute & Simelyte, 2018; Gebre, 2020), as increased investment in education stimulates economic growth (Cuaresma et al., 2014; WHO, 2023a). Secondary education in middle-income countries and tertiary education in high-income countries contributed the most to growth (UNICEF, 2015). Past investigations have proven that more years of education significantly improves the Gross Domestic Product (GDP) per capita and a country's growth (UNICEF, 2015; Global Partnership for Education, 2016). It was shown that with every additional year of education, the world output increased by around 2 per cent, presuming that other things were constant (Barro and Lee, 2010).

Investment in education results in increased productivity and employability, thereby accelerating the country's overall income and development (Barro and Lee, 2010; Cuaresma

et al., 2014; UNICEF, 2015). Education enables people to engage in productive activities through which they can support themselves economically and organize socially (WHO, 2011b). Globally, it is accepted that education is one of the most important areas through which socio-economically backward people can overcome poverty and participate fully in the activities of the society (UNESCO, 2023).

Advancements in education leads to several welfare effects. On average, people with higher education have higher earnings than those without education, which in turn reduces poverty (Schultz, 1961; UNICEF, 2015). It has been observed that rural poverty declined significantly due to improvements in education (Eshetu et al., 2022). Housing conditions in which people with higher education live were better than those without education (Sudharani et al., 2015).

Even in terms of health, educated people and their children have better health status than uneducated people (UNICEF, 2015). Increased level of education improves life expectancy (Hill & King, 1995) with lower mortality rates among individuals belonging to more educated groups (Barro and Lee, 2010). A positive association was found between life expectancy at birth and tertiary education (Raghupathi & Raghupathi, 2020). People with higher educational level have a significantly lower risk of death from all causes than those with lower education (Yang et al., 2019). Thus, it aids in improving the health status of people (Hosseinpoor et al., 2012).

1.1.2 The Role of Female Education

Female education plays a significant role in transforming communities, countries, and the entire world. Education confers benefits not only to women but also to the entire family (UNICEFa, n.d.). Female education has a strong and positive impact on inclusive growth (Hong et al., 2019). Women reap higher returns to education as compared to men (Depken et al., 2019). Female education enhances households' welfare, i.e., it improves households' income level (Awan and Munir, 2016; Miller et al., 2017), as educated women can earn a higher income than uneducated women (Global Partnership for Education, 2016; Roy et al., 2017). Women with graduation or higher education are more likely to participate in the labour market (Ince, 2010; Yousefy & Baratali, 2011; Chatterjee et al., 2018) as they are positively encouraged to participate in the labour force (Shah & Riaz, 2020; Iheonu et al., 2020; Backhaus & Loichinger, 2022).

Education enables women to enhance their problem-solving and life skills and become more flexible and open-minded (Ince, 2010). Educated girls are more probable to marry at a later age and live a healthier life (UNICEFa, n.d.), as their education has a significant impact on their age at first marriage, while the girls without any formal education have a higher probability of early marriage. Thus, a woman's age at first marriage is positively associated with her educational attainment (Global Partnership for Education, 2016; Shahzad, 2017; Radwan et al., 2021; Laksono et al., 2021; Rasul et al., 2022; Lami et al., 2023). Women with tertiary education are in a better position to influence household decisions than illiterate or less educated women (Roy et al., 2017; Bitew et al., 2023), have a say about their earnings (Samarakoon & Parinduri, 2015; UNICEF, 2015), decide the number of children to have and to be a part of other important household decisions (UNICEF, 2015). Further, women with higher education are less probable to face domestic violence (Ipek & Kizilgol, 2018). This results in higher empowerment and civic engagement of educated women and enables to create a better future for themselves and their families (UNICEFa, n.d.).

1.2 Research Problem

The Sustainable Development Goal (SDG) - 4 states that inclusive and equitable quality education needs to be ensured, thereby promoting lifelong learning opportunities for everyone (United Nations, n.d.). Article 21-A of the Constitution (Eighty-sixth Amendment) Act, 2002 states that "Free and compulsory education needs to be provided to all children aged 6-14 years" and it was declared as a fundamental right of every child. Accordingly, the Right to Education Act of 2009 came into force on 1st April, 2010 (Government of India, notification dated 13th, December, 2002). However, many children are deprived of this right due to various reasons such as poverty, political instability, disability, natural calamities, gender, ethnicity, language, etc. Hence, it is mandatory to impart quality education and skills for all children and adolescents irrespective of their background and circumstances (UNICEFb, n.d.).

The beginning years, i.e., zero to eight years, are the most vital years of growth and development in a child's lifetime, which lays a foundation for all further learning. The fundamental right to education provides huge benefits in the future, including improved learning in school and attaining a higher educational level (UNICEFc, n.d.). Access to quality pre-primary education is a must for every child. Children having access to quality

education in their early childhood have greater chances of developing critical skills needed to succeed in school, thereby reducing repeat grades or dropouts (UNICEFd, n.d.). Quality education is essential to empower children and young individuals, thereby protecting their health, and lifting them from poverty (UNICEFe, n.d.).

It is very well known that female education acts as a crucial factor in accelerating the economic growth of the country. Women's education can affect the socio-economic and health status of the family. Women can acquire the skills and knowledge required to seek better employment through education. Hence, educated women have an increased likelihood of being a part of the labour market, earning higher income, and contributing to the household's wealth. They can enjoy a better standard of living as well as take part in household decisions. They are better aware of their rights as well as their children's rights. More importantly, women's education is associated with their better health status and the health of their family members. The educational level that a woman possesses significantly affects the health and nutrition of her children. It enables the women to solicit medical help, follow health advice, and take appropriate decisions regarding dietary intake and lifestyle patterns. Women with formal schooling would be more aware and knowledgeable about the health issues that exist and measures to prevent them. However, the prevalence of anaemia, overweight/obesity and noncommunicable diseases (NCDs) among women and men in Goa shows an increase despite having higher literacy rate and an increase in the proportion of women with 10 or more years of education. The probe of impact of female education on the socio-economic status and family health in Goa- an advanced state of India can provide a roadmap to other states or regions which are less developed.

In this background, it is imperative to evaluate the impact of women's education on her socio-economic status and the health of her family.

1.2.1 Research Questions

1. Whether there is a connection between the level of female education and their socio-economic status?
2. Does women's workforce participation differ by their education levels across various social groups?
3. Does female education have any impact on women's health across employment status and social categories?

4. Does the female education influence the health of her husband and children?

5. Is there any association between the lifestyle patterns and the incidence of noncommunicable diseases within households stratified by the level of female education?

1.3 Importance of the Study

Probing the above questions will help to understand issues to be addressed for the sustainable development of the society. It will enable the policymakers to decide the priorities to be given for investing more on different levels of female education, which in turn may contribute towards enhancing women empowerment, public health and development of the country. The findings will also help in suggesting other steps to be initiated in addition to investing more on educational infrastructure.

1.4 Objectives

Primarily, the research study aims to assess the influence of female education on the socio-economic status and family health.

The following are the specific objectives of the research:

1. To study the inter-relationship between the level of female education and their socio-economic status.

2. To assess the workforce participation of women with respect to their levels of education by social category in the study area.

3. To examine the impact of female education on the health of women by employment status and social category.

4. To analyse the impact of female education on the health of her husband and children.

5. To investigate into the lifestyle patterns, prevalence of noncommunicable diseases among women and their husbands by level of female education.

1.5 Research Hypotheses

The study proposes to test the following hypotheses:

1. There is an association between female education and their economic status.

2. The female education affects their health status.

1.6 Research Methodology

The present study attempts to investigate the impact of female education on the socio-economic and health status of the family. To achieve this prime objective, both primary and secondary sources of data have been utilised. Tiswadi taluka of North Goa district and Ponda taluka of South Goa district of the State of Goa were selected for primary survey.

A semi structured schedule of questions was framed to obtain the required information from the sample respondents resorting to a multi-stage stratified purposive sampling technique. The informed consent was provided by the participants before participating in the study. The sample included women respondents aged 18 years and above having at least one child and selected proportionately from each of the sample villages and towns. The information required for the research was collected through face-to-face interviews. A total sample of 594 respondents was considered for final analysis.

The secondary data needed for the investigation was procured from various published and unpublished official sources like the World Health Organization (WHO), Census of India, National Family Health Survey (NFHS), Reserve Bank of India (RBI), Economic Surveys of India and Goa, NITI Aayog, and various authentic reports.

Pertinent statistical tools have been utilised to analyse the collected information, such as descriptive statistics, the chi-square test, stratified chi-square analysis, Kruskal-Wallis H test, logistic regression analysis, K-means clustering analysis, etc. Tables and graphs have been used to present the collected data. Linear regression model and chi-square test were used to test the hypotheses of the study. The collected data was analysed by using MS-Excel 2019, IBM Statistical Package for the Social Sciences (SPSS) Statistics version 25, and Python software (Version 3.x) through the Anaconda distribution. Data management and descriptive statistics were conducted using the Pandas and NumPy libraries, while inferential statistical analyses were performed using SciPy and Statsmodels.

1.7 Chapter Scheme

The research study is presented in six chapters as follows:

Chapter I: Introduction

The first chapter gives a brief introduction to the study. It provides a theoretical background to human capital and the role of education in contributing towards the development of a society /country and the importance of women's education. It also presents the research problem, objectives of the study, importance of the study, hypotheses, and a brief of research design, and chapter scheme.

Chapter II: Review of Literature

The second chapter presents a thematic review of the past studies related to the present research topic. Maximum possible literature relating to female education and socio-economic status as well as its association with family health and lifestyle were reviewed to get a grip on the research topic, to locate the gaps existing in the past studies, and to enable strenghten the present research questions.

Chapter III: Research Design

The sources of primary and secondary data, sampling design, measurements, as well as statistical tools and models used to address the research problem, and operational definitions, have been elaborated in this chapter.

Chapter IV: An Overview of Educational and Health Status of Goa, India

Chapter IV provides a brief profile of Goa, a comparative analysis of the educational, employment, and health status of Goa and India using secondary data.

Chapter V: Impact of Female Education on Socio-economic Status and Family Health: An Empirical Analysis

This chapter analyses the five main objectives of the study by applying appropriate statistical tools and models. The results of hypotheses tested in the study by using appropriate statistical techniques have also been presented in this chapter.

Chapter VI: Conclusion and Suggestions

The summary and key findings of the study have been presented in the final chapter of the thesis. It provides the main findings with conclusions drawn from the study, suggestions/ recommendations made to deal with the issues based on the study, limitations of the study and the scope for further research.

Limitations

A few limitations of this study include the data collected during the COVID-19 pandemic, impacting the socio-economic status and lifestyle of the sample respondents and their family due to pandemic-imposed restrictions. Also, the reliability of the primary data might have affected the findings of the study to some extent.

CHAPTER II

REVIEW OF LITERATURE

2.1 Introduction

2.2 Female Education and Economic Development

2.3 Female Education and Socio-economic Status

2.4 Female Education and Participation in the Workforce

2.5 Education and Health

2.6 Female Education and Health Status

2.7 Female Education and Husbands' and Households' Health Status

2.8 Mother's Education and Child's Nutritional Status

2.9 Education and Noncommunicable Diseases and Risk Factors

2.10 Female Education and Lifestyle Patterns

2.11 Summary of Review

2.12 Research Gap

CHAPTER II

Review of Literature

2.1 Introduction

It is essential to gain a deep insight into the research topic and obtain the theoretical and empirical background for the research study. Therefore, the present chapter resorts to a thematic literature review using the available sources, such as journals, books, surveys, and other research- related documents allied with the research topic.

The literature reviewed is grouped under the following sections.

- Education and Economic Development
- Female Education and Socio-economic Status
- Female Education and Workforce Participation
- Education and Health
- Female Education and Health Status
- Female Education and Husbands' and Households' Health Status
- Mother's Education and Child's Nutritional Status
- Education and Noncommunicable Diseases (NCDs)
- Education and Lifestyle Patterns

2.2 Female Education and Economic Development

A study of four countries, namely, Morocco, Egypt, Tunisia, and Algeria, reported a significant and positive impact of women's tertiary education on economic growth (El Alaoui, 2016). A study conducted in India revealed that states with higher female literacy rates had a lower percentage of the poor, highlighting an inverse association between female literacy rates and the proportion of poor and a direct relationship between female education and economic development (Singh, 2016). The time series (1997 – 2016) analysis of fourteen selected European Union countries showed that an increase in the share of educated people resulted in an increase in the level of economic development of certain countries (Dudzeviciute & Simelyte, 2018).

A positive relationship between female education and economic development was also reported by a study conducted in Ethiopia (Gebre, 2020). Another research based on time-series data (1991–2019) from the Pakistan Economic Survey and the World Bank and applying the autoregressive distribution lag (ARDL) model revealed that women's higher education was positively associated with GDP growth in the long run (Zahra et al., 2021).

2.3 Female Education and Socio-economic Status

Female education may have a relation with their socio-economic status, such as income, place of residence. This section reviews the literature related to female education and their socio-economic status.

Socio-economic status is determined not only by income but also by educational level, employment status, subjective social status, and social class (APA, n.d.).

2.3.1 Educational Status of Women and Place of Residence

A study from Karnataka related to 300 women found that the majority of the rural women had up to primary and secondary level of education, whereas urban women had a comparatively higher level of education (Kamble, 2009). In Madhya Pradesh, a primary study using responses from 900 married women aged 15-49 years, revealed that the percentage of educated women was higher (90.6%) in urban areas than in rural areas (53.3%) (Som & Mishra, 2020).

2.3.2 Educational Status of Women and Social Category

In Andhra Pradesh, an empirical study of 900 respondents showed that the educational status of SC/ST girls was low (Krishnamma, 1991). In West Bengal, an analysis of the 2001 Census data indicated that tribal people had a very low literacy rate, and tribal women's educational status was very poor (Daripa, 2018). Similarly, using data of 254 tribal women aged 15-45 years, a study in Maharashtra found that tribal women had a very poor educational status (Chavhan, 2019). The illiteracy rate was very high among ST women compared to those belonging to SC, OBC, and general categories in Madhya Pradesh, India, using primary data of 900 married women aged 15-49 years (Som & Mishra, 2020).

Another study in West Bengal utilising primary data of 287 sample households revealed that the educational status of SC people was poor except for the present generation, and their proportion with higher educational level was very poor (Sardar, 2020). Utilising the responses of 390 tribal women in the age group of 18-49 years residing in Karnataka, it was revealed that the majority of them were illiterate and the average education level was primary and secondary (Muthamma, 2022).

However, a primary investigation in Manipur using a sample of 528 SC women highlighted that 56 per cent of them were highly educated with graduation and post-graduation degrees (Devi, 2022).

2.3.3 Female Education and Family Income

In Manipur, the ANOVA test of the responses of 1,008 women aged 35-59 years highlighted a highly significant association between women's educational status and increased family income (Maisnam, 2008). An exploration in a rural area of Pakistan using data of 320 women aged 18-70 years revealed a rise in household income by 72 per cent with an additional year of schooling (Awan and Munir, 2016). In Nepal using primary data of 1,011 rural women aged over 15 years, an inquiry highlighted a significant increase in household wealth at higher levels of women's education (Miller et al., 2017). In Pakistan, a primary data analysis by employing ordered logit model showed that the contribution of female entrepreneurs toward household income significantly increased by 14 per cent with an increase in their education (Ge, T et al., 2022).

2.3.4 Female Education and Income Earned by Her

An Ordinary Least Square analysis of data pertaining to selected female public sector teachers in Pakistan showed that a teacher's monthly income increased by 14.2 per cent with an additional year of schooling (Shah, 2007). Another study in Pakistan related to data drawn from the Household Integrated Economic Survey (HIES), 2010-11 applying the Ordinary Least Square method revealed that returns to education increased for both male and female workers with an improvement in educational level. All education levels, except primary education, had a significant impact on income earned. However, returns to education were found to be significantly higher for female workers as compared to male workers (Ali & Akhtar, 2014). In the United States, it was demonstrated that as the educational level

increased above bachelor's degree, the salary earned also increased (Carlson & McChesney, 2014). In Bangladesh, a primary data analysis of rural households using multiple regression technique revealed a positive association between female education and income earned by them (Roy et al., 2017). The multiple linear regression results related primary data of rural women respondents in Pakistan estimated that every one-unit increase in women's educational level resulted in a 0.191 unit increase in income (Akhtar et al., 2020). A primary investigation utilising data of female workers from Indonesia along with applying multiple linear regression model showed that one per cent increase in the level of education led to an increase in the income of female workers by 0.372 per cent (Marwati et al., 2020). Using the OLS method, a study carried out in Nigeria based on the data obtained from the Living Standard Measurement Survey Wave III, 2017, showed that the income earned by women rose with an increase in educational level (Adeosun & Owolabi, 2021). A primary analysis in Manipur using a sample of 528 SC women revealed that a higher income was earned by highly qualified women than those with less or no education (Devi, 2022). Linear regression analysis of a study based on China's comprehensive social survey data revealed a significant and positive correlation between education level and income earned (Mou, 2023).

2.4 Female Education and Participation in the Workforce

Utilisation of data from 70 nations indicated that secondary-level education was a vital factor affecting female labour force participation (Pampel & Tanaka, 1986). The probit analysis applied to the data drawn from the World Fertility Surveys (WFS) of five Asian countries found a positive relationship between women's tertiary education and employment (Cameron et al., 2001). The multivariate analysis of Demographic and Health Survey data of Ghana and Zimbabwe with sample sizes of 4,488 and 4,201 women aged 15-49 years respectively revealed that education increased the chances of women's participation in non-family work (Benefo & Pillai, 2003). Research conducted in Turkey by employing regression analysis to the data related to the period from 1980 to 2004 highlighted that the share of women in the labour market increased with an increase in educational level (Ince, 2010). An exploration of the relationship between increasing female education and their participation in paid employment in Japan, China, and India found that a large proportion of highly educated females were employed (Sinha Mukherjee, 2015).

A primary survey of rural women from Pakistan revealed that an increasing level of higher education increased female work participation (Akhtar et al., 2020). A study employing data from 16 West African countries (2004-2016) highlighted that female labour force participation improved significantly with an improvement in female education level (Iheonu et al., 2020). Using primary data pertaining to 350 females aged 15-49 years from Pakistan and applying a binomial logit regression model revealed that women's labour force participation increased by 0.048 per cent with an increase in one year of schooling (Shah & Riaz, 2020). Using secondary data from the 2018 National Labour Force Survey (SAKERNAS) of Indonesia and employing the logit model, testified that women's junior high school and college education had a significant impact on their workforce participation (Tsaniyah & Sugiharti, 2021). The results of the logistic regression model pertaining to a primary study of 660 participants in Qatar found a positive and significant association between women's higher education and workforce participation (Lari et al., 2022). Another inquiry using Census data of 13 sub-Saharan African countries and applying regression analysis demonstrated that, on average, one additional year of education was associated with 2.9 per cent rise in the share of women working in the non-primary sector (Backhaus & Loichinger, 2022). Data from Education Statistics and World Development Indicators, 2021 in Afghanistan showed a highly positive correlation between enrollment in upper secondary education and female labour force participation rate (Mariel, 2022).

The application of a logistic regression model to the data from India's Human Development Survey reported that the chances of graduate women to be in the labour force were 0.65 per cent greater than those with secondary education. Women with secondary level education were less likely to be in the labour force than illiterate women (Chatterjee et al., 2018). The multinomial logit model applied to data related to four Middle East and North African countries indicated a weakening trend in the relationship between women's labour market participation and education level. Furthermore, it was observed that participation in the workforce had reduced over time among women with secondary and tertiary education, showing a sharp increase in unemployment among educated women (Assaad et al., 2020).

2.5 Education and Health

An inquiry in the United States using multiple regression analysis demonstrated that highly educated individuals were more likely to have improved health (Ross & Wu, 1995). A meta-

analysis of 40 studies showed that quality-adjusted life years improved with an increase in educational level. This indicates that the cost-benefit ratio of health education investments was highly positive (Furnee et al., 2008). Multivariate linear regression analysis of data from the World Health Survey 2002-04 of 57 countries indicated that people with higher than primary education had better health (Hosseinpoor et al., 2012). Another study in Greece, which applied a logistic regression model to the pooled data from two national surveys (2006 and 2011) comprising 10,572 individuals showed that people belonging to higher education and income groups were more likely to report a better self-rated health (Zavras et al., 2012). The application of ordered logistic regression analysis to 29 countries' European Social Surveys (2002–2008) highlighted a significant role played by education in improving the health of the people (Alvarez-Galvez et al., 2013). Another cross-sectional study that applied linear regression analysis to the data of 300 participants from Sarajevo Canton, Bosnia, and Herzegovina depicted that respondents with low educational level had worse physical and mental health (Kurspahic-Mujcic & Mujcic, 2019). By applying a binary logistic regression model to the primary data of 347 respondents in Malaysia, it was confirmed that less educated people had three times higher risk of having poor health status (Wan Puteh et al., 2019).

2.6 Female Education and Health Status

The data analysis of the 1994 Statistics Canada's National Population Health Survey reported a strong inverse relationship between women's self-reported health status and low educational attainment (Curtis, 2001). Using data from the 52nd round of the National Sample Survey, it was shown in Kerala that the morbidity rate was high among illiterate females, with health improving with an improvement in education level (Menon, 2007). Assessment of primary data of 270 rural SC/ST households in Andhra Pradesh indicated that a lower literacy rate among females resulted in poor health (Kumar, 2013). Regression analysis of Nigerian women farmers reported that the health status of rural women improved significantly with an increase in their educational level (Angba & Angba, 2015). A primary analysis of tribal women aged 15-45 years in Maharashtra had pointed out that a very poor educational status among women was associated with their poor health condition (Chavhan, 2019).

A study using longitudinal data from the Chinese Family Panel Studies, 2010-16 and latent growth curve model found that women with one additional year of education had a 1.6 per cent higher self-reported health than men (Zhu & Ye, 2020). An examination of SAARC-ASEAN countries utilising data from the World Development Indicator of the World Bank (2002-18) revealed that the life expectancy at birth had increased by 0.041 per cent due to one per cent rise in education among women, showing a better health status among educated women (Rahman & Alam, 2021). Another inquiry by Devi (2022) using data of 528 SC women from Manipur and chi-square test found that women with up to secondary education had the poorest health. Illiteracy was the major factor responsible for a moderate health status of women as indicated by a primary analysis of 390 tribal women aged 18-49 years in Karnataka (Muthamma, 2022).

Application of the multivariable regression model to the primary data of 537 rural married women with little or no formal education from West Bengal showed that women with low levels of formal education who were able to earn money and have access to health information through media had better health outcomes (Long et al., 2013).

2.6.1 Education and the Prevalence of Obesity

A research problem investigated in Vietnam using data from three national surveys and multiple logistic regression analysis found an inverse relationship between higher educational attainments and overweight (Nguyen et al., 2007). A study conducted in Germany using data of 7,462 adults aged 50–75 years reported that people with lower education had a higher chance of being obese (Steele et al., 2017). A cross-sectional survey in Kuwait using data of adults aged 18–82 years and a multivariable logistic regression model found that people with higher educational attainment had lower odds of obesity/central obesity (Oguoma et al., 2021). A multivariate logistic regression analysis of 9,980 Iranian adults aged 35–70 years from Iran revealed a decline in overweight/obesity and abdominal obesity with an improvement in education (Sadeghi et al., 2023). In Nigeria, a descriptive cross-sectional study of 360 rural adults aged 29-60 years using the chi-square test demonstrated a significant association between obesity and low levels of education (Oseni et al., 2023).

The application of the logistic regression model to the data of 5,495 adults from the 2011 Bangladesh Demographic and Health Survey pointed out that people with higher education

had almost four times higher chances of being overweight/obese than people without education (Biswas et al., 2017). The data drawn from the 2015 National Health and Morbidity Survey (NHMS) of Malaysia consisting of 3,794 respondents aged 60 years, through multiple logistic regression analysis demonstrated that older adults with primary or higher education had a higher chance of being obese (Ariaratnam et al., 2020).

2.6.2 Female Education and the Prevalence of Obesity

A primary study of 4,903 respondents aged 18-75 years of Flemish adults, one of the Belgian main ethnic groups residing in Belgium using binary logistic regression model reported that highly educated women had a significantly lower chance of being overweight (Duvigneaud et al., 2007). Another inquiry in the United States based on the data obtained from the Women's Health Study consisting of 23,992 participants, showed that women with a doctorate degree had a lower prevalence of obesity (Lee et al., 2011). A multivariate logistic regression model using VIGITEL 2011 telephone survey data of 13,745 women aged 18–44 years in Brazil revealed that women with less than a college education had a higher risk of obesity (Mpofu et al., 2016). Utilising primary data of 2,145 women aged 25–50 years and multiple logistic regression analysis, a study in Japan found that unmarried women with university or higher education had a significantly lower risk of being overweight/obese (Murakami et al., 2017).

A multivariable regression analysis of the cross-sectional data of 8,904 women aged 15-49 years from the 2015 Zimbabwe Demographic Health Survey revealed that women with higher education levels were more likely to be obese (Mangemba & San Sebastian, 2020). A study that used 2016 Ethiopian Demographic and Health Survey (EDHS) data, including 2,848 women aged 15–49 years, and multivariable logistic regression analysis found that the chances of being overweight and obese was around 2 times higher among women with a primary or higher level of education (Mengesha Kassie et al., 2020). Another investigation using data from the 2018 Nigeria Demographic Health Survey consisting of 13,255 women aged 15-49 years found that higher educational attainment was strongly and significantly associated with an increased risk of overweight and obesity among women (Ezenweke et al., 2022). Using data from the 2014 Ghana Demographic and Health Survey (GDHS) including a sample of 4,393 reproductive women and a multilevel logistic model, it was

highlighted that women with education had a significantly higher risk of being overweight/obese than those without formal education (Asosega et al., 2023).

2.7 Female Education and Husbands' and Households' Health Status

A case-control investigation in the USA using a logistic regression model and data of 133 male case-control pairs aged 25-75 years depicted that the chances of experiencing cardiac arrest were lower among men with highly educated wives than those whose wives were less educated (Strogatz et al., 1988). An empirical study in rural Bangladesh with a total sample of 14,803 married women aged 45 years and above and employing Poisson regression, revealed that men had an additional survival advantage if their wives had attended Koranic or formal education (Hurt et al., 2004). A primary analysis in Kerala using a linear regression model indicated that as female education improves, it positively affects households' health status (Menon, 2007). By applying a multinomial logistic regression model to the data from the 2016 Indonesia Social and Economic Survey (SUSENAS) consisting of 172,939 households, it was revealed that minor and severe illness among husbands decreased significantly with an improvement in his wife's education (Putri, 2019).

2.8 Mother's Education and Child's Nutritional Status

Another probe in Pune using data of 658 children aged below five years showed that children's nutritional status improves with an increase in their mother's educational level (Mamulwar et al., 2014). A cross-sectional study in Bangladesh utilising data of 706 children under 5 years and multivariate analysis highlighted that mothers with higher education significantly had children with better nutritional status (Bashar et al., 2020). Another data analysis of 13,624 children under 5 years using logistic regression model in Yemen highlighted that a rise in the educational level of mothers reduces the chances of malnutrition among children (Al-Zangabila et al., 2021). Data from three waves of the Ethiopian Socio-economic Survey consisting of 8,275 observations from 4,402 children aged six months to 9 years, and regression analysis found that children of mothers with higher education had a better nutritional status (Bras & Mandemakers, 2022).

2.8.1 Mother's Education and Height of Children

Utilisation of data from 22 Demographic and Health Surveys indicated a statistically significant influence of mother's primary and secondary education on children's height-for-age in only a few countries (Desai & Alva, 1998). Using data from the 2003 DHS survey consisting of 6,876 children aged 0-5 years in Mozambique, the OLS regression revealed that highly educated mothers had taller children (Burchi, 2012). An investigation in Bangladesh using data of 869 households from the 2010 Household Income and Expenditure Survey and OLS regression highlighted a greater and positive effect of mother's education on their child's height (Mondal et al., 2014). A multivariate logistic regression analysis of 1,116 mothers from Hardoi, Uttar Pradesh, and 657 mothers from New Delhi, India revealed that high maternal health literacy was inversely related to severe stunting among children (Johri et al., 2016). Using data from 134 Demographic Health Surveys (DHS) of 56 developing countries and regression model, it was depicted that a mother with some tertiary education had a taller child (Alderman & Headey, 2017). By obtaining data from 1,011 women aged above 15 years residing in Nepal and using a regression model, it was shown that children of highly educated mothers were more likely to have better Height for Age Z scores (Miller et al., 2017).

In Indonesia, a cross-sectional data of 156 children under five reported that the proportion of children who had low height for age Z score was higher in the group of children whose mothers had basic education compared to those with advanced education (Sukmawati & Sirajuddin, 2019). Using data of 11,858 and 92,630 under 5 years children from NFHS-3 and NFHS-4 of EAG Indian states, respectively, and binary logistic regression analysis, it was highlighted that educational level had contributed to stunting among children to a large extent (Kumar & Paswan, 2021). Another probe in Ethiopia using total 8,275 observations and regression analysis found that the children of highly educated mothers were taller (Bras & Mandemakers, 2022). Utilising data from the Gambia Demographic Health Survey (GDHS) 2019-20 and multiple logistic regression, it was reported that illiterate women had 51% higher chances of having stunted children than those with primary and higher education (Sey-Sawo et al., 2023). The application of the multinomial logit regression model to the primary data of 267 female workers in Bangladesh revealed that child stunting reduces with an improvement in the mother's level of education (Haque et al., 2023).

2.8.2 Mother's Education and Children's Weight

An investigation in Mozambique utilising data of 6,876 children aged 0-5 years and the OLS regression reported that children's weight-for-age z-scores had improved with a rise in mother's education (Burchi, 2012). A multivariate logistic regression model in India revealed an inverse association between high maternal health literacy and severely underweight children (Johri et al., 2016). Another inquiry in Indonesia using primary data of 156 children aged five years indicated that the child's weight for age Z scores was affected by their mother's educational attainment (Sukmawati & Sirajuddin, 2019). A cross-sectional data of 1,282 Palestinian adolescents revealed that mothers with high school education or below had a higher chance of having underweight children (Amer & Kateeb, 2021). By applying the binary logistic regression model to the data from NFHS-3 and NFHS-4 of EAG Indian states, it was revealed that mothers' educational level had contributed to underweight among children to a greater extent (Kumar & Paswan, 2021).

In Ethiopia, regression analysis showed that children of mothers with higher education were heavier for their age (Bras & Mandemakers, 2022). Applying a multiple logistic regression to the data from the Gambia Demographic Health Survey (GDHS) 2019–20, it was highlighted that uneducated women had a 52% higher probability of having underweight children than those with primary and higher education (Sey-Sawo et al., 2023). A multinomial logit regression model applied to the data of 267 female workers from Bangladesh showed that the odds of a child having a normal weight increases with an improvement in the educational level of mothers (Haque et al., 2023).

2.8.3 Mothers' Education and Obesity among Children

A cross-sectional study in Spain using data of 6,287 and 2,806 children from the 2011 and 2013 ALADINO studies, respectively, found that highly educated parents had significantly lower odds of having overweight children (Perez-Farinos et al., 2017).

Another exploration in Jammu and Kashmir, India, using cross-sectional data of 354 children and adolescents aged between 8-19 years found that children of highly educated mothers were more likely to be overweight and obese (Chesti et al., 2022).

2.9 Education and Noncommunicable Diseases and Risk Factors

An investigation in Germany using data of 13,781 participants aged 50-75 years revealed a higher prevalence of multimorbidity among people with lower education (Nagel et al., 2008). In China, the utilisation of data from the Thematic Household Survey (THS) comprising 25,780 individuals aged 15 years or above and binary logistic regression analysis highlighted that people with secondary education or below had a higher chance of multimorbidity and an increased number of chronic diseases (Chung et al., 2015). Using a multivariable logistic regression model and data of 1,528 women aged 24–64 years residing in Malaysia, it was revealed that women with lower education had a greater chance of having ≥3 cardiovascular disease risk factors (Ghazali et al., 2015). A cross-sectional study conducted in Bangladesh among 507 participants aged 25 years and above, along with the application of a logistic regression model, reported that a lower level of education was positively related to three or more NCD risk factors (Rawal et al., 2017). In West Bengal, a primary data analysis of rural respondents revealed a significant association between preschool education or below and a higher risk of developing NCDs (Dutta et al., 2022).

2.9.1 Education and Hypertension

A research study in Brazil using data of 13,745 women respondents aged 18–44 years and chi-square test depicted that women with lower than a college education had a higher probability of reporting hypertension (Mpofu et al., 2016). Another investigation in India using data from NFHS (2015–2016) including 8,11,917 participants aged 15–49 years and a multivariate logistic regression analysis pointed out that people with secondary or higher education had a lower prevalence of hypertension (Ghosh & Kumar, 2019). An analysis of 1,210 respondents aged 18 years and above from Kerala found that illiterate people had a higher risk of developing uncontrolled hypertension than literate people (Lalu et al., 2021).

2.9.2 Education and Diabetes

A data of 4,405 adults aged 25 years and above from the Australian Diabetes Obesity and Lifestyle Study and multinomial logistic regression model indicated that less educated people had a higher risk of developing type 2 diabetes (Williams et al., 2010). Research conducted in the USA utilising data of 23,992 participants from the Women's Health Study and hazard ratios reported that the relative risk of diabetes decreased with an increase in

educational level (Lee et al., 2011). A data of 5,290 Ghanaians aged 25-70 years from the multicentre Research on Obesity and Diabetes among African Migrants (RODAM) study highlighted that there was a reduction in the prevalence of diabetes due to a rise in the educational level in urban areas (Addo et al., 2017). Using a multivariable logistic regression model and data from the National Health and Nutritional Evaluation Survey 2007–13 comprising 19,303 respondents from Korea, it was revealed that people with low education had a higher prevalence of diabetes (Kim et al., 2017). A probe in Germany confirmed that highly educated individuals had a lower risk of developing type 2 diabetes mellitus by applying the Cox proportional hazards regression model to data from 7,462 adults aged 50–75 years (Steele et al., 2017). An investigation using data from The China Kadoorie Biobank Study, consisting of 0.5 million adults aged 30–79 years with logistic and Cox regression models, found that educational level was negatively associated with the prevalence and incidence of diabetes among women (Wu et al., 2019).

Using data from NFHS, 2005-06 including 1,68,135 respondents and a multilevel logistic regression model, an inquiry in India reported that the prevalence of self-reported diabetes had increased with educational level (Corsi & Subramanian, 2012). By applying a multilevel logistic regression model to the data of 1,60,381 participants from 22 low- and 27 middle-income countries, it was revealed that the odds of diabetes mellitus increased with an increase in educational level (Wang et al., 2014). The multicentre Research on Obesity and Diabetes among African Migrants (RODAM) study, which included 5,290 adults aged 25-70 years found that the prevalence of diabetes had increased at higher levels of education in rural areas (Addo et al., 2017). A cross-sectional data of 6,979 participants from the Indonesia Family Life Survey- 5 and a logistic regression model confirmed that highly educated people had a significantly greater risk of developing diabetes mellitus (Kusumaningrum & Ricardo, 2022).

2.10 Female Education and Lifestyle Patterns

The lifestyle patterns are important factors influencing one’s health status. The education level, especially of women will have a bearing on lifestyle patterns of people.

2.10.1 Education and Vegetable Fruit (VF) Consumption

Using data from the Bogalusa Heart Study consisting of 995 adults aged 19–39 years and linear regression, it was reported in USA that young adults with more than 12 years of education consumed more vegetables and fruits (Deshmukh-Taskar et al., 2009). A data of 18,429 adults aged 25-64 years from five Asian countries and a multivariate logistic regression analysis depicted that less educated people had a higher chance of consuming inadequate fruits and vegetables (Kanungsukkasem et al., 2009). A study utilising multivariate logistic regression analysis and data from the Thailand National Health Examination Survey III comprising 39,290 respondents aged 15 years and above revealed that less educated people consumed lower fruit, vegetables, and fruit plus vegetables (Satheannoppakao et al., 2009). A primary analysis of data from 541 individuals aged 25–60 years from Benin using multiple linear regression model revealed a positive relationship between higher education and the consumption of vegetables (Delisle et al., 2012). Research in Mozambique that used a sample of 3,323 adults aged 25–64 years indicated an increase in the consumption of fruits with an increase in education in urban areas (Padrao et al., 2012). Using VIGITEL 2011 telephone survey data consisting of 13,745 women aged 18–44 years from Brazil and multivariable logistic regression model, it was reported that women having less than a college or university education were more likely to have inadequate consumption of fruit and vegetables (Mpofu et al., 2016).

A cross-sectional study in Japan using data of 3,137 adults aged 30-59 years and binomial logistic regression analysis indicated a significant association between higher education level and more vegetable consumption (Nakamura et al., 2016). The 2013 China Chronic Disease and Risk Factors Surveillance survey data from 1,70,847 respondents and logistic regression analysis reported that illiterate and less educated people had a higher prevalence of low VF consumption (Li et al., 2017). An adjusted logistic regression analysis of the data from the 2015 Kenya national STEPS survey consisting of 4,479 adults aged 18-69 years reported that the intake of fruits and vegetables increased with education level (Pengpid & Peltzer, 2018). A cross-sectional descriptive study in Nigeria using data from 330 adults and chi-square test found that adequate consumption of fruits and vegetables was related to educational level (Olatona et al., 2018).

In Portugal, the application of a logistic regression model to the data of 17,410 participants showed that highly educated women were 3.7 times more likely to consume adequate fruits and vegetables than those with no or only basic education (Costa et al., 2018). An

observational study in Portugal using data of 11,085 individuals aged 25–64 years from the 2014 National Health Interview Survey (NHIS) along with a logistic regression model revealed that consumption of fruits and vegetables gradually increased with education among women (Velhinho & Perelman, 2021). Data from the 2018 Indonesian Basic Health Survey and a multivariate regression analysis revealed that women with higher levels of education had a significantly 1.28 per cent lower prevalence of inadequate consumption of fruits and vegetables (Darmawan et al., 2023).

2.10.2 Education and Consumption of Milk /Dairy Products

In China, regression analysis performed on data of 314 households pointed out that the probability of purchasing yogurt and ice cream increased with higher levels of education (Fuller et al., 2007). A primary investigation in Benin using data of 541 individuals aged 25–60 years and multiple linear regression model showed a positive relationship between higher education and the consumption of dairy products (Delisle et al., 2012). An observational study in Portugal using data of 11,085 individuals aged 25–64 years from the 2014 National Health Interview Survey and a multivariate logistic regression indicated that dairy product intake gradually increased with education among women (Velhinho & Perelman, 2021).

Research in Iran using primary data of 981 participants and chi-square test found that the consumption of dairy products was higher among people with a diploma degree and lower levels of education (Vakili et al., 2023).

2.10.3 Education and Fish / Chicken / Meat Intake

In Malaysia, a cross-sectional data of 2,675 adults aged 18 years and above revealed that people with higher education had consumed significantly less seafood than less educated people, as confirmed by the Kruskal-Wallis H test (Ahmad et al., 2016).

A probe in Benin using primary data of 541 individuals aged 25–60 years and a multiple linear regression model showed that people with primary education had higher fish consumption than illiterate people (Delisle et al., 2012). Another inquiry in Portugal using cross-sectional data of 11,085 individuals aged 25–64 years and a logistic regression model found that fish consumption had increased gradually and significantly among women with an improvement in education (Velhinho & Perelman, 2021).

A cross-sectional study in the USA using data of 995 respondents aged 19–39 years reported that more quantity of red meats, processed meats and eggs was consumed by people with 12 years or lower education (Deshmukh-Taskar et al., 2009).

A cross-sectional data of 11,085 individuals aged 25–64 years (2014 National Health Interview Survey) from Portugal highlighted that the consumption of meat and precooked foods was lower among women with lower education (Velhinho & Perelman, 2021).

2.10.4 Education and Consumption of Unhealthy Diets

An exploration in the United States using data from 1,918 adults and applying multivariable logistic regression analysis showed that people with high school or less education had 52 per cent lower chances of consuming healthy food items than those with college education (Blanck et al., 2007). The data of 995 adults aged 19–39 years from the United States pointed out that the consumption of unhealthy food items was higher among young adults with 12 years or less education (Deshmukh-Taskar et al., 2009). Using a logistic regression model and data of 7,220 individuals, a study in Mississippi indicated that the consumption of sugar-sweetened beverages was higher among those with less than high school education (Qobadi & Payton, 2017). A cross-sectional study in Portugal revealed a reduction in the consumption of soft drinks among highly educated women using data from the 2014 National Health Interview Survey and multivariate logistic regression analysis (Velhinho & Perelman, 2021).

In the United States, a cross-sectional data of 236 adults aged 50–79 years belonging to the low-income group by applying an ordinal logistic regression model found that women with a graduate degree or higher had a higher consumption of fast food (Hidaka et al., 2018). A probe in Portugal using the 2014 National Health Interview Survey data reported a positive and significant relationship between education and cake consumption (Velhinho & Perelman, 2021).

2.10.5 Education and Alcohol Intake / Tobacco Use

Utilising data from 15 countries and a multiple logistic regression model, it was highlighted that women with higher education were more likely to drink heavily in Germany, the Netherlands, France, Switzerland, and Austria (Bloomfield et al., 2006). Another research

conducted in the USA, which used data from the Women's Health Study including 23,992 participants revealed that women with higher education had a higher chance of consuming alcohol daily (Lee et al., 2011). A meta-analysis of 33 countries including data from 1,01,525 individuals aged 25–69 years found that highly educated women were more likely to drink frequently than those with lower educational levels (Grittner et al., 2013). In Germany, the data of 7,462 adults aged 50–75 years had confirmed that alcohol consumption was higher among people with higher education (Steele et al., 2017).

Research carried out in Kenya utilising the 2015 STEPS data of 4,484 individuals and logistic regression analysis highlighted that the prevalence of harmful alcohol use was higher among respondents with less than 12 years of education (Mwangi et al., 2020).

Investigation carried out in Brazil using data from 13,745 women aged 18–44 years and a multivariable logistic regression model revealed that women with less than a college or university education were more likely to smoke (Mpofu et al., 2016). Another cross-sectional study in Bangladesh using primary data of 507 participants aged 25 years and above and a logistic regression model reported that people with below primary education had a higher prevalence of smoking (Rawal et al., 2017). In Kenya, the 2015 STEPS data of 4,484 individuals highlighted that highly educated people had 89 per cent lower chances of using tobacco than those with lower education (Mwangi et al., 2020). In Karnataka, the data of 390 tribal women aged 18-49 years depicted that the majority of the tribal women were using tobacco because they were less educated (Muthamma, 2022). Another probe in Pakistan using data of 18,737 adults aged 15–49 years, and a multivariable logistic regression model found that people with secondary or higher education had a lower risk of smoking than those without education (Zubair et al., 2022).

2.10.6 Education and Physical Activity

By applying the ANOVA test to the data of 2,700 participants aged 14-95 years, research in Turkey revealed a significant and negative correlation between physical activity and educational level (Aksoy & Ziyagil, 2017). Data from the 2014 WHO STEPS Survey on NCD Risk Factors consisting of 2,822 respondents aged 18–69 years residing in Bhutan by using a weighted log-binomial regression model found that people with secondary and above education had a greater prevalence of low physical activity (Pelzom et al., 2017). A multiple

regression analysis of data from 4,143 adults aged 15–69 years in Nepal showed that people with secondary or higher educational attainment had a lower total self-reported physical activity (Pedisic et al., 2019). Another study in Italy using data from National Health Interview Surveys 2000 and 2005 comprising 1,32,686 respondents aged 30-74 years demonstrated that reduction in education level had resulted in an increase in the prevalence of physical activity among both men and women (Petrelli et al., 2022).

In the United States, data of 23,992 participants from Women's Health Study revealed that highly educated women were more likely to exercise at least 4 times in a week as compared to those with lower education (Lee et al., 2011). Using data of 4,892 adults aged 60 years and over from the Irish Longitudinal Study on Ageing along with logistic regression analysis, it was confirmed that people with above secondary level education had lower levels of physical inactivity (Murtagh et al., 2015). Using telephone survey data of 13,745 women aged 18–44 years, an investigation in Brazil showed that less educated women had insufficient physical activity (Mpofu et al., 2016). In Germany, a study using data from 7,462 adults aged 50–75 years reported that highly educated individuals engaged in vigorous physical activity at least once a week (Steele et al., 2017).

2.10.7 Education and TV Viewing Time

Using data from the 2008 Health Survey, which included 2,289 adults aged 16–96 years residing in England, it was found that education level was negatively associated with TV time (Stamatakis et al., 2014). Another inquiry in Spain using data of 10,199 individuals aged 18 years and older and by applying a linear regression model indicated that people with lower education had a greater TV watching time (Andrade-Gómez et al., 2017).

2.10.8 Education and Sleeping Pattern

By applying a multivariable logistic regression model to the data of 12,022 individuals aged 15 years and above, it was demonstrated in Hong Kong that people without education or with primary education had a significantly higher chance of both insufficient and disturbed sleep (Bedford et al., 2022).

2.11 Summary of Review

Several studies have revealed a positive and significant relationship between women's education, especially tertiary education, and economic growth and development (El Alaoui, 2016; Singh, 2016; Dudzeviciute & Simelyte, 2018; Gebre, 2020; Zahra et al., 2021). Studies related to women's educational status and place of residence have highlighted that the educational status of rural women was lower than that of urban women (Kamble, 2009; Som & Mishra, 2020). Previous studies have indicated that the educational status of ST women was very poor (Krishnamma, 1991; Daripa, 2018; Chavhan, 2019; Som & Mishra, 2020; Muthamma, 2022) and that SC women also had a poor educational status (Krishnamma, 1991; Sardar, 2020). However, another recent study reported that most SC women had graduation and post-graduation degrees, indicating a higher educational status (Devi, 2022). Overall, the literature reveals that even though the underprivileged have a lower educational status, over the period, there has been an improvement in their educational status.

Various studies showed the relationship between women's education and family income. These studies indicated that women's educational level is important in enhancing the family's income and wealth. Household income increased with a rise in women's education (Maisnam, 2008; Awan & Munir, 2016; Miller et al., 2017; Ge, T. et al., 2022). Studies conducted at the national and international levels have shown that women's income increased with an improvement in their level of education (Shah, 2007; Ali & Akhtar, 2014; Carlson & McChesney, 2014; Roy et al., 2017; Akhtar et al., 2020; Marwati et al., 2020; Adeosun & Owolabi, 2021; Devi, 2022; Mou, 2023).

The role of women's education in their workforce participation was investigated, and it was found that female education was positively associated with their labour force participation (Pampel & Tanaka, 1986; Benefo & Pillai, 2003; Ince, 2010; Iheonu et al., 2020; Shah & Riaz, 2020; Backhaus & Loichinger, 2022; Mariel, 2022). Most importantly, women's tertiary education is positively related to their labour market participation (Cameron et al., 2001; Sinha Mukherjee, 2015; Chatterjee et al., 2018; Akhtar et al., 2020; Tsaniyah & Sugiharti, 2021; Lari et al., 2022).

However, it was observed that in both rural and urban areas, the chances of women with secondary education to be part of the labour force were lower than those without education (Chatterjee et al., 2018). Similarly, participation of women with secondary and tertiary

education in the labour force which decreased over time, causing a rise in unemployment among educated women (Assaad et al., 2020). Thus, literature reveals contrasting association between female education and their participation in the labour force.

Previous studies investigating the relationship between education and health have highlighted that the health of the people was positively related to education level (Ross & Wu, 1995; Furnee et al., 2008; Hosseinpoor et al., 2012; Zavras et al., 2012; Alvarez-Galvez et al., 2013). People with low levels of education had poorer health than those with higher educational levels (Kurspahic-Mujcic & Mujcic, 2019; Wan Puteh et al., 2019).

The studies have demonstrated that women's health status improved due to an increase in their level of education (Menon, 2007; Angba & Angba, 2015). Women who were illiterate or less educated had a poor or moderate health status compared to those with higher educational attainment (Curtis, 2001; Menon, 2007; Kumar, 2013; Chavhan, 2019; Zhu & Ye, 2020; Rahman & Alam, 2021; Devi, 2022; Muthamma, 2022). However, it was also observed that less educated women who earned income and had access to health information through the media had better health outcomes (Long et al., 2013).

The risk of overweight / obesity was significantly lower among women with higher education (Duvigneaud et al., 2007; Lee et al., 2011; Mpofu et al., 2016; Murakami et al., 2017). Contrary to this, other studies have shown that highly educated women had a higher chance of being overweight / obese than illiterate women (Mangemba & San Sebastian, 2020; Mengesha Kassie et al., 2020; Ezenweke et al., 2022; Asosega et al., 2023).

Studies related to the impact of female education on the health of husbands and households had depicted that increase in women's education level improved their husbands' (Strogatz et al., 1988; Hurt et al., 2004; Putri, 2019) and households' health status (Menon, 2007).

Quite a few studies have demonstrated that children whose mothers were highly educated had better nutritional status (Mamulwar et al., 2014; Bashar et al., 2020; Al-Zangabila et al., 2021; Bras & Mandemakers, 2022).

Mothers' education has a positive and significant impact on their children's height (Desai & Alva, 1998; Burchi, 2012; Mondal et al., 2014; Kumar & Paswan, 2021). Mothers with higher education had taller children than those with less education (Johri et al., 2016; Alderman & Headey, 2017; Miller et al., 2017; Sukmawati & Sirajuddin, 2019; Bras &

Mandemakers, 2022; Haque et al., 2023; Sey-Sawo et al., 2023). Similarly, children's weight-for-age z-scores improved at higher levels of their mother's education (Burchi, 2012; Johri et al., 2016; Sukmawati & Sirajuddin, 2019; Amer & Kateeb, 2021; Kumar & Paswan, 2021; Bras & Mandemakers, 2022; Haque et al., 2023; Sey-Sawo et al., 2023). The chances of having overweight children were less among parents with higher education (Perez-Farinos et al., 2017), while a study showed that mothers with higher education had higher odds of having overweight and obese children than those with lower levels of education (Chesti et al., 2022).

Pertaining to noncommunicable diseases previous research have revealed that people with lower levels of education had a higher risks and incidence of NCDs than those with higher educational levels (Nagel et al., 2008; Chung et al., 2015; Ghazali et al., 2015; Rawal et al., 2017; Dutta et al., 2022). An inverse relationship was observed between educational level and the incidence of hypertension (Mpofu et al., 2016; Ghosh & Kumar, 2019; Lalu et al., 2021). Similarly, the incidence of diabetes was found to be higher among less educated individuals than among those with higher education (Williams et al., 2010; Lee et al., 2011; Addo et al., 2017; Kim et al., 2017; Steele et al., 2017; Wu et al., 2019). On the other hand, some other studies have found an increase in the prevalence of diabetes with an increase in education levels (Corsi & Subramanian, 2012; Wang et al., 2014; Addo et al., 2017; Kusumaningrum & Ricardo, 2022).

Related to lifestyle patterns, previous studies have illustrated that people with no or less education were more likely to consume inadequate fruits and vegetables than those with higher education (Deshmukh-Taskar et al., 2009; Kanungsukkasem et al., 2009; Satheannoppakao et al., 2009; Delisle et al., 2012; Padrao et al., 2012; Mpofu et al., 2016; Nakamura et al., 2016; Li et al., 2017; Pengpid & Peltzer, 2018; Costa et al., 2018; Olatona et al., 2018; Velhinho & Perelman, 2021; Darmawan et al., 2023).

Furthermore, education was found to have a positive relationship with the consumption of dairy products (Fuller et al., 2007; Delisle et al., 2012; Velhinho & Perelman, 2021) while, another study reported that people with a diploma and less education had a higher intake of dairy products than the higher educated (Vakili et al., 2023).

Highly educated people consumed significantly less seafood than those with less education (Ahmad et al., 2016), whereas other studies have pointed out a positive relationship between education and fish intake (Delisle et al., 2012; Velhinho & Perelman, 2021). The consumption of red meat, processed meats, and eggs was higher among young people with lower education than among those with higher than 12 years of education (Deshmukh-Taskar et al., 2009). Conversely, another study showed that women with lower education had a lower consumption of meat and precooked foods (Velhinho & Perelman, 2021).

Consumption of unhealthy food items was higher among people with less education (Blanck et al., 2007; Deshmukh-Taskar et al., 2009; Qobadi & Payton, 2017; Velhinho & Perelman, 2021). Other studies reported that women with higher education had a higher consumption of fast food (Hidaka et al., 2018) and cakes (Velhinho & Perelman, 2021).

The likelihood of alcohol consumption was higher among highly educated women than among those with lower education (Bloomfield et al., 2006; Lee et al., 2011; Grittner et al., 2013; Steele et al., 2017). Conversely, there are a few studies which revealed that people with lower education were more likely to consume alcohol than those with higher education (Mwangi et al., 2020). People without or with less education were more likely to smoke or use tobacco than highly educated people (Mpofu et al., 2016; Rawal et al., 2017; Mwangi et al., 2020; Muthamma, 2022; Zubair et al., 2022).

People with secondary or higher education were more likely to have low physical activity than people without or with less education (Aksoy & Ziyagil, 2017; Pelzom et al., 2017; Pedisic et al., 2019; Petrelli et al., 2022). However, other studies revealed that highly educated people had higher chances of being physically active than the less educated (Lee et al., 2011; Murtagh et al., 2015; Mpofu et al., 2016; Steele et al., 2017).

An inverse relationship was found between educational level and television (TV) time (Stamatakis et al., 2014; Andrade-Gomez et al., 2017). Regarding sleep, it was found that illiterate or less educated individuals were more likely to have both insufficient and disturbed sleep than those with tertiary education (Bedford et al., 2022).

From the preceding review of literature, we find many of above studies with exceptions revealing positive effects of women's education on economic growth and development of a society, on their household income and the income they earn, their labour market participation, their own health and the health of their family members and, more importantly, their children's health and nutrition.

2.12 Research Gap

- Several studies have shown the positive impact of female education on their family income and the income earned by themselves but research is limited while examining the simultaneous impact of female education and their employment status on the family income. Limited studies have assessed the relationship between female education and place of residence. Research is also limited with respect to the simultaneous examination of the education status of women belonging to different social groups. The present study attempts to address this gap.
- Numerous studies have shown that higher education increases women's participation in the workforce, while, a recent study showed that over time workforce participation reduced among women with secondary and higher education showing a sharp increase in unemployment among educated women. This contradicts the positive relationship between education level and women's participation in the workforce. There is always a possibility that social category along with education level might influence work participation by women. In this background, this study attempts to assess the association between women's education and their workforce participation by social category.
- Several studies have shown a positive association between education and women's health status. A few studies have revealed a positive association between education and BMI, whereas other studies indicated a negative association between them. The present study attempts to analyse the impact of women's education on their physical health and nutritional status considering their employment and social category.
- A very few studies have investigated the impact of a wife's education on her husband's health status, with the results showing a positive impact. Therefore, the study intended to find out the impact of the wife's education on her husband's health and nutritional status.
- Several studies have shown that children of women with higher education had better nutritional status. The present study examines the impact of women's education on the nutritional status of their children by classifying them into three groups, (1) belonging to 5 years and below, (2) 6-14 years and (3) 15-21 years separately.
- Previous studies have highlighted that a low level of education was associated with a higher prevalence of multi-morbidity / NCDs and associated risk factors. A low education level was associated with a higher risk of developing hypertension and

diabetes, while, a few studies have found a positive relationship between education and self-reported diabetes. Several studies have examined the relationship between education and healthy and unhealthy diet consumption separately. Similarly, the impact of education on physical activity, screen time, sleep have been separately investigated. In view of this, an attempt is made to investigate the association between the prevalence of NCDs, consumption, and lifestyle patterns simultaneously using composite index considering the levels of female education.

In this direction, the present study investigates the influence of female education on her socio-economic status and family health as well as lifestyle patterns simultaneously in the state of Goa.

CHAPTER III

RESEARCH DESIGN

3.1 Introduction

3.2 Sources of Data

3.2.1 Secondary Sources

3.2.2 Primary Sources

3.3 Sampling Design

3.3.1 Selection of the Sample Talukas

3.3.2 Selection of Villages and Towns

3.4 Measurements

3.4.1 Socio-economic and Demographic Variables

3.4.2 Body Mass Index (BMI) and Lifestyle Patterns

3.5 Statistical Tools and Techniques

3.6 Operational Definitions of Term/s Used in the Study

CHAPTER III

Research Design

3.1 Introduction

The present study adopted a descriptive and exploratory approach to probe the impact of female education on the socio-economic status and health of the family. The present chapter deals with the details of the research design of the study.

3.2 Sources of Data

The present study employed data garnered from both secondary and primary sources.

3.2.1 Secondary Sources

The secondary data required for the present study were acquired from various published and unpublished official sources, such as WHO, United Nations International Children's Emergency Fund (UNICEF), NITI Aayog, Census of India, Ministry of Statistics and Program Implementation (MOSPI), National Family Health Survey, RBI, Economic Survey of Goa, etc. In order to discover the impact of female education on family health in Goa and India, the data were compiled from different rounds of the National Family Health Survey (NFHS).

3.2.2 Primary Sources

An empirical study was administered to analyse the impact of female education on the socio-economic status and health of the family in the state of Goa. A semi structured schedule of questions was framed to obtain the required information from the sample respondents to probe the objectives of the study. The framed questionnaire attempted to collect information pertaining to the socio-economic and demographic features of the respondents, self-reported health status of the respondents, and their husbands and children, their consumption and lifestyle patterns, etc. The questionnaire used to collect the primary data is given in Annexure - I. The data from the women respondents were collected between October, 2021 and December, 2022.

3.3 Sampling Design

This section provides a detailed account of sampling design adopted in the study.

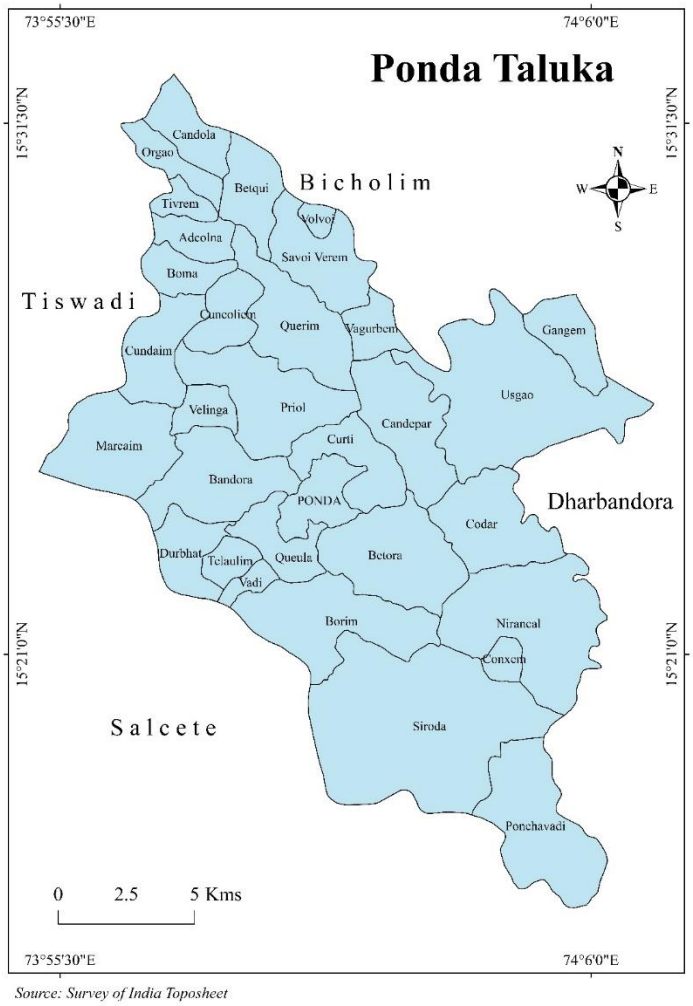
3.3.1 Selection of the Sample Talukas

For proper representation of Goa, the Tiswadi taluka of North Goa and the Ponda taluka of South Goa were selected as sample talukas for this study. As per the Census of 2011, Tiswadi taluka has 42,241 households, whereas Ponda taluka has 38,349 households, which together constituted 23.45 per cent (total 80,590 households) of the total households in Goa. In terms of literacy rates, Tiswadi taluka ranks second, while Ponda taluka ranks sixth. The sex ratio was the sixth highest in Tiswadi taluka and the third lowest in Ponda taluka (Economic Survey of Goa, 2015-16). Both talukas have an equal number of villages and towns and are neighbouring talukas (Goa at a Glance, 2021). Ponda taluka has a higher Scheduled Tribe (ST) population forming 18.5 per cent of Goa's ST population compared to 12.6 per cent in Tiswadi Taluka, as reflected by the Census, 2011 (Economic Survey of Goa, 2021-22).



Source: Survey of India Toposheet

Figure 3.1: Map of the Tiswadi Taluka



Source: Survey of India Toposheet

Figure 3.2: Map of the Ponda Taluka

3.3.2 Selection of Villages and Towns

A multi-stage stratified purposive sampling technique was used to gather the required primary data. The sample size was decided proportionately to the total number of households from each of the village and town in the study area. The purposive sampling technique was used to select the sample women respondents who were aged 18 years and above with at least one child.

According to the 2011 Census, there are total 22 villages and 10 towns each in both the sample talukas. To obtain an appropriate representation and derive rational conclusions, a minimum sample size of around 1 per cent of the total households from each village and around 0.5 per cent of total households from each town of both the talukas were selected. In the households with multiple eligible women, one respondent was chosen randomly. A

total sample of 594 respondents formed the basis for the final analysis. The details of the selection of samples are given in Tables 3.1 to 3.4.

Table 3.1: Town-wise Selection of Sample Households from Ponda Taluka

Sr. No.	Name of the Census town	Total No. of households in towns	0.5% of households	Actual No. of sample selected	Sample as percentage of households
1	Ponda Municipal Council	5,818	29	**33**	**0.6**
2	Curti	3,859	19	**19**	**0.5**
3	Bandora	2,517	13	**13**	**0.5**
4	Usgao	2,867	14	**15**	**0.5**
5	Borim	1,871	9	**10**	**0.5**
6	Priol	1,814	9	**10**	**0.6**
7	Quela	1,623	8	**8**	**0.5**
8	Marcaim	1,408	7	**10**	**0.7**
9	Candola	1,280	6	**6**	**0.5**
10	Orgao	1,156	6	**7**	**0.6**
	Total Urban Households	**24,213**	**121**	**131**	**0.5**

Source: Primary District Census, North Goa, 2011

Table 3.2: Village-wise Selection of Sample Households from Ponda Taluka

Sr. No.	Name of the villages	Total No. of households in villages	1% of households	Actual No. of sample selected	Sample as percentage of households
1	Adcolna	385	4	**5**	**1.3**
2	Betora	1,405	14	**15**	**1.1**
3	Betqui	382	4	**6**	**1.6**
4	Boma	653	7	**8**	**1.2**
5	Candepar	860	9	**10**	**1.2**
6	Codar	172	2	**2**	**1.2**
7	Conxem	39	1	**1**	**2.6**
8	Cuncoliem	323	3	**3**	**1.0**
9	Cundaim	913	9	**10**	**1.1**
10	Durbhat	771	8	**8**	**1.0**
11	Gangem	112	1	**2**	**1.8**
12	Nirancal	406	4	**5**	**1.2**
13	Ponchavadi	931	9	**9**	**1.0**
14	Querim	774	8	**9**	**1.2**
15	Savoi-Verem	700	7	**10**	**1.4**
16	Siroda	3,197	32	**32**	**1.0**
17	Telaulim	604	6	**7**	**1.2**
18	Tivrem	454	5	**6**	**1.3**
19	Vadi	110	1	**2**	**1.8**
20	Vagurbem	116	1	**3**	**2.6**
21	Velinga	444	4	**4**	**1.0**
22	Volvoi	385	4	**7**	**1.8**
	Total Rural Households	**14,136**	**143**	**164**	**1.2**

Source: Primary District Census, North Goa, 2011

Table 3.3: Town-wise Selection of Sample Households from Tiswadi Taluka

Sr. No.	Name of the Census town	Total No. of households in towns	0.5% of households	Actual No. of sample selected	Sample as percentage of households
1	Panaji (Municipal Corporation + Out Growth)	17,807	89	**91**	**0.5**
2	Chimbel	3,093	15	**16**	**0.5**
3	Calapor	3,514	18	**22**	**0.6**
4	Murda	1,803	9	**11**	**0.6**
5	Bambolim	1,165	6	**7**	**0.6**
6	Corlim	1,583	8	**11**	**0.7**
7	Mercurim	1,233	6	**6**	**0.5**
8	Cumbarjua	1,121	6	**9**	**0.8**
9	Goa Velha	1,055	5	**5**	**0.5**
10	Jua	1,057	5	**7**	**0.7**
	Total Urban Households	**33,431**	**167**	**185**	**0.6**

Source: Primary District Census, North Goa 2011

Sample for Analysing Husband's Health Status and Lifestyle Patterns

Although the study included the data of 594 women respondents, the information of only 528 respondents' husband was considered for analysis because widow/separated respondents (n = 66) could not furnish details of their deceased or separated husbands. Therefore, the analysis of the variables of husbands was based on 528 eligible participants.

Sample for Analysing the Probability of Child being Overweight or Obese

The children of the sample respondents were classified based on their age groups for further analysis. The child level analysis consisted of 38 children aged 5 years or below, 118 children aged 6-14 years and 147 adolescents aged 15-21 years while the children above the age of 21 were excluded. This age-specific classification ensured adequate representation of younger and older children which allowed for comprehensive analysis across different age groups.

Table 3.4: Village-wise Selection of Sample Households from Tiswadi Taluka

Sr. No.	Name of the villages	Total No. of households in villages	1% of households	Actual No. of sample selected	Sample as percentage of households
1	Ambarim	27	1	**1**	**3.7**
2	Azossim	270	3	**4**	**1.5**
3	Bainguinim	388	4	**4**	**1.0**
4	Batim	356	4	**5**	**1.4**
5	Capao	37	1	**1**	**2.7**
6	Caraim	44	1	**1**	**2.3**
7	Carambolim	1,195	12	**16**	**1.3**
8	Chorao	1,202	12	**15**	**1.2**
9	Curca	560	6	**7**	**1.3**
10	Ella	1,258	13	**15**	**1.2**
11	Gancim	113	1	**1**	**0.9**
12	Gandaulim	73	1	**1**	**1.4**
13	Goalim Moula	97	1	**1**	**1.0**
14	Goltim	423	4	**5**	**1.2**
15	Malar	382	4	**8**	**2.1**
16	Mandur	726	7	**9**	**1.2**
17	Naroa	119	1	**3**	**2.5**
18	Navelim	280	3	**3**	**1.1**
19	Neura-O-Grande	330	3	**3**	**1.0**
20	Neura-O-Pequeno	131	1	**1**	**0.8**
21	Siridao	578	6	**7**	**1.2**
22	Talaulim	221	2	**3**	**1.4**
	Total Rural Households	**8,810**	**91**	**114**	**1.3**

Source: Primary District Census North Goa, 2011

3.4 Measurements

The required information from the respondents related to their socio-economic and demographic background, consumption and lifestyle patterns, and health issues were collected with the help of a semi-structured schedule of questions through face-to-face interviews.

3.4.1 Socio-economic and Demographic Variables

The socio-economic variables included education (Illiterate, Elementary, Secondary and Higher Secondary, Graduate and above), place of residence (urban, rural), monthly family income, employment status (unemployed, self-employed, employed, retired and daily wage earner), social category / caste (SC, ST, OBC and General).

Construction of the Economic Status Index

The Economic Status (ES) Index was developed by using a scoring and normalization method, wherein key indicators, such as, monthly family income, employment status, and nature of employment were considered by assigning a score to each variable (Table 3.5). The employment score was obtained by taking a higher value between employment status and nature of employment to account for both participation and job security. All indicators were normalized on a 0-1 scale and then averaged to obtain an overall ES index, which was subsequently rescaled to 0-100.

Table 3.5: Variables Used to Develop the Economic Status (ES) Index

Variables	Measurement
Monthly family income	coded as <10,000 = 1, 10,001-20,000 = 2, 20,001-30,000 = 3, 30,001-40,000 = 4, 40,001-50,000 = 5, 50,001-60,000 = 6, 60,001 and above = 7
Employment status	coded as Unemployed = 1, Daily wage earners = 2, Self-employed = 3, and Employed = 4
Nature of employment	coded as Housewife = 1, Temporary = 2, Contractual = 3, Permanent =4

Source: Primary survey

The dataset was classified into three equal groups based on percentiles. The 33rd percentile (Q1) being the first tertile cut-off, the 66th percentile (Q2) being a second tertile cut-off. The

index was segmented into three tertiles based on these thresholds denoting different levels of economic well-being. Consequently, the ES index was categorized into three groups: low ES (T1), medium ES (T2), and high ES (T3). The index distribution among respondents based on three thresholds was: T1=0-8.33, T2=8.34-33.33, and T3 greater than 33.33. This means that 33 per cent of women had ES scores of 8.33 or lower, another 33 per cent had scores between 8.34 and 33.33, and the remaining 34 per cent had scores above 33.33. This happens because the ES scores were skewed towards lower values, indicating that many respondents had relatively low normalized ES scores.

3.4.2 Body Mass Index (BMI) and Lifestyle Patterns

Self-reported weight in kilograms (kg) and height in feet by participants were considered to calculate BMI as per WHO definition. A participant's weight in kilograms was divided by the square of their height in metres (kg/ m^2) to obtain BMI. Those with a BMI of 18.5–24.9 kg/m^2 were defined as normal weight, BMI of <18.5 kg/m^2 was categorized as underweight, those with BMI of 25-29.5 kg/m^2 as overweight and BMI of 30 kg/m^2 or higher were depicted as obese. The same methodology was adopted for calculating their husbands' BMI. BMI-for-age percentile was utilised for calculating the child's BMI status, wherein a child with BMI less than 5^{th} percentile was considered as underweight, between 5^{th} to less than 85^{th} percentile as normal weight, between 85^{th} to less than 95^{th} percentile was categorized as overweight and above 95^{th} percentile was represented as obese as per WHO Growth Standards. However, for the purpose of analysis overweight and obese were clubbed together in the present study.

The Diet History Questionnaire III (DHQ) was used to gather information on consumption patterns (NIHa, n.d.). Respondents were asked to report the frequency of their food items intake (daily/very often, weekly/less often, sometimes, and rarely/never) in the past 12 months. Respondents were also asked to reveal their frequency of engagement in physical activity (daily/very often, weekly/less often, sometimes, and rarely/never) and screen time (2 hours or less and more than 2 hours). Information on smoking, alcohol intake, and tobacco use were also obtained from the participants (Yes, No).

Construction of the Healthy Lifestyle Index (HLI)

The HLI was constructed by following the method used by Hu et al., 2022; Meer et al., 2023; Viallon et al., 2024.

Table 3.6: Variables Used for the Construction of HLI

Variables	Categories	Scores
Vegetables/fruit consumption	Daily/very often	4
	Weekly/less often	3
	Sometimes	2
	Rarely/never	1
Fish/egg intake	Daily/very often	4
	Weekly/less often	3
	Sometimes	2
	Rarely/never	1
Intake of fast food/food items high in salt, sugar, and fat	Daily/very often	1
	Weekly/less often	2
	Sometimes	3
	Rarely/never	4
Engagement in exercise/yoga	Daily/very often	4
	Weekly/less often	3
	Sometimes	2
	Rarely/never	1
Screen time	2 hours or less	2
	> 2 hours	1
Smoking	Yes	1
	No	2
Alcohol consumption	Yes	1
	No	2
Tobacco use	Yes	1
	No	2

Source: Primary survey

The HLI considered eight variables comprising intake of vegetables / fruits, fish / eggs, fast food/ food items high in salt, sugar, and fat, engagement in exercise/yoga, screen time, smoking, alcohol consumption, and tobacco use, as presented in the Table 3.6. The total score of every participant was added to obtain the HLI score. The HLI score was then categorized as low (0-17), moderate (18–21) and high (22–24).

3.5 Statistical Tools and Techniques

Descriptive and analytical tools and techniques have been used along with graphs and figures for the analysis of data. The raw data collected from women were analysed by using MS-Excel 2019, IBM Statistical Package for the Social Sciences (SPSS) Statistics version 25, and Python software (Version 3.x) through the Anaconda distribution. The Pandas and NumPy libraries were utilised to carry out data management and descriptive statistics, while inferential statistical analyses were performed using SciPy and Statsmodels. Diverse statistical tools have been deployed in the study for the meaningful analysis of the collected data.

Descriptive Statistics

Descriptive Statistics were obtained to use the mean, mode, median, and standard deviation to check the data structure and normality and to further apply various tests required for analysis.

Chi-square (X^2) Test

The chi-square test was applied to determine the association between the following categorical variables:

- Women's education and place of residence
- Women's educational level and social category
- Education and employment status of women
- Education and self-reported health status of women
- Wife's education and husband's health status as reported by her

The observed values from the sample were compared with the expected values using the chi-square statistic at 5 per cent level of significance. If the p-value was smaller than 0.05 ($\alpha < 0.05$) then it revealed a significant difference between the observed and expected values.

Stratified Chi-square Analysis

Stratified chi-square analysis was applied in the following cases:

- **Women's Self-reported Health by Education and Social Category**

The association between educational level and self-reported health among women was evaluated across various social categories. For each social category, a separate chi-square test was executed to ascertain the association between the specified variables within that each social group.

- **Self-reported Health by Women's Education Level and Employment Status**

The relationship between women's education level and self-reported health was tested while controlling for the third confounding variable i.e. employment status. The data was divided into two separate strata namely employed and unemployed. For each stratum, a separate chi-square test was administered to assess the association between the two of the above-mentioned variables within each stratum.

Kruskal-Wallis H Test

In this study, the Kruskal- Wallis test was used to verify the impact of female education on household income, wherein the median of three or more independent groups was compared to determine if there was a statistically significant association between them. This test was employed because of ordinal data or small/unequal sample sizes across groups.

Simple Linear Regression Analysis

This statistical tool was exerted to describe the linear relationship between the dependent variable ES Index and the independent variable, women's education, as the ES Index is a continuous variable (0-100) and the independent variable, women's education, an ordinal variable coded as illiterate =1, elementary = 2, secondary/higher secondary = 3 and graduate and above = 4. The predicted value of the outcome variable obtained was based on the independent variable by fitting a straight line to the data.

The linear equation of the model is as follows:

$$ES\ Index\ =\ \beta_0 + \beta_1\ (Education) + \epsilon$$

Where,

ES Index (y) = dependent variable

Education (x) = independent variable

β_0= y-Intercept, the value of y when x=0

β_1= Coefficient of women's education, the change in *y* due to one unit change in *x.*

ϵ = Error term

Logistic Regression Analysis

Logistic regression has been used to calculate odds ratios wherein categorical dependent variable and either categorical or continuous independent variable are involved.

a) Binary Logistic Regression: This model was applied to the following cases where the dependent variable was dichotomous:

i. Wife's Education and the Probability of Husband being Overweight/Obese

This model was used to see the association of woman's education and the probability of her husband being overweight/obese. In this model, wife's educational level was coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, and graduate and above = 3 and the husband being overweight or obese was coded as 1, otherwise 0.

The fitted model is:

$$ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1\, Wife's\ Education + \varepsilon$$

Where:

P = Probability of the husband being overweight/obese

β_0= Intercept

β_1= Coefficient of wife's education

ε = Error term

ii. Mother's Education and the Probability of Child being Overweight/Obese

This model was applied to assess the correlation between the mother's educational attainment and the probability of the child being overweight or obese. Mother's education

was coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, and graduate and above = 3 and the child being overweight or obese was coded as 1, otherwise 0.

The fitted model is:

$$logit\ (P) = \beta_0 + \beta_1\ Mother's\ Education + \varepsilon$$

Where,

P = Probability of the child being overweight or obese

β_0 = Intercept

β_1 = Coefficient of the mother's education

ε = Error term

iii. Women's Education and the Presence of Diabetes or High Blood Pressure

The association between women's education and the presence of diabetes or high blood pressure was examined by using this model. If a woman suffered from either diabetes or high blood pressure was coded as 1 otherwise 0 and the education level was coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, and graduate and above = 3.

The fitted model is:

$$logit(\ P) = \beta_0 + \beta_1\ Education + \ \varepsilon$$

Where,

P = Presence of diabetes or high blood pressure

β_0 = Intercept

β_1 = Coefficient of education

ε = Error term

iv. Women's Education and the Presence of Diabetes or High Blood Pressure among their Husbands

This model was utilised to deduce the association between women's education and the prevalence of diabetes or high blood pressure among husbands. Women's education level was coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, and graduate

and above = 3 whereas the diabetes or high blood pressure prevalence among husbands was coded as 1, otherwise 0.

The fitted model is:

$$logit(P) = \beta_0 + \beta_1\ Women's\ Education + \varepsilon$$

Where,

P = Presence of diabetes or high blood pressure among husbands

β_0 = Intercept

β_1= Coefficient of women's education

ε = Error term

b) Multinomial Logistic Regression: This model was used to determine the influence of women's education on family income wherein the dependent variable had more than two possible outcomes and these values were not having a specific order. Since the monthly family income was a continuous variable, it was categorized into quartiles as Low-income quartile (Q1): up to ₹10,000 coded as **1**, Lower-middle income quartile (Q2): ₹10,001–₹20,000 as **2**, Upper-middle income quartile (Q3): ₹20,001–₹30,000 as **3** and High-income quartile (Q4): Above ₹30,000 as **4**. To fit in this model, high-income quartile, Q4 was taken as reference category. Educational level was an ordinal variable coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, graduate and above = 3.

$$ln\left(\frac{P(Y \leq j)}{P(Y > j)}\right) = \propto_j - \beta\ x\ Education$$

Where,

Y= Family income quartiles (1- 4)

$\propto_j$ = Thresholds/Intercepts representing the cut points between the different quartiles

β = Coefficient of female education

c) Ordered Logistic Regression / the Proportional Odds Model: This model was applied to test an association between the following variables wherein the dependent variable had three or more possible outcomes and these values had a defined order.

i. Women's Education and HLI

The relationship between women's education level and HLI was evaluated by using Ordered logistic regression model. The dependent variable HLI was coded as low HLI = 0, moderate HLI = 1, and high HLI = 2, whereas the independent variable- education level was coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, and graduate and above = 3.

ii. Influence of Women's Education on their Husband's HLI

The relationship between women's education and husband's HLI was also examined by using ordered logistic regression model. The dependent variable husband's HLI was coded as low HLI = 0, moderate HLI = 1, and high HLI = 2 while the independent variable, women's educational attainment was coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, graduate and above = 3.

Stratified Logistic Regression Analysis

This analysis was performed to assess the employment status by women's educational attainment and social category wherein stratification was adopted to analyse data by dividing it into subgroups. Subsequently, a separate logistic regression was performed within each stratum. To get an overall effect measure across all strata, a combined estimate such as the Mantel-Haenszel combined odds ratio was calculated. A homogeneity test was performed to determine if the Odds ratios were consistent across the different strata. Here, employment status was a binary variable coded as 1 for employed, and 0, otherwise. Education being an ordinal variable, was coded as illiterate =1, elementary = 2, secondary/higher secondary = 3, graduate and above = 4.

Hierarchical Logistic Regression Model

This technique was utilised to examine the interrelation between women's educational level and employment status along with other variables such as education and social category, interaction effect, marital status, age, and household income. A multilevel or clustered data was analysed by using this technique wherein women's employment status was a binary outcome variable with employed coded as 1; otherwise, 0. Educational level was coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, graduate and above = 3. The social category was coded as SC = 1, ST = 2, OBC = 3, and General = 4. Education × Social

Category indicates the interaction effect. Marital status was coded as married = 1 and divorced/widowed = 0. Age in years and monthly family income in Rupees was taken as continuous variable. Variations at different levels were considered by constructing a model in a series of steps and incorporating the predictor variables in blocks based on theoretical significance. The explanatory variables were entered in blocks. Each block represented one model. The distinct impact of each predictor group was evaluated by determining the extent to which it enhanced the model's fit and explained variance (R-squared) at each step.

The final equation of this model is as follows:

$$P(Y=1) = \frac{e^{(\beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_nX_n)}}{1+\ e^{(\beta_0+\beta_1X_1+\beta_2X_2+\cdots+\beta_nX_n)}}$$

Where:

(Y=1) is the probability of being employed.

β_0 is the intercept.

X_i are the independent variables.

β_i are the coefficients estimated by the model.

Model 1: Base Model (Education and Social Category)

$$log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \beta_0 + \beta_1\ Education + \beta_2\ Social\ Category$$

Model 2: Adding the Interaction Effect (Education x Social Category)

$$log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \beta_0 + \beta_1\ Education + \beta_2\ Social\ Category + \beta_3\ (Education\ X\ Social\ Category)$$

Model 3: Adding Marital Status

$$log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \beta_0 + \beta_1\ Education + \beta_2\ Social\ Category + \beta_3\ (Education\ X\ Social\ Category) + \beta_4\ Marital\ Status$$

Model 4: Adding Age Group

$$log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \beta_0 + \beta_1\ Education + \beta_2\ Social\ Category + \beta_3\ (Education\ X\ Social\ Category) + \beta_4\ Marital\ Status\ +\ \beta_5\ Age$$

Model 5: Adding Household Income (Final Model)

$$log\left(\frac{P(Y=1)}{1-P(Y=1)}\right) = \beta_0 + \beta_1\, Education + \beta_2\, Social\ Category + \beta_3\, (Education\ X\ Social\ Category) + \beta_4\, Marital\ Status + \beta_5\, Age + \beta_6\, Income$$

K-means Clustering Analysis

In this study, K-means clustering analysis was employed to assess the relationship between women's educational level, monthly family income, and employment status. In this analysis, the dataset was divided into similar groups / clusters considering the distance between their centroids. The centroid or cluster centre was represented by the mean or median of all the points within the cluster. The data points were iteratively assigned to the nearest cluster centroid, and the position of each centroid was recalculated until the centroids or clusters stabilized. The data was organized based on similarity wherein three clusters were formed based on educational attainment, monthly household income, and employment status.

Structural Equation Modelling (SEM)

SEM was used to explore the relationship between women's BMI and education along with employment, social category, family income, and age thereby, enabling to examine complex relationships between measured and latent variables. Multiple relationships were tested simultaneously in a single model. Path diagrams were used to clearly represent the relationship between the examined variables. Both the model fit indices and the indicators explaining the association between variables were considered while interpreting the SEM results. To apply this model, Body Mass Index (BMI) was taken as the outcome variable (continuous variable) while independent variables included education (coded as illiterate = 0, elementary = 1, secondary/higher secondary = 2, graduate and above = 3), employment status (coded as regularly employed = 1, daily wages = 2, self-employed = 3, retired = 4, homemaker = 5), household income taken as a continuous variable which also serves as a mediator (see Eq. 2), social category (coded as SC = 1, ST = 2, OBC = 3, General = 4), and age taken as a continuous variable in years. Women's BMI was calculated by dividing the woman's weight in kilograms by height (squared) in centimetres.

The final equation of this model is as follows:

Full Model:

Equation 1: $BMI = \beta_0 + \beta_1\, Education + \beta_2\, Employment + \beta_3\, Social\ Category + \beta_4\, Income + \beta_5\, Age + \epsilon_1$

β_0 = Coefficient of the Intercept and $\beta_{1,\ldots\ldots}\beta_5$ are coefficients of the variables.

Equation 2: $Household\ Income = \gamma_0 + \gamma_1 Education + \epsilon_2$

β_1 showed the direct effect of education on BMI. Υ_1 implied the impact of education on income. The coefficient β_4 indicated the influence of income on BMI.

3.6 Operational Definitions of Term/s Used in the Study

The definitions of key concepts employed in the study are outlined below:

1. Urban area: According to the Census, an urban area has been defined as the place having a municipality, corporation, cantonment board or notified town area committee, etc or the place which simultaneously satisfies three criteria given below:
   i) A minimum population of 5,000;
   ii) At least 75% of male working population involved in non-agricultural activities; and
   iii) Population density should be at least 400 per sq. km. (1,000 per square mile)

Additionally, urban areas also consist of outgrowths (O.Gs), which are sections of Urban Agglomerations (Census of India, 2011).

2. Taluka: It is an administrative division of a district.

3. District: It depicts an administrative division of a state/territory.

4. Household: It refers to a group of individuals who usually live together and consume their meals from a common kitchen (Census of India, 2011).

5. Highest educational qualification: This denotes the highest educational level that a respondent has achieved (Census of India, 2011).

- Illiterate: An individual who could not read or write.
- Below Primary/Primary: Education from the 1st Standard to the 4th Standard.
- Below S.S.C/ S.S.C/Below H.S.S.C: Education from the 5th Standard to the 10th Standard.
- H.S.S.C/Under Graduate: Education up to 12th standard or not completed graduation.
- Graduate: A bachelor's degree
- Post Graduate: A Master's degree
- Ph.D.: Doctorate
- Others (Diploma, etc.): A technical and non-technical diploma or certificate not equal to degree.

6. Social category: It refers to the classification of respondents based on their caste as per the Government of Goa guidelines.

7. Socio-economic Status: It represents the respondents based on their education level, family income, and the type of employment (NIHb, n.d.).

8. Health: The state of total physical and mental wellbeing (WHOa, n.d.).

9. Self-reported health status: Overall health status reported by the female respondents themselves.

10. Self-reported weight: A measurement of weight provided by the respondents on their own.

11. Self-reported height: Height measurement provided by the respondents.

12. Health issues, if any: It depicts any health problem, disease, illness, or any other kind of health condition.

13. Lifestyle patterns: It connotes the diet, physical activity, and behaviour among households.

14. Noncommunicable diseases (NCDs): It denotes chronic diseases of long duration arising from a combination of genetic, physiological, environmental, and behavioural factors (WHO, 2025).

15. Consumption of fast food/ food items high in salt, sugar, and fat: Consumption of processed and fast-food rich in saturated fats and trans fats as well as salty snacks and intake of sugary snacks and sugar-sweetened beverages (WHOb, n.d.).

16. Screen time: A total number of hours spent in a day watching television or using a computer or playing video games.

17. Smoking: An individual who currently smokes or who has smoked in the past.

18. Tobacco use: A person who presently uses or has used any type of smokeless tobacco product in the past.

CHAPTER IV

AN OVERVIEW OF EDUCATIONAL AND HEALTH STATUS OF GOA, INDIA

4.1 Introduction

4.2 Brief Profile of Goa

4.2.1 Socio-economic and Demographic Characteristics

4.3 Education, Employment, and Health Status

4.3.1 Educational Status

4.3.2 Employment Status

4.3.3 Health Status

4.3.3a Nutritional and Health Status by Women's Education

4.3.3b Nutritional and Health Status of Men

4.3.3c Nutritional and Health Status of Children

4.4 An Overview of the Findings

4.5 Concluding Observations

CHAPTER IV

An Overview of Educational and Health Status of Goa, India

4.1 Introduction

This chapter presents a brief profile of Goa and a comparative analysis of the educational, employment, and health status of Goa and India based on secondary sources of data. It is divided into four sections. The first section provides a brief profile of Goa, while the second section deals with education, employment, and health status, where a comparison has been made between Goa and all India averages. This section presents health indicators and attempts to compare them with educational attainment. The third section presents the main findings, and the fourth section provides the concluding observations.

4.2 Brief Profile of Goa

Before the arrival of the Portuguese, Goa had a very extensive area on its borders, including parts of the Ratnagiri district of the Maharashtra state, Ankola Taluka of the North Kannada district of Karnataka state, and a large portion of the Belgaum district. During the period of about 200 years, its area has remained almost unchanged. Goa was under Portuguese rule for over four centuries and was liberated from Portuguese rule on 19th December, 1961 (Gazetteer of Goa, 1979). After liberation, Goa was a district under the Goa, Daman, and Diu Union Territory until 1987. It was conferred statehood on 30th May 1987 and was made the twenty-fifth state of India by including it in Schedule I of the Constitution of India (Government of Goa, 1987). Goa is one of the beautiful smallest states of India and is located on the South West Coast of India with a geographical area of 3,702 square kilometres. The state shares its borders with the Arabian Sea to the West, Maharashtra to the North, and Karnataka to the South and East. It has three major physical divisions namely, the mountainous region of the Sahyadries, the middle level plateaus, and the low-lying river basins and the coastal plains (Gazetteer of Goa, 1979). It is very close to the rainforests of the North Western Ghat, making it rich in flora and fauna. The state is a preferred tourist destination due to its beautiful beaches, tropical plantations, temples, and churches. The Mandovi, Zuari, Terekhol, Chapora, Galgibag, Kumbarjua canal, Talpona and the Sal are the seven major rivers of Goa (Gazetteer of Goa, 1979). The total area under forest in the state was 1,225 square kilometres in 2022-23 (Government of Goa, 2022-23).

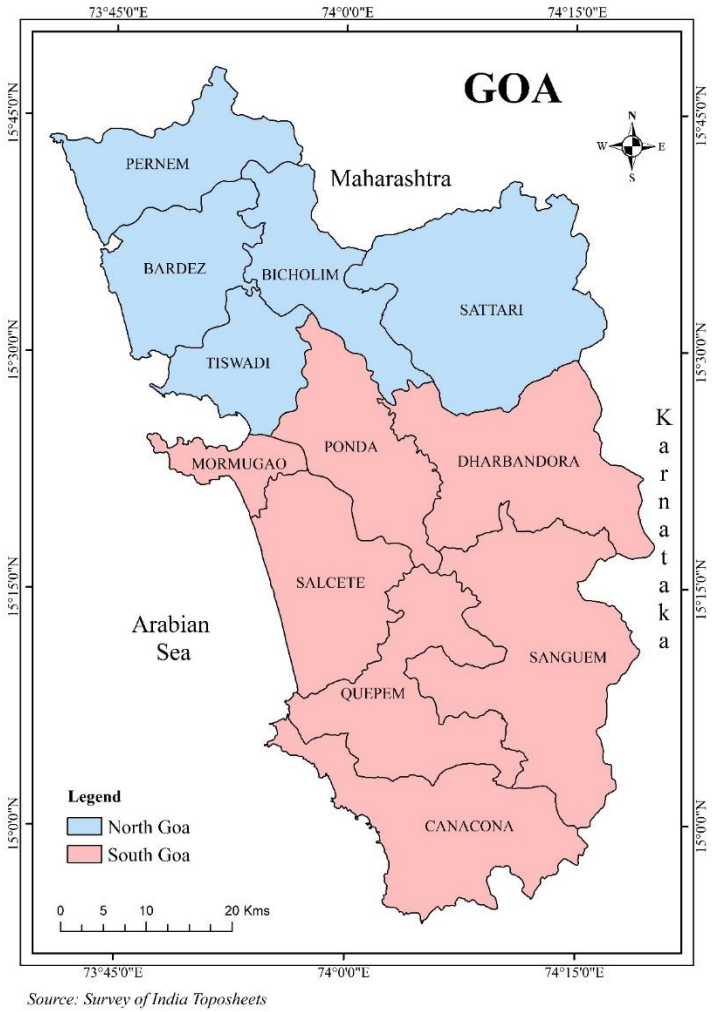


Figure 4.1: Map of Goa

Panaji is the capital of Goa. For administrative convenience, Goa has been bifurcated into two districts, namely, North Goa and South Goa. The North Goa district has a total geographical area of 1,736 square kilometres which is lower than that of the South Goa district (1,966 square kilometres). In terms of area, the North Goa district ranks 517, whereas the South Goa district ranks 496 in the country. The North Goa district is situated between the latitudinal parallels of 15°47'59" N and 15°16'22" N and the longitudinal parallel of 73°40'54" E and 74°16'89" E. From North to South and from East to West, the district spans a distance of 65 kms and 58 kms respectively. It consists of five talukas, namely, Pernem, Bardez, Tiswadi, Bicholim, and Sattari. The South Goa district is located between the latitudinal parallels of 15^0 29'32" N and 14^0 53'57" N parallel of 73^0 46'21" E and 74^0 20'11" E. From North to South and from East to West the district spans a distance of 68 kms and 40 kms respectively. Margao is its headquarter, and the district is subdivided into seven talukas, namely, Mormugao, Salcete, Quepem, Sanguem, Canacona, Ponda, and

Dharbandora, the new 12th taluka of Goa formed in 2011 (Government of Goa, 2011). Ponda, the sample taluka of South Goa district is well known for many Hindu temples, while Tiswadi, the selected taluka from North Goa district is famous for churches.

4.2.1 Socio-economic and Demographic Characteristics

Goa has a better socio-economic profile than many other Indian states (State Industrial Profile of Goa, 2014-15). Goa's Income Index value was 0.979 in 2017-18, which was significantly higher than that of India (0.739) (MOSPI, n.d.).

Economic Status: Goa occupies a prominent position in India with respect to economic growth. Goa's Gross State Domestic Product (GSDP) at constant prices was ₹7,99,243 lakhs during 1990-91 which had risen to ₹59,86,675 lakhs in 2022-23 indicating a rising trend over the period. In 1990-91, the growth rate of Goa's GSDP was 15 per cent, while that of India's GDP was 5.5 per cent. However, in 2022-23, Goa's GSDP's growth rate declined to 8 per cent while, India's GDP growth rate increased to 7 per cent. The per capita GSDP of Goa and per capita GDP of India show an upward trend. In Goa it surged by over five times from ₹68,675 in 1990-91 to ₹3,57,611 in 2023-24, while in India the per capita GDP registered more than fourfold increase from ₹29,971 to ₹1,26,528 during the same period. Goa, which has the highest per capita income in India has been a top performing state (MOSPI, n.d.).

The share of primary sector in Goa's GSDP was 15.03 per cent in 1990-91, which slightly increased to 18.8 per cent in 1995-96 and after that there has been a continuous decline in the primary sector's share. In 2022-23(Q), its share in GSDP stood at 5.51 per cent. As far as the secondary sector is concerned, its share in GSDP was 33.14 per cent in 1990-91 which came down to 26.43 per cent in 1995-96 and thereafter its share shows an increasing trend, accounting for 57.72 per cent of GSDP in 2022-23(Q). The share of the tertiary sector in GSDP, which was 51.81 per cent in 1990-91 rose to 54.75 per cent in 1995-96, while, subsequently it decreased and contributed only 36.77 per cent to GSDP in 2022-23(Q) (Economic Survey of Goa 2010-11 & 2023-24).

Demographic Features: Goa's population, increased by 67.2 per cent between 1900 and 1971 (Gazetteer of Goa, 1979). Its total population was 14,58,545 forming a meagre proportion (0.12%) of India's population in 2011 (Census of India, 2011). In the total

population of Goa, North Goa had a larger share (56.1%) than South Goa (43.9%). The total population in Tiswadi taluka was 1,37,202 whereas Ponda taluka had a total population of 1,43,166. According to the National Commission on Population Estimates, the population of Goa increased to 15.87 lakhs in 2024 (Govt. of Goa, 2023-24). Goa's population growth rate shows a decreasing trend since 1981 and its decadal growth rate was 8.2 per cent as per the Census of 2011.

Goa's population density was 394 persons per square kilometre which is higher than that of India (382) in 2011. The North Goa district has a much higher density (471) than the South Goa (326). Tiswadi taluka had the third highest density of population (915) next to Mormugao, and Salcete talukas of Goa while Ponda taluka had a density of 566 (Census of India, 2011).

Goa had a sex ratio of 973 females per thousand males, surpassing the national average (943), ranking it tenth highest in the country. The sex ratio in North Goa was 963 while South Goa had a higher sex ratio of 986. Tiswadi taluka had a sex ratio of 966 which is higher than that of Ponda taluka (940) (Primary Census Abstract of Goa, 2011). The main religion in Goa is Hindu comprising of 66.1 per cent of the state's population. North Goa had a considerably larger proportion of Hindus (76.1%) compared to South Goa (53.3%) (Census of India, 2011).

The total SC population in Goa was 1.7 per cent comprising of 2.2 per cent in North Goa district and 1.2 per cent in South Goa district. The state had a total ST population of 10.2 per cent comprising 6.9 per cent in the North Goa district and 14.5 per cent in the South Goa district (Census of India, 2011).

The population in urban areas has surged drastically in Goa from 41 per cent in 1991 to 62.2 per cent in 2011, indicating rapid urbanization in the state, and it has been significantly higher than all India average of 31.1 per cent in 2011 (Census of India, 1991 & 2011). The urban population in North Goa district was 60.3 per cent, and 64.6 per cent in South Goa district. The urban population in Tiswadi taluka was 78.8 per cent, whereas that of South Goa district was 62.5 per cent. The household size shows a declining trend from 4.53 to 4.24 in Goa and from 5.31 to 4.85 in India between 2001 and 2011. The household size was slightly lower in South Goa (4.22) than in North Goa (4.27).

Goa had a relatively high Human Development Index (HDI) (0.779) in 2021, (Govt. of Goa, 2025), which was above the national average of 0.647 (UNDP, 2025). Goa is one of the five top-ranking states with better health and education outcomes and a higher per capita income (Global Data Lab, n.d.). The overall SDG score of Goa was 77 in 2023-24 which was higher than all India score of 71. The SDG 3 and 4 scores of Goa were 79 and 72 while that of India were 77 and 61 respectively in 2023-24 (NITI Aayog, 2024a). In 2019-21, Goa had a Multidimensional Poverty Index (MPI) value of 0.003 which was much lower than of all India (0.07) (NITI Aayog, 2023).

4.3 Education, Employment, and Health Status

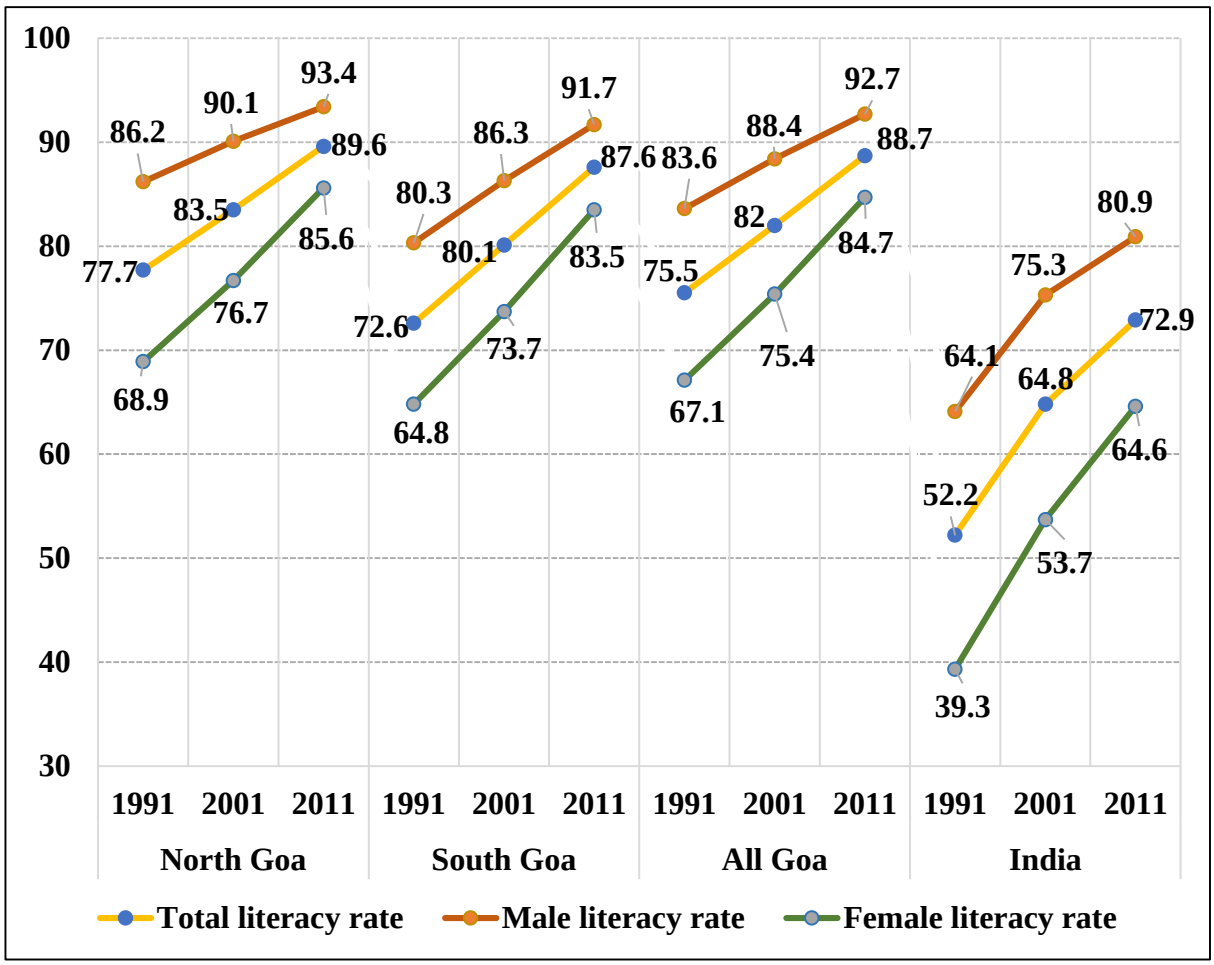
This section gives an account of progress made in by Goa and India related to education, employment and health status over a period of time. This will put a foundation for further empirical analysis of the study.

4.3.1 Educational Status

The literacy rate in the Goa district was only 13.1 per cent with male literacy rate of 19.8 per cent and female literacy rate of 6.4 per cent as per the Census of 1910. Immediately after the liberation in 1961, the entire educational system existing in Goa was intensively reviewed in line with the recommendations of the Jha committee (Gazetteer of Goa, 1979). Before liberation, the literacy rate of the territory was 30.75 per cent (39.04 % for males and 23.01% for females), which increased to 44.75 per cent (54.31 % for males and 35.09 % for females) in 1971. In 1981, the literacy rate of the Goa district was 65.7 per cent, with 76 per cent for males and 55.2 per cent for females (Census of India, 1981). In 2017-18, the educational index value of Goa was 0.684, which was greater than the national average (0.545) (MOSPI, n.d.).

A significant improvement in the total literacy rate at the district and state levels in Goa was noted from 1991 to 2011 (Figure 4.2). Similarly, there has been a significant upswing in the female literacy rates in Goa, with the literacy rate in the North Goa district being slightly higher than that in the South Goa district. Overall literacy and female literacy rates in Goa are vastly higher than those of national average and the gender difference in literacy has been declining at all levels.

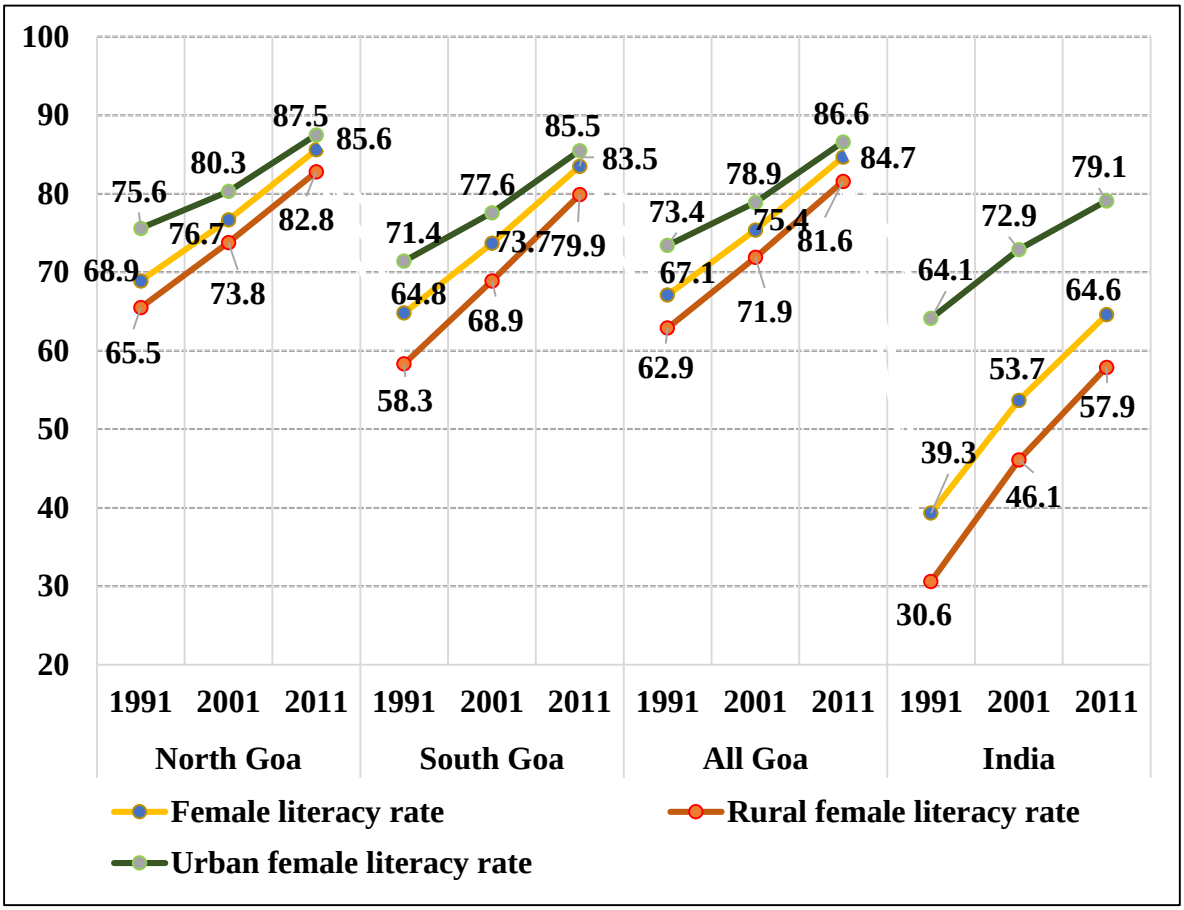
Figure 4.2: Trends in Literacy in Goa and India by Gender, 1991- 2011 (in percentages)



Source: District Census Handbook Census of India North Goa & South Goa 1991, 2001 & 2011

The female literacy rate was always lower in rural areas than in urban areas in both districts and at the state level (Figure 4.3). Interestingly, the urban-rural gap in female literacy rates has been reducing in Goa and India over the years, indicating the availability of better educational facilities and opportunities.

Figure 4.3: Rural-Urban Literacy Trends among Females in Goa and India, 1991 - 2011 (in percentages)



Source: District Census Handbook Census of India North Goa & South Goa 1991, 2001 & 2011

As per 2011 census, the total literacy rate in Tiswadi taluka was 90.37 per cent while that in Ponda taluka was 89.21 per cent. The literacy rate among males in Tiswadi taluka was 93.41 per cent which is almost the same as that in Ponda taluka (93.56%). The female literacy rate in Tiswadi was 87.24 per cent which is higher than that of Ponda taluka (84.58%). The rural female literacy rate was 84.1 per cent in Tiswadi taluka which is again more than that of Ponda taluka (82%). This indicates that the Tiswadi taluka has a slightly better educational status than Ponda taluka.

Goa had a literacy level of 88.7 per cent in 2011 against 82 per cent in 2001. The literacy level of the Scheduled Tribe (ST) population is found to be lower than that of Scheduled Caste (SC) population at all India level as well as in Goa (Table 4.1). The figures indicate that the gender-wise and region-wise, the ST population had the lowest literacy rate in the state. However, these differentials significantly decreased in 2011, especially in the case of rural ST women. The rural female literacy rate, which was approximately 30 per cent among

STs in both the districts and the State of Goa in 2001, increased significantly to 76 per cent in North Goa, to over 68 per cent in South Goa district, and nearly 71 per cent in the State as a whole in 2011. This could be due to the inclusion of three OBC communities, namely, Kunbi, Velip, and Gawda, under the ST category (Govt. of Goa, 2016-17).

Table 4.1: Literacy Level of Scheduled Tribes and Scheduled Caste Populations in Goa and India (in percentages)

Indicators	North Goa		South Goa		All Goa		India	
	2001	2011	2001	2011	2001	2011	2001	2011
Total								
Literacy rate	83.52	89.57	80.06	87.59	82.01	88.7	64.84	72.98
SC literacy rate	72.11	83.7	71.42	83.81	71.92	83.73	54.68	66.07
ST literacy rate	56.27	83.54	55.51	76.4	55.88	79.13	47.09	58.95
Male								
Total literacy rate	90.05	93.40	86.28	91.67	88.42	92.65	75.26	80.88
SC literacy rate	82.03	89.76	80.35	90.20	81.55	89.89	66.64	75.17
ST literacy rate	63.41	91.47	63.56	84.46	63.49	87.16	59.17	68.51
Female								
Total literacy rate	76.69	85.60	73.68	83.47	75.37	84.66	53.67	64.63
SC literacy rate	62.06	77.76	62.03	77.51	62.05	77.68	41.90	56.46
ST literacy rate	48.14	75.94	46.55	68.83	47.32	71.53	34.75	49.35
Rural Female								
Total literacy rate	73.80	82.81	68.97	79.98	71.92	81.60	46.13	57.93
SC literacy rate	60.48	74.72	59.55	74.62	60.33	74.70	37.84	52.56
ST literacy rate	30.0	75.67	33.33	68.31	31.42	70.67	32.44	46.93
Urban Female								
Total literacy rate	80.30	87.47	77.59	85.47	78.98	86.56	72.86	79.11
SC literacy rate	63.87	80.29	62.93	78.27	63.52	79.51	57.48	68.63
ST literacy rate	58.82	76.20	51.16	69.72	54.54	72.71	59.86	70.31

Source: Compiled from Census of India, 2001 & 2011

The illiteracy rate was higher among females than males, and the illiterate population was higher in the South Goa district than in the North Goa district. A considerable decline in the

proportion of illiterates in Goa was observed from 1991 to 2011, and a gradual decline in the proportion of people with primary and middle education, with a slight increase in secondary education (Table 4.2). Conversely, a considerable rise in the percentage of people with higher secondary education and above in the state during the same period is observed indicating improvement in the availability of facilities and opportunities, and increasing interest in acquiring higher levels of education in Goa.

Table 4.2: Population Distribution by Educational Level in Goa (in percentages)

	North Goa			South Goa			All Goa		
	1991	**2001**	**2011**	**1991**	**2001**	**2011**	**1991**	**2001**	**2011**
Illiterate	31.2	25.3	18.9	36.2	28.9	21.6	33.4	26.9	20.1
Illiterate Males	23.6	19.5	15.6	29.6	23.5	18.1	26.2	21.3	16.7
Illiterate Females	39.0	31.3	22.4	43.1	34.4	25.1	40.8	32.7	23.6
Primary	18.8	14.5	12.4	15.9	14.2	12.6	17.5	14.4	12.4
Males	20.1	15.1	12.5	17.0	15.0	13.0	18.8	15.1	12.8
Females	17.4	13.9	12.1	14.6	13.3	12.1	16.2	13.6	12.1
Middle	17.9	12.3	11.6	15.9	11.2	11.2	17.1	11.8	11.4
Males	19.5	13.4	12.5	17.5	12.3	12.2	18.6	12.9	12.4
Females	16.3	11.1	10.6	14.3	10.1	10.2	15.4	10.6	10.4
Matriculation/ Secondary	12.1	12.1	12.5	12.5	10.7	13.0	12.2	11.5	12.7
Males	14.0	13.6	13.5	14.2	12.0	14.2	14.1	12.9	13.8
Females	10.0	10.5	11.3	10.7	9.4	11.8	10.3	10.0	11.5
Higher Secondary	3.3	11.1	12.9	3.5	12.5	11.6	3.4	11.7	12.3
Males	3.9	11.9	13.9	4.0	13.5	12.6	3.9	12.6	13.3
Females	2.7	10.2	11.8	3.0	11.6	10.5	2.8	10.8	11.3
Graduate and above	3.8	7.5	10.6	4 .2	7.0	9.4	4.0	7.3	10.1
Males	4.7	8.3	10.7	4.9	7.3	9.1	4.8	7.9	10.0
Females	2.9	6.7	10.4	3.5	6.7	9.8	3.2	6.7	10.1

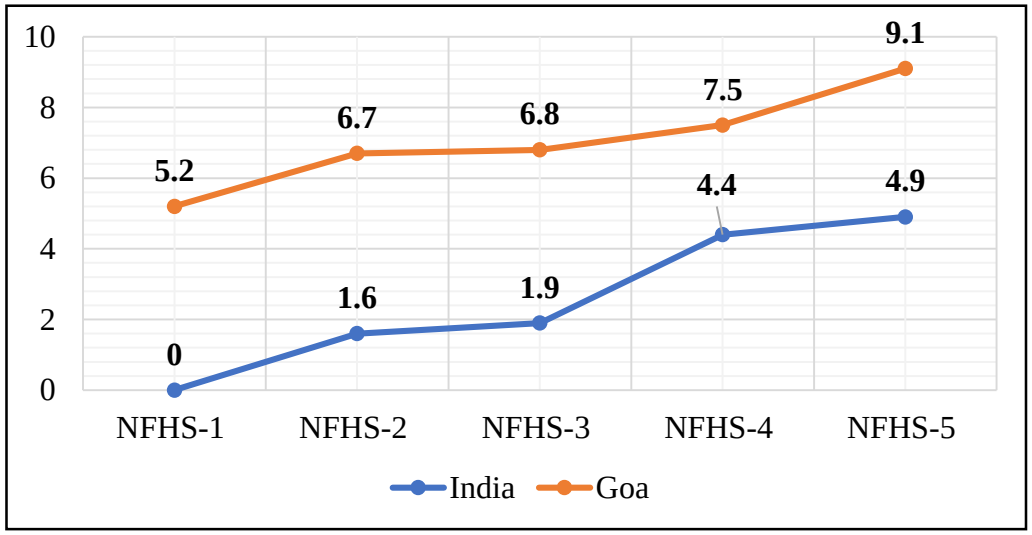
Source: Census of India, District Census Handbook, North Goa & South Goa 2001 & 2011

The gap between males and females has reduced at lower levels of education, and the proportion of females with higher education is almost equal to that of males. Although both districts have improved in terms of higher education, the North Goa district has outperformed than the South Goa district. Interestingly, the proportion of females with higher education in the South Goa district and Goa as a whole was greater than that of males, whereas the gap was very low in the North Goa district.

The proportion of literate women in Goa has consistently increased from 73.1 per cent in 1992-93 to 93 per cent in 2019-21 (NFHS-1 to 5). The literacy rate among women has also increased from 43.3 per cent in 1992-93 to 71.5 per cent in 2019-21 at all India level. These figures indicate that the literacy level in Goa is much higher than the national average across all NFHS rounds. The gap in female literacy between Goa and India has slightly reduced due to an improvement in all-India female literacy. Even then, Goa is ahead of India in terms of female literacy, highlighting the availability of better educational infrastructure, higher socio-economic development, and an enhanced emphasis on female education.

The median years of schooling indicates the typical level of education attained by women. In India, there has been a steady improvement in female education between 1992-93 and 2019-21 (Figure 4.4). However, there has been a greater rise in the median years of schooling of females in Goa from 5.2 years in 1992-93 to 9.1 years in 2019-21.

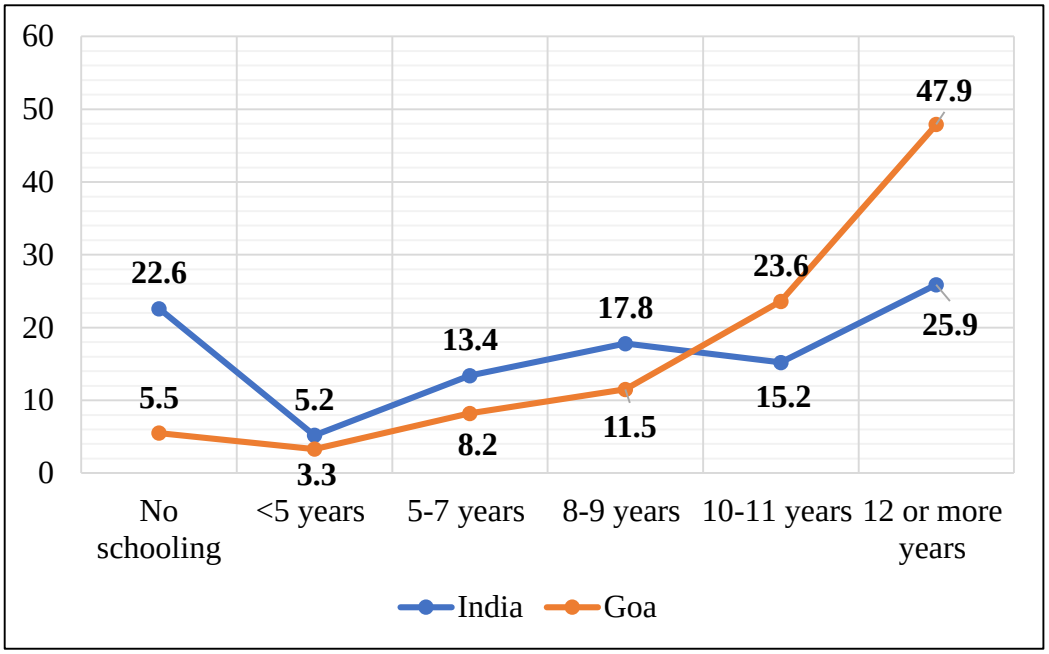
Figure 4.4: Median Number of Years of Schooling Completed by Women in Goa and India



Source: NFHS-1:1992-93; NFHS-2:1998-99; NFHS-3:2005-2006; NFHS-4:2015-2016; NFHS-5:2019-2021

The maximum proportion (47.9%) of women in the age group of 15-49 years in Goa completed 12 or more years of schooling and over 70 per cent with 10 or more years of schooling, while the national average of the same were only around 26 per cent and 40 per cent, respectively (Figure 4.5). The proportion of women in the age group of 15-49 years without education was 5.5 per cent in Goa, which was remarkably lower than the national average (22.6%). This shows that women in Goa have better access to and utilisation of education facilities than women in India as a whole.

Figure 4.5: Distribution of Female Respondents Aged 15-49 Years by Number of Years of Schooling Completed in Goa and India, 2019-21 (in percentages)



Source: NFHS-5

4.3.2 Employment Status

The proportion of main workers in Goa hovered between 31.6 per cent in 2001 and 32.8 per cent in 1991, during the period from 1991 to 2011 (Table 4.3). A similar drift was discerned with regard to female work participation, which was between 14.9 per cent in 2001 and 16.8 per cent in 1991. The male work participation rates were consistently high, ranging from 47 per cent to 48 per cent. The figure was slightly higher in North Goa than in South Goa. During the reference period, the proportion of marginal workers in Goa rose from 2.5 per cent in 1991 to 7.2 per cent in 2001; however, with a dip to 6.9 per cent in 2011.

North Goa consistently had a slightly higher percentage of the total population and male population as main workers and marginal workers and total workers than South Goa. Notably, female marginal workers in South Goa outnumbered their counterparts in North Goa and all Goa average as per the Census of 1991 and 2001, except for 2011.

Table 4.3: Distribution of Workers and Non-Workers in Goa (in percentages)

	North Goa			South Goa			All Goa		
	1991	**2001**	**2011**	**1991**	**2001**	**2011**	**1991**	**2001**	**2011**
Main Workers	33.2	31.9	32.9	32.3	31.1	32.3	32.8	31.6	32.6
Main Workers (Male)	48.8	47.8	48.5	47.7	47.3	48.0	48.3	47.6	48.3
Main Workers (Female)	17.0	15.2	16.8	16.4	14.5	16.3	16.8	14.9	16.6
Marginal Workers	2.9	8.6	7.1	2.0	5.5	6.7	2.5	7.2	6.9
Marginal Workers (Male)	1.5	8.1	8.9	0.9	5.6	7.9	1.3	7.0	8.5
Marginal Workers (Female)	4.3	9.2	5.3	3.1	5.3	5.5	3.8	7.5	5.4
Non-Workers	63.9	59.4	59.9	65.7	63.5	61.0	64.7	61.2	60.4
Non-Workers (Male)	49.8	44.1	42.6	51.4	47.1	44.1	50.4	45.4	43.2
Non-Workers (Female)	78.7	75.6	77.9	80.5	80.3	78.3	79.5	77.6	78.1
Total Workers/Total Population	36.1	40.6	40.1	34.3	36.5	38.9	35.3	38.8	39.6

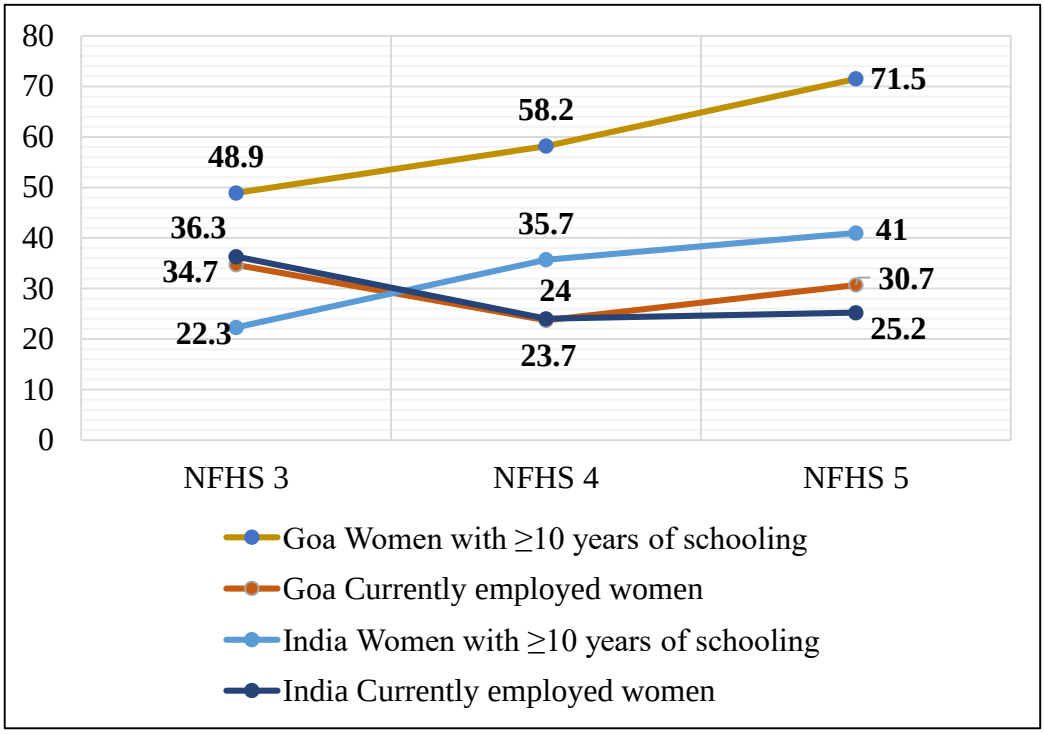
Source: District Census Handbook Census of India North Goa & South Goa 2001 & 2011

The number of female, male and total non-workers was higher in South Goa than in North Goa and all Goa across the reference period. Women's participation in the workforce in Goa is significantly lower than that of men, indicating a gender disparity in workforce participation.

As per the NFHS data, the percentage of employed women in Goa decreased from 34.7 per cent in 2005-06 to 23.7 per cent in 2015-16 before rising to 30.7 per cent in 2019-21 (Figure 4.6). Meanwhile, at the national level, a similar trend was observed. The proportion of currently employed women was higher in India in the third round of the NFHS, almost the

same in the second round, compared to Goa, while in 2019-21, Goa had a higher percentage of employed women than India. A comparison between the percentage of women with 10 or more years of schooling and their current employment status in Goa and India does not evince any specific relationship.

Figure 4.6: Employment Status of Women and Women with ≥10 Years of Schooling in Goa and India (in percentages)



Source: NFHS-3, 4 & 5

4.3.3 Health Status

Crude Birth Rate (CBR), Crude Death Rate (CDR), and Infant Mortality Rate (IMR) indicate the health status of a society. A decline in the CBR was observed between 1997 and 2023 both in Goa (from 14.2 to 10.8 per thousand) and at the national level (from 27.2 to 18.4 per thousand). The CDR in Goa and India, which were 7.7 and 8.9 per thousand in 1997, declined to 6.8 and 6.4 per thousand, respectively in 2023. An immense decline in the IMR has been observed at both the state and national levels, which decreased from 17.1 to six in Goa and from 71.2 to 25 per thousand at all India levels between 1997 and 2023 (SRS Bulletin, 1999 & 2025).

The Health Index value of Goa was 0.782 in 2017-18, which was a bit higher than that of India (0.754) (MOSPI, n.d.). In 2015-16, the Health Index of Goa had shown a better

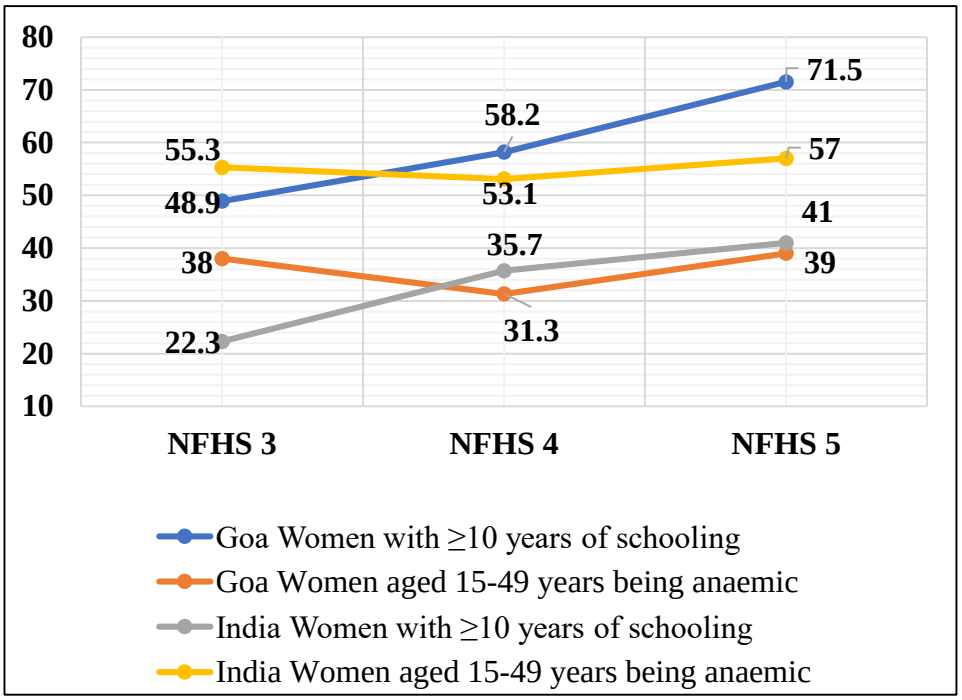
Incremental Performance, ranking second among eight smaller Indian states. However, the Health Index did not show an improvement in the Incremental Performance in 2019-20, which led the state to rank eighth among smaller states of India (NITI Aayog, 2024b). Furthermore, Goa is one of the states with the highest proportion of NCDs (70.9%) which is higher than national average (55.4%) (ICMR, 2017). A few major causes for death and disability in Goa and India were Lower Respiratory Infections, Diarrhoeal Diseases, and Preterm Birth Complications in 1990. However, in 2016, noncommunicable diseases, such as ischaemic heart disease, sense organ diseases, diabetes, chronic obstructive pulmonary disease, and stroke, became the leading causes of death and disability in the state and at the national level, the major causes of death and disabilities were ischaemic heart disease, chronic obstructive pulmonary disease, Diarrhoeal Diseases, and Lower Respiratory Infections. In 2016, the major causes responsible for losing most years of life among both genders in Goa were Ischaemic heart disease, stroke, and diabetes. Total deaths in the age groups of 40−69 years and 70+ years, occurred due to cardiovascular diseases accounting for 37.4 per cent and 42.8 per cent, respectively, whereas 14.4 per cent and 7.5 per cent of the deaths had been triggered due to cancers among 40−69 years and 70+ year olds, respectively in Goa. At the national level, 73.2 per cent and 71.6 per cent of deaths in the age groups of 40−69 years and 70+ years respectively had occurred due to NCDs (ICMR, 2017).

In the Goa state Budget of 2026-27, government has allocated ₹2,217.66 crores for the health sector. The DDSSY insurance limit has also been increased up to six lakhs rupees for stronger health coverage. New Ayush Department is proposed to be established through which state-wide awareness camps will be organized and wellness centres will be set up. The population-based Cancer Registry to be maintained to create a cancer database (Government of Goa Budget, 2026-27).

4.3.3a Nutritional and Health Status by Women's Education

The prevalence of anaemia declined from 38 per cent and 55.3 per cent in 2005-06 to 31.3 per cent and 53.1 per cent in 2015-16 among women aged 15-49 years at the state and national levels, respectively (Figure 4.7). Notably, anaemia rates rose to 39 per cent in Goa and 57 per cent in India in 2019-21. Goa had persistently lower anaemia rates than the national average across all referred NFHS rounds.

Figure 4.7: The Prevalence of Anaemia among Women and Women with ≥ 10 Years of Schooling in Goa and India (in percentages)

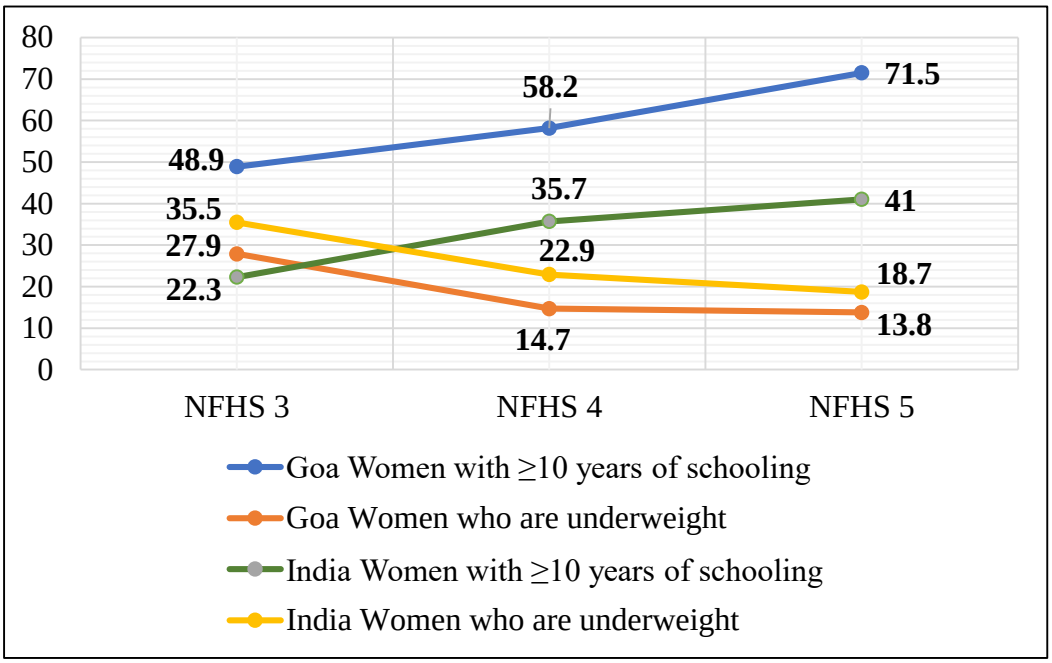


Source: NFHS-3, 4 & 5

Figures at the state and national levels indicate a surge in the prevalence of anaemia among women except in 2015-16, despite the improved proportion of women with 10 or more years of schooling, especially in the case of Goa is a cause of concern. This underscores that education alone is not the sole factor determining proper nutrition, as it may also dependent on other potential factors such as inadequate awareness, diet with poor nutritional content, and changes in lifestyle patterns.

At both the state and national levels, the proportion of women with 10 or more years of schooling rose significantly from 48.9 per cent and 22.3 per cent in 2005-06 to 71.5 per cent and 41 per cent in 2019-21, respectively (Figure 4.8). A considerable decline in the proportion of underweight women has been observed at both the state and national levels. The proportion of underweight women halved to 13.8 per cent in Goa and to almost halved to 18.7 per cent in India during 2019-21 compared to the figures of 2005-06 indicating an inverse relationship between educational level and being underweight. Goa has a consistently lower proportion of underweight women than the national average in all NFHS rounds while the gap between Goa and India has reduced noticeably. This reflects improvement in women's nutritional status with an enhancement in their educational attainment.

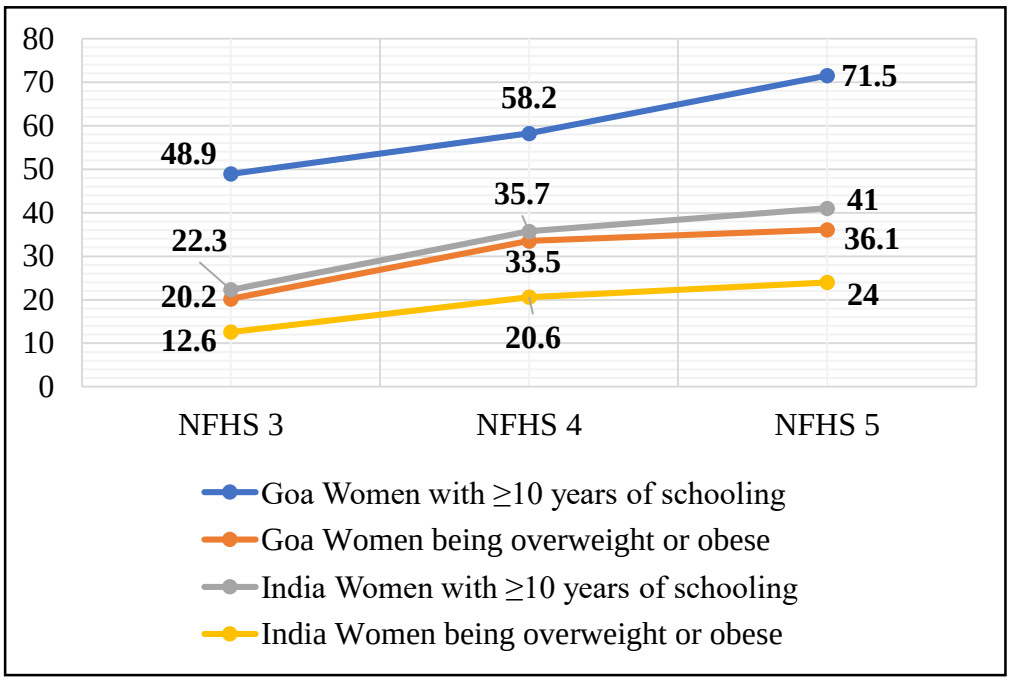
Figure 4.8: Women who are Underweight and Women with ≥10 Years of Schooling in Goa and India (in percentages)



Source: NFHS-3,4 & 5

It is perceived that the percentage of overweight or obese women in Goa has been significantly higher than the national average across all three NFHS rounds (Figure 4.9).

Figure 4.9: Overweight or Obesity among Women and Women with ≥10 Years of Schooling in Goa and India (in percentages)



Source: NFHS-3, 4 & 5

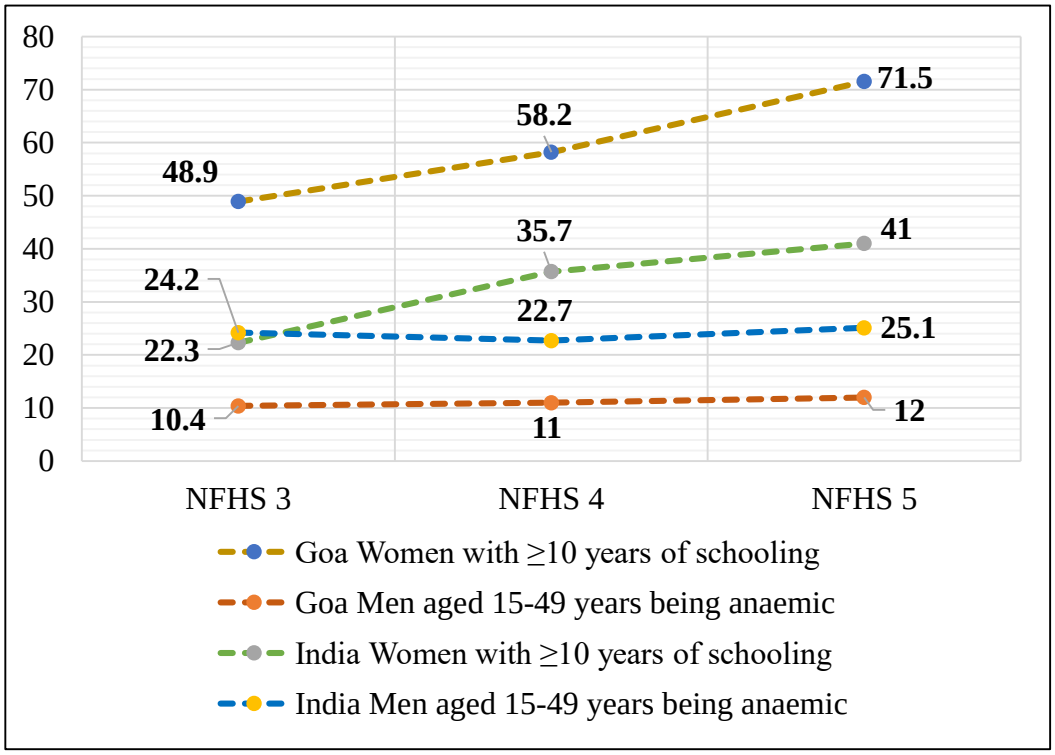
The proportion of overweight or obese women has soared significantly from 20.2 per cent to 36.1 per cent in Goa and from 12.6 per cent to 24 per cent at the national level during the period from 2005-06 to 2019-21. The prevalence of overweight or obesity in women has increased in tandem with an increase in their education level. This indicates a positive association between women's educational level and a higher likelihood of being overweight or obese.

4.3.3b Nutritional and Health Status of Men

This section compares women's education and men's nutrition/health status indicators at the state and national levels.

The proportion of anaemic men aged 15-49 years rose from 10.4 per cent in 2005-06 to 12 per cent in 2019-21 in Goa. At the national level, this proportion decreased from 24.2 per cent to 22.7 per cent in 2015-16 but rose to 25.1 per cent in 2019-21 and these figures are more than double the rate of Goa (Figure 4.10).

Figure 4.10: Prevalence of Anaemia among Men and Women with ≥10 Years of Schooling in Goa and India (in percentages)

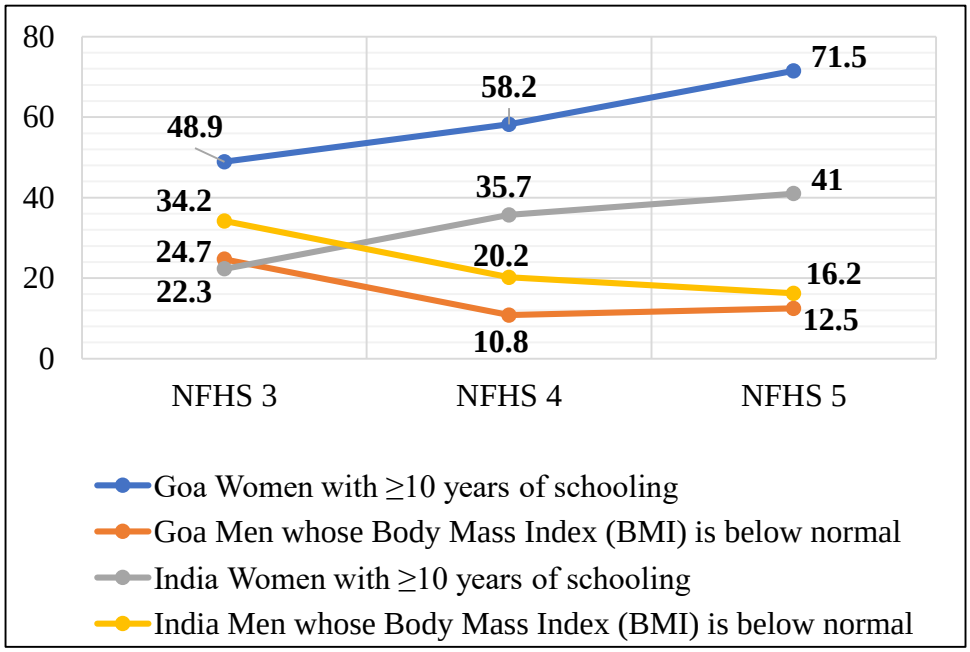


Source: NFHS-3, 4 & 5

Even though the proportion of anaemic men was higher in India than in Goa, the association between women's education and the men being anaemic was not clear at the national level. However, a positive association can be noted in Goa between women's education and men being anaemic from NFHS round III to V.

The percentage of underweight men in Goa and India declined substantially from 24.7 per cent and 34.2 per cent in 2005-06 to 12.5 per cent and 16.2 per cent in 2019-21 respectively, indicating a higher underweight men in India than in Goa during the same period (Figure 4.11). However, the difference between Goa and India decreased substantially in 2019-21. The proportion of underweight men has declined as the percentage of women with 10 or more years of education has increased at both the state and national levels, suggesting that female education is inversely related to underweight men.

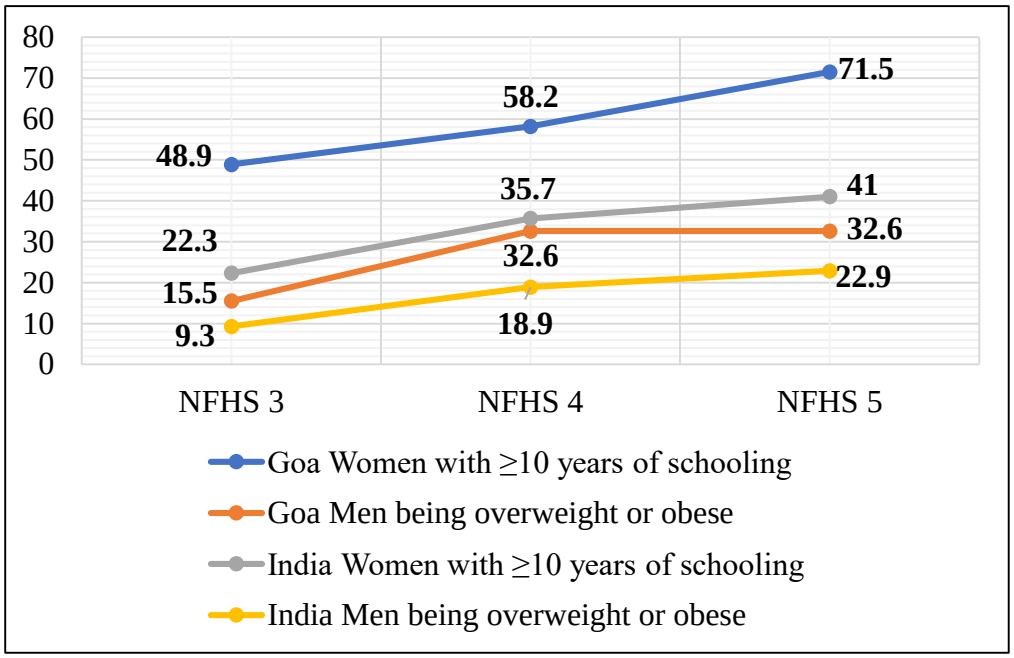
Figure 4.11: Men with BMI below Normal Level and Women with ≥ 10 Years of Schooling in Goa and India (in percentages)



Source: NFHS-3, 4 & 5

The proportion of overweight / obese men is substantially greater in Goa than the national average in all the cited rounds of NFHS and the percentage of overweight / obese men rose from 15.5 per cent to 32.6 per cent at the state level and from 9.3 per cent to 22.9 per cent at the national level between 2005-06 and 2019-21 (Figure 4.12). The data show a positive relationship between the proportion of women with 10 or more years of schooling and overweight or obese men.

Figure 4.12: Overweight or Obesity among Men and Women with ≥10 Years of Schooling in Goa and India (in percentages)

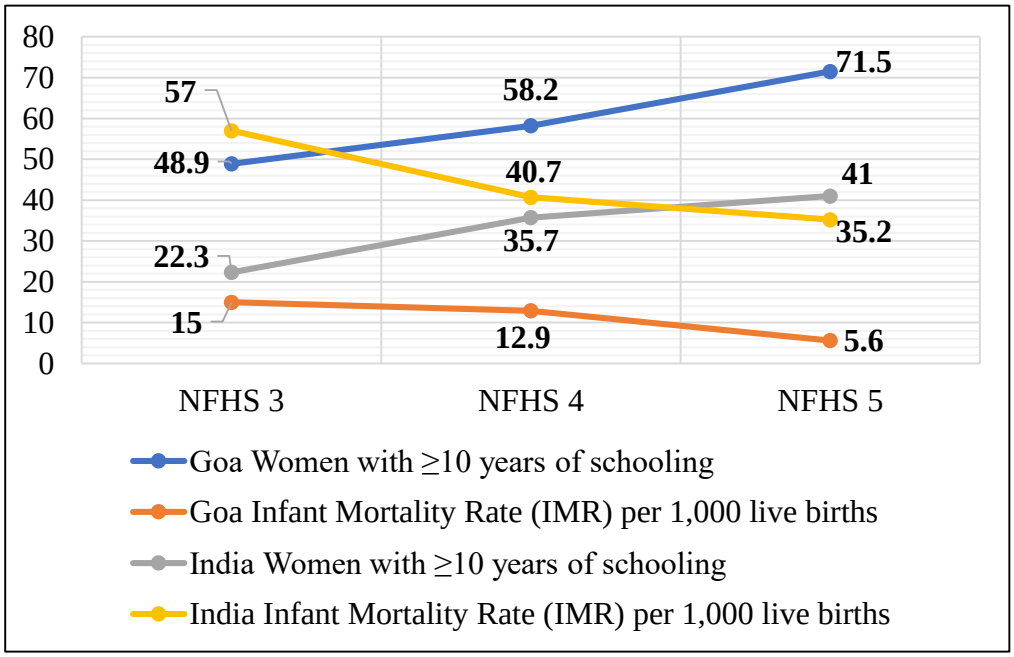


Source: NFHS-3, 4 & 5

4.3.3c Nutritional and Health Status of Children

This section compares women's education with the nutritional /health status indicators of children in Goa and India.

Figure 4.13: Infant Mortality Rate and Women with ≥10 Years of Schooling in Goa and India (in percentages)

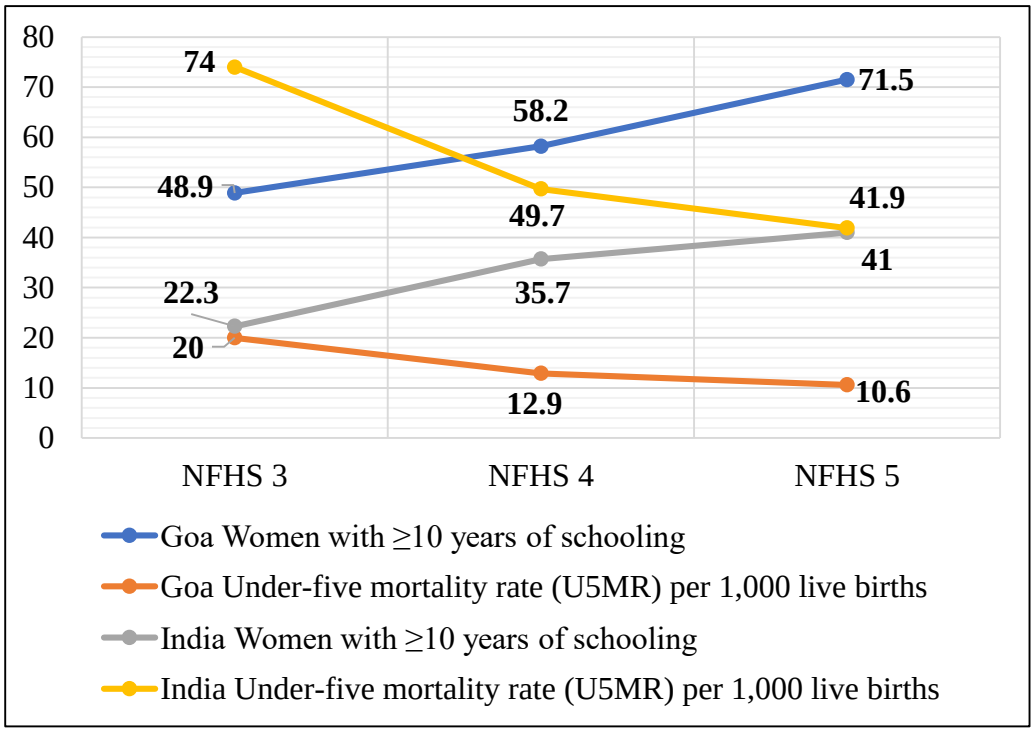


Source: NFHS-3, 4 & 5

The IMR showed a decreasing trend, from 15 per thousand live births in 2005-06 to 5.6 per thousand live births in 2019-21 in Goa and from 57 to 35.2 per thousand live births in India during the same period (Figure 4.13). The IMR in Goa has consistently been lower than the national average. This observation suggests a negative association between female education and IMR.

The Under-five Mortality Rate (U5MR) in Goa, has reduced from 20 to 10.6 per thousand live births between 2005-06 and 2019-21, whereas at the national level, it has dropped from 74 to 41.9 per thousand live births during the reference period (Figure 4.14). The U5MR has been significantly lower in Goa compared to all India average. The Sustainable Development Goal (SDG) target for U5MR for Goa was 25 per thousand live births (Goa SDG Index, 2023), which has already been attained with a reduction in U5MR to 10.6 per thousand live births in 2019-21.

Figure 4.14: Under-five Mortality Rate and Women with ≥10 Years of Schooling in Goa and India (in percentages)

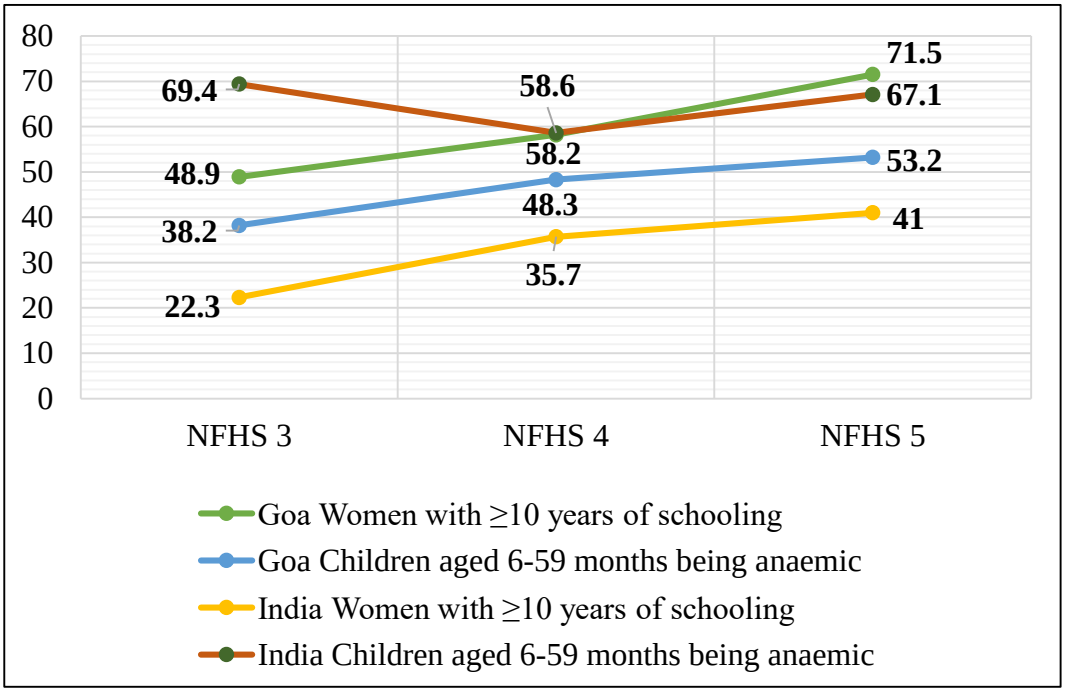


Source: NFHS-3, 4 & 5

A notable decrease in child mortality rates under five years is observed at both the state and national levels, and the disparity between them has narrowed with an increase in the proportion of women with 10 or more years of schooling.

The proportion of anaemic children aged 6-59 months in Goa has steadily proliferated from 38.2 per cent to 53.2 per cent between 2005-06 and 2019-21, whereas the national proportion of anaemic children declined from 69.4 per cent in 2005-06 to 58.6 per cent in 2015-16 before rising to 67.1 per cent in 2019-21 (Figure 4.15).

Figure 4.15: Children aged 6-59 Months being Anaemic and Women with ≥ 10 Years of Schooling in Goa and India (in percentages)

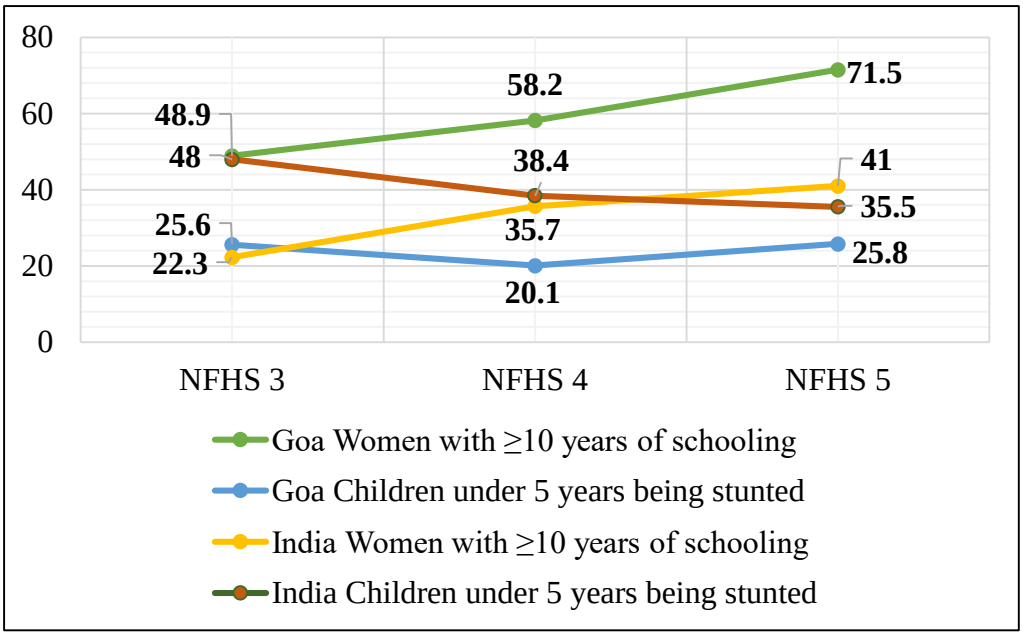


Source: NFHS-3, 4 & 5

Although Goa had a lower percentage of anaemic children as compared to India, the figures do not exhibit an inverse relationship between the proportion of women with 10 or more years of schooling and the prevalence of anaemia among children as expected.

The prevalence of stunting in children under the age of five declined from 25.6 per cent in 2005-06 to 20.1 per cent in 2015-16 but then rose to 25.8 per cent in 2019-21 in Goa, whereas at the national level it declined from 48 per cent to 35.5 per cent. This suggests a negative relationship between an improved proportion of women's education and reduced stunting in children under the age of five in India (Figure 4.16). Goa, even though has consistently demonstrated a better performance compared to the national average with a lower proportion of stunted children, it does not exhibit a continuous decreasing trend. The SDG target for stunted children was 6 per cent for Goa (Goa SDG Index, 2023), which is yet to be accomplished by the state as the proportion of stunted children was 25.8 per cent in 2019-21.

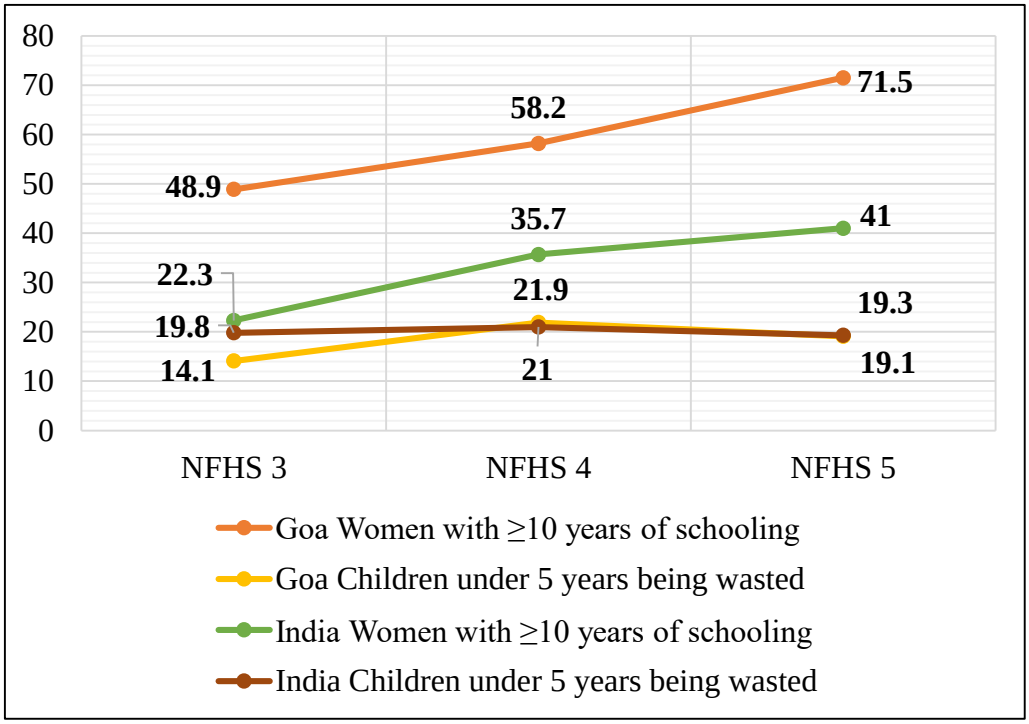
Figure 4.16: Stunting among Children Under 5 Years and Women with ≥ 10 Years of Schooling in Goa and India (in percentages)



Source: NFHS-3, 4 & 5

The proportion of wasted children rose from 14.1 per cent and 19.8 per cent in 2005-06 to 21.9 per cent and 21 per cent in 2015-16 at the state and national levels respectively (Figure 4.17).

Figure 4.17: Children Under 5 Years being Wasted and Women with ≥10 Years of Schooling in Goa and India (in percentages)

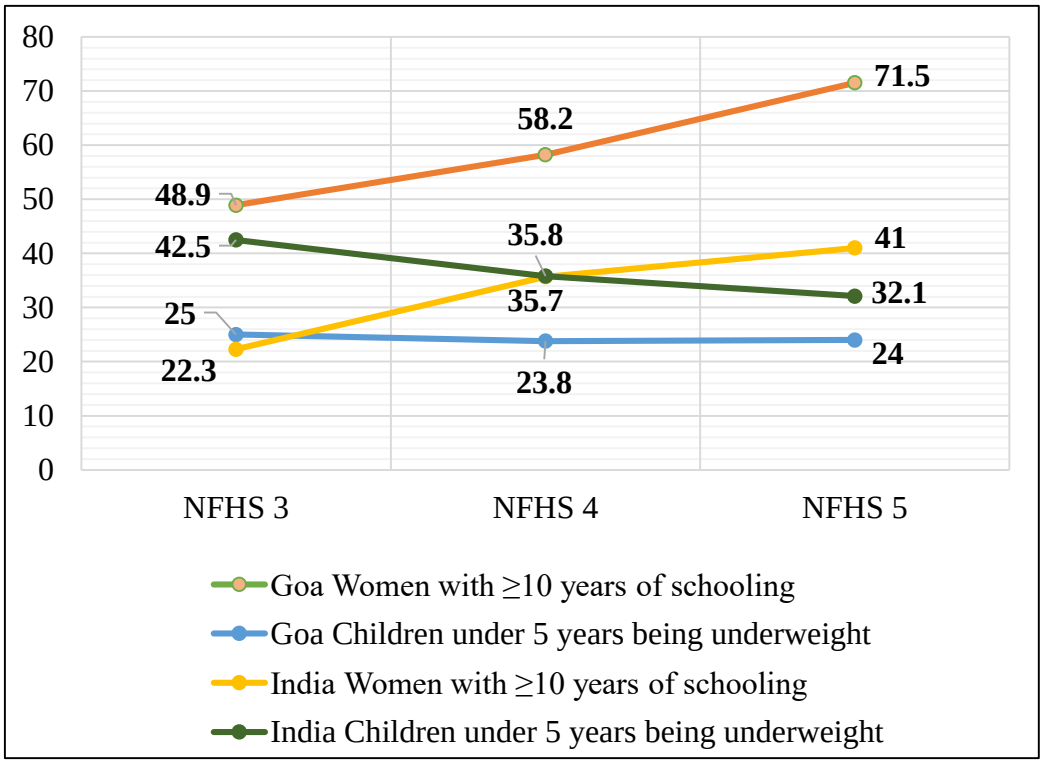


Source: NFHS-3, 4 & 5

In 2019-21, it reduced to 19.1 per cent in Goa and 19.3 per cent in India. The given figures do not convey any correlation between women's education and wasting among children aged under 5 years. Goa and India had nearly the same proportions of wasted children in 2019-21.

The proportion of underweight children in Goa decreased from 25 per cent in 2005-06 to 23.8 per cent in 2015-16 and then slightly increased to 24 per cent in 2019-21, in contrast, the national percentage of underweight children declined from 42.5 per cent in 2005-06 to 32.1 per cent in 2019-21 indicating a link between women's education and child's weight, especially in India (Figure 4.18).

Figure 4.18: Underweight Children Under 5 Years and Women with ≥10 Years of Schooling in Goa and India (in percentages)



Source: NFHS-3, 4 & 5

Goa has consistently outperformed India in terms of the prevalence of underweight children, with the disparity between them significantly narrowing down in 2019-21. However, the SDG target of reduction in underweight children to 1.9 per cent (Goa SDG Index, 2023) is far to be achieved.

4.4 An Overview of the Findings

i) Socio-economic and Demographic Indicators

Goa is one of the best performing Indian state in terms of HDI, economic growth rate, per capita income, and many of the socio-economic and demographic indicators. Even at the national level, a considerable improvement in these indicators is observed.

ii) Educational and Employment Status

- The literacy rates of all categories have improved significantly in Goa as well as at all India level.
- The ST population has the lowest literacy rate at both the state and national levels.
- A decline in the proportion of people with lower education and a rise in the proportion of people with higher levels of education have been observed in Goa.
- Women in Goa have attained much higher levels of schooling than all India average and the state have double the proportion of women with 12 or more years of schooling as compared to all India level.
- Between 2005-06 and 2015-16, the percentage of employed women declined at both the state and national levels before rising in 2019-21. This could be attributed to an increase in the enrollment of women in higher education, the withdrawal of some women from the labour force due to a rise in household income and improved standard of living, etc. Goa had a relatively higher proportion of employed women than India in 2019-21.

iii) Health Status

Goa has a better Health Index value and better in terms of many health indicators compared to the majority of the states and all India average. In terms of birth rate, IMR, underweight, anaemia among women, men, and children, U5MR, stunted children, Goa is better than all India average. However, the proportion of NCDs, overweight or obese women, and men are more in Goa compared to all India level. The IMR, underweight, U5MR, stunted children have been decreasing with an increasing proportion of women with 10 or more years of schooling both in Goa and India. However, despite an improvement in female education, an increase in the prevalence of anaemia, overweight or obesity among women, men, and children, and NCDs is concerning at both the state and national levels.

4.5 Concluding Observations

Goa has been one of the best performing states of India with better socio-economic and many aspects of health indicators. However, it has shown poor performance in terms of a few health indicators, such as prevalence of anaemia, overweight/obesity and wasted children. Many of the health indicators during 2019-21 show discouraging results for Goa as well as India which may be ascribed to the COVID-19 pandemic. Even though the data of various health indicators show a disappointing relationship with the proportion of women with 10 or more years of schooling, it can be implied that various other factors might contribute to the adverse associations, especially pertaining to anaemia, and overweight/obesity among women, men, and children. Therefore, a careful and more exhaustive analysis is required to compare the impact of female education on the employment and health status of women themselves, their husbands, and their children. In this light, the forthcoming chapter empirically analyses the impact of female education on the socio-economic and health status of women and their families.

CHAPTER V

IMPACT OF FEMALE EDUCATION ON SOCIO-ECONOMIC STATUS AND FAMILY HEALTH: AN EMPIRICAL ANALYSIS

5.1 Introduction

5.2 The Socio-economic and Demographic Profile of Respondents

5.3 Objective-wise Results and Analysis

5.3.1 Inter-relationship between the Level of Female Education and their Socio-economic Status

5.3.2 The Workforce Participation of Women with respect to their Levels of Education by Social Category

5.3.3 Impact of Female Education on Health by Employment Status and Social Category

5.3.4 Impact of Female Education on the Health of her Husband and Children

5.3.5 The Lifestyle Patterns and Prevalence of NCDs among Households by Level of Female Education

CHAPTER V

Impact of Female Education on Socio-economic Status and Family Health: An Empirical Analysis

5.1 Introduction

Education is a tool that facilitates improvements in various facets of one's life in particular and the wellbeing of mankind in general. An improvement in women's education has a far-reaching impact as women can shape the lives of their families and thereby the society as a whole. This chapter presents an empirical inquiry into the impact of female education on her socio-economic status and family health. The chapter consists of two sections, the first one deliberates on the respondent's socio-economic and demographic background and the second section provides an objective-wise analysis of the results and discussion of the research study.

5.2 The Socio-economic and Demographic Profile of Respondents

In the study area, the proportion of respondents belonging to the urban area (53.2%) was higher than that of the rural area (46.8%). The majority of the respondents (91.3%) were Hindus, and the lowest proportion (2.9%) belonged to the Muslim religion (Table 5.1). Most respondents (61%) hailed from nuclear family, and a sizeable proportion (39%) belonged to joint family. More than half of the respondents (58.9%) had 4 to 5 members in the family, 21 per cent of women had up to 3 members in the family, while 4.7 per cent had a family size of 9 and above. The larger family size (5 and above) can be ascribed to the prevalence of joint family system. A majority of women (88.9%) were married, while 10.9 per cent were widowed, and 0.2 per cent were separated.

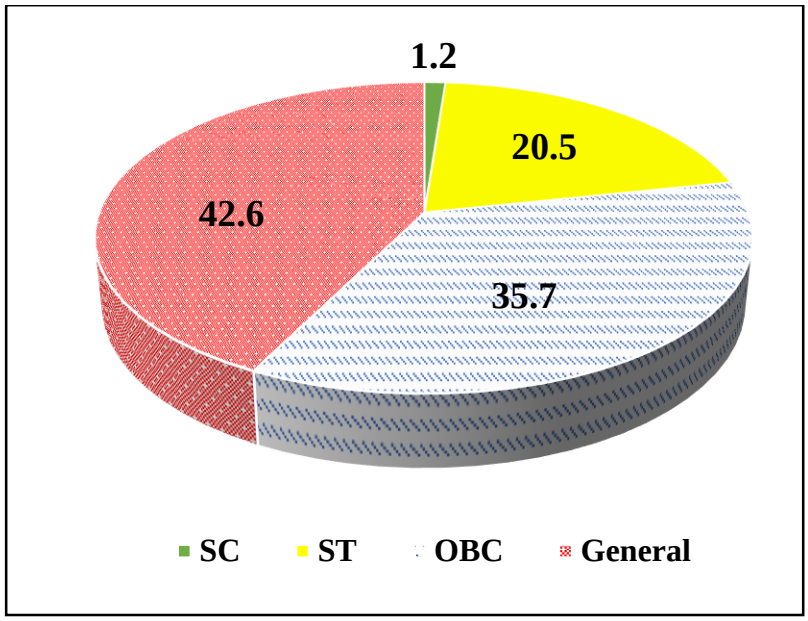
Table 5.1: Descriptive Statistics of the Female Respondents

Variable (n=594)	Categories	n (%)
Place of residence	Urban	316 (53.2)
	Rural	278 (46.8)
Religion	Hindu	542 (91.3)
	Christian	35 (5.9)
	Muslim	17 (2.9)
Type of the family	Joint	232 (39.1)
	Nuclear	362 (60.9)
Family size	Up to 3	125 (21.0)
	4-5	350 (58.9)
	6–8	91 (15.3)
	9 and above	28 (4.7)
Marital status	Married	528 (88.9)
	Widow	65 (10.9)
	Divorced/Separated	01 (0.2)

Source: Primary survey data

A large proportion of respondents (42.6%) belonged to the general category, followed by the OBC (35.7%), ST (20.5%), and SC communities (1.2%) as shown in Figure 5.1.

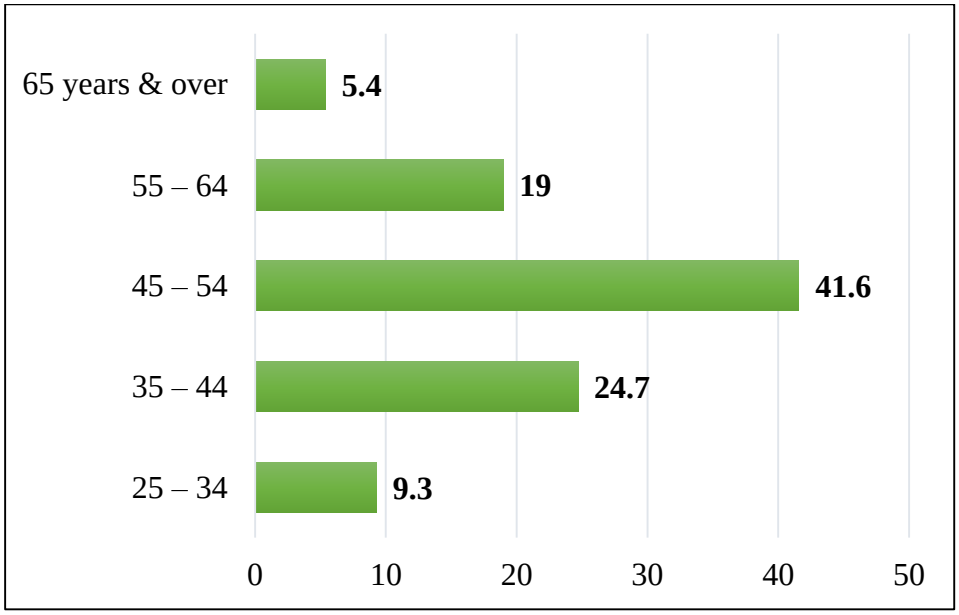
Figure 5.1: Distribution of Respondents by Social Category/Caste



Source: Primary survey data

The age-wise distribution of the respondents shows that the highest proportion (41.6%) belonged to the age group of 45-54 years followed by 24.7 per cent to the age group of 35-44 years whereas 5.4 per cent were 65 years and above (Figure 5.2).

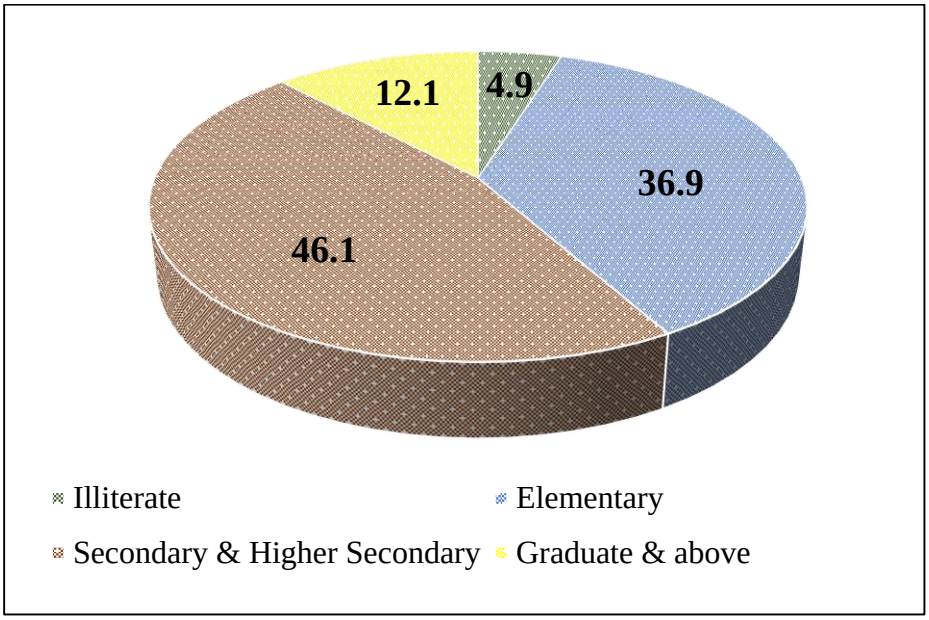
Figure 5.2: Age-wise Distribution of Respondents



Source: Primary survey data

The educational level of female respondents highlighted that 46 per cent of women had secondary/higher secondary education, whereas a smaller percentage of respondents (4.9%) were illiterates (Figure 5.3).

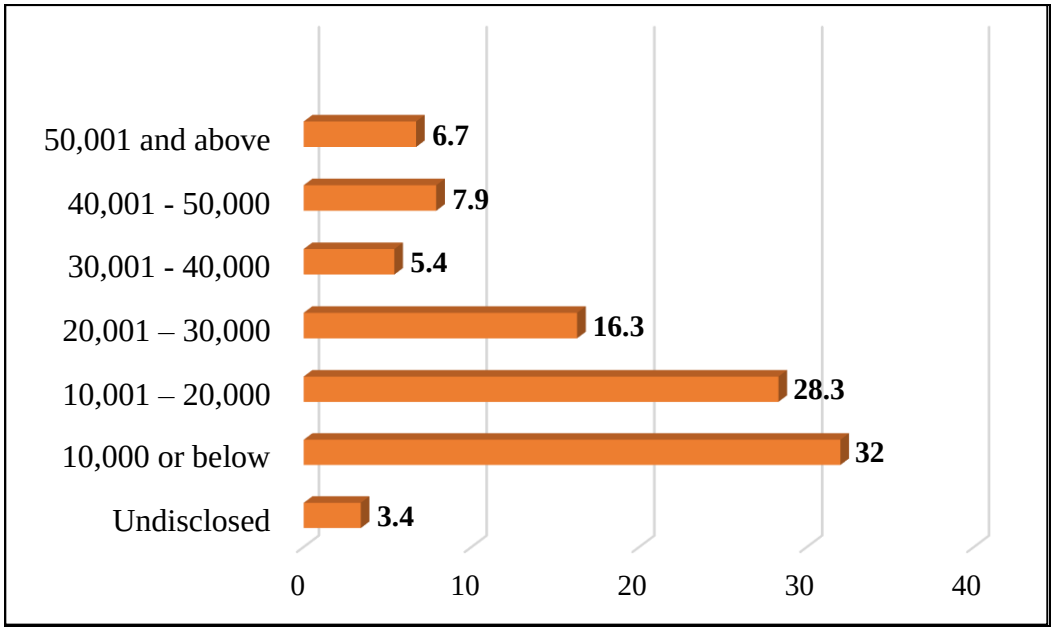
Figure 5.3: Educational Status of Sample Respondents



Source: Primary survey data

Many of the respondents (32%) had a monthly family income of ₹10,000 or less, whereas only about seven per cent belonged to the monthly family income of above ₹50,000 (Figure 5.4).

Figure 5.4: Distribution of Sample Respondents by Monthly Family Income (in Percentages)



Source: Primary survey data

A higher proportion of respondents (72.1%) were homemakers /currently unemployed or never a part of the labour force, followed by 18.7 per cent of women being regularly employed, whereas nearly one per cent were employed on a daily wage basis (Figure 5.5).

Figure 5.5: Employment Status of the Sample Respondents



Source: Primary survey data

5.3 Objective-wise Results and Analysis

The following provides objective-wise results and analysis of the empirical investigation of the research.

5.3.1 Inter-relationship between the Level of Female Education and their Socio-economic Status

An individual or family's socio-economic status is determined by a variety of social and economic factors, such as their income, level of education, occupation, place of residence, religion, and ethnic class (APA, 2023). Socio-economic status has a positive influence on quality of life (Nutakor et al., 2023).

Socio-economic conditions, including parental education, play a pivotal role in determining the educational status of children (Ramesh, 2012). Educated parents are more inclined to educate their children, showing a significant positive impact of parents' educational status on their children's educational status (Barkha, 2019), with the children of highly educated parents more likely to have higher educational status (Krishnamma, 1991; Sandhu et al., 2005). A low educational level of parents might result in educational backwardness, especially among the tribals (Daripa, 2018). The quality of studies is significantly affected by the socio-economic status of students (Lutfiu and Hoxha, 2024). A better academic performance has been found among students with higher socio-economic status (Dhawale, 2023) and health status in turn is positively related to socio-economic status (Zhang et al., 2022; Barakat & Konstantinidis, 2023). Moreover, investment made in girls' secondary education benefits in several ways, such as raising the growth rates of the country, a significant increase in their lifetime earnings, and reducing child marriage, etc (UNICEF, n.d.).

The female education is expected to improve her and her family's socio-economic status. The present section attempts to analyse the impact of female education on the socio-economic status of her family.

5.3.1a Women's Education Level by Place of Residence

The proportion of illiterate women in rural areas was almost the same (5.0%) as that of urban areas (4.7%) (Table 5.2). A higher proportion of women with elementary education was found in rural areas (43.2%) than in urban areas (31.3%), whereas a higher percentage of women with secondary / higher secondary education (49.1%) and higher education (14.9%)

was found in urban areas than in rural areas (42.8% and 9.0%, respectively). Thus, urban areas had a larger proportion of women with higher levels of education, indicating better access to higher education for women in urban areas.

Table 5.2: Distribution of Sample Respondents on the basis of Education and Place of Residence (in percentages)

Education/Place of Residence	**Rural**	**Urban**
Illiterate	5.0	4.7
Elementary	43.2	31.3
Secondary and higher secondary	42.8	49.1
Graduate and above	9.0	14.9
Total	**100**	**100**
Chi-square statistic		11.114
Degree of freedom		3
p-value		0.011*

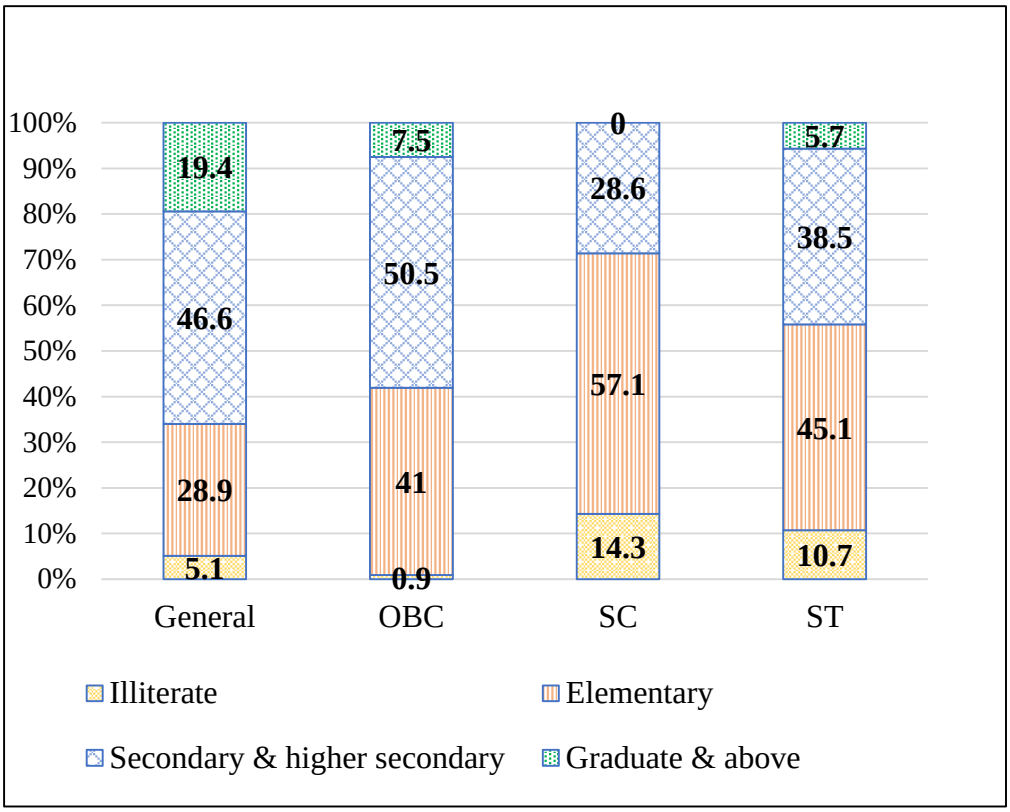
Source: Primary survey data ****** *indicates significant at 5% level*

The chi-square statistics with a p-value of 0.011< 0.05 strengthens the existence of a significant association between the place of residence and educational level of women. This suggests that women's place of residence may influence their education level.

5.3.1b Women's Level of Education by the Social Category

The presence of illiterates was the highest among the SC respondents (14.3%), followed by the ST women (10.7%). Similarly, a significantly higher proportion of women in the SC (57.1%) and ST (45.1%) categories were elementary educated compared to other categories (Figure 5.6). Furthermore, a considerable proportion of women belonging to the OBC (50.5%) and general (46.6%) categories had secondary / higher secondary education. Similarly, a sizeable percentage of women belonging to the general category (19.4%), followed by OBC (7.5%) had a graduation or above level of education. This indicates that a larger proportion of women belonging to the general and OBC categories had higher educational attainment, whereas women belonging to the SC and ST categories had a larger share in lower education.

Figure 5.6: Educational Level of Female Respondents by Social Category



Source: Primary survey data

The chi-square test also revealed a very strong association between social category and educational level, as the p-value was extremely small (p =0.0000<0.001) (Table 5.3). Thus, the results indicate the prevalence of a significant disparity in women's educational attainment based on social categories.

Table 5.3: Results of the Chi-Square Test for Women's Education and Social Category

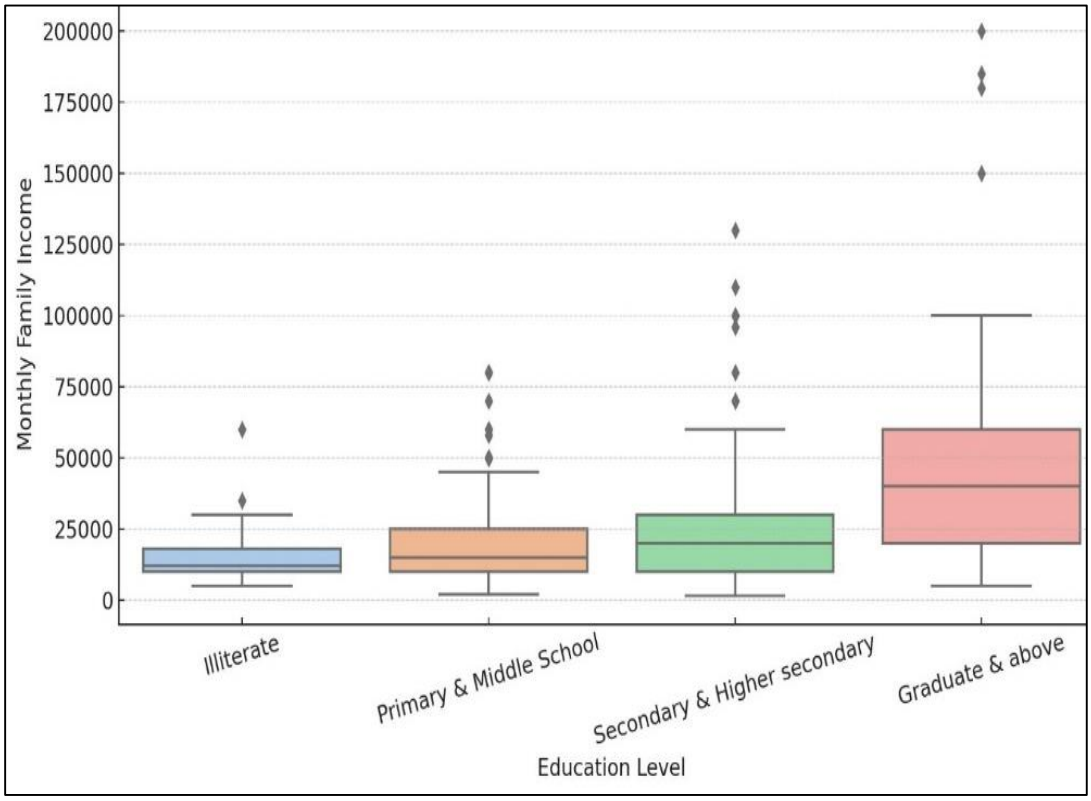
Variable	Chi-Square Statistic	df	p-value
Social Category/Caste	47.24	9	0.0000***

Source: Calculations based on primary survey data
**** indicates p<0.001 (significant at 0.1% level)*

5.3.1c Monthly Family Income by Level of Female Education

It is obvious that higher education levels improve one's earning capacity. Similarly, the current study found that women with higher educational levels had higher monthly family incomes than women with lower education or without education (Figure 5.7).

Figure 5.7: Monthly Family Income by Women's Education Level



Source: Primary survey data

Women with graduation or above level of education had the highest median income, whereas those who belonged to the illiterate group had the lowest median income. However, the outliers implied that some women with lower educational attainment had a significantly higher family income.

The Kruskal-Wallis test was conducted to check whether there are differences between the monthly family income and the educational levels of the women respondents. The result of the test indicated a highly significant positive association between the educational level of women and their family income, the p-values being extremely low ($p < 0.001$). Thus, female education level might have a strong positive influence on their family income (Table 5.4).

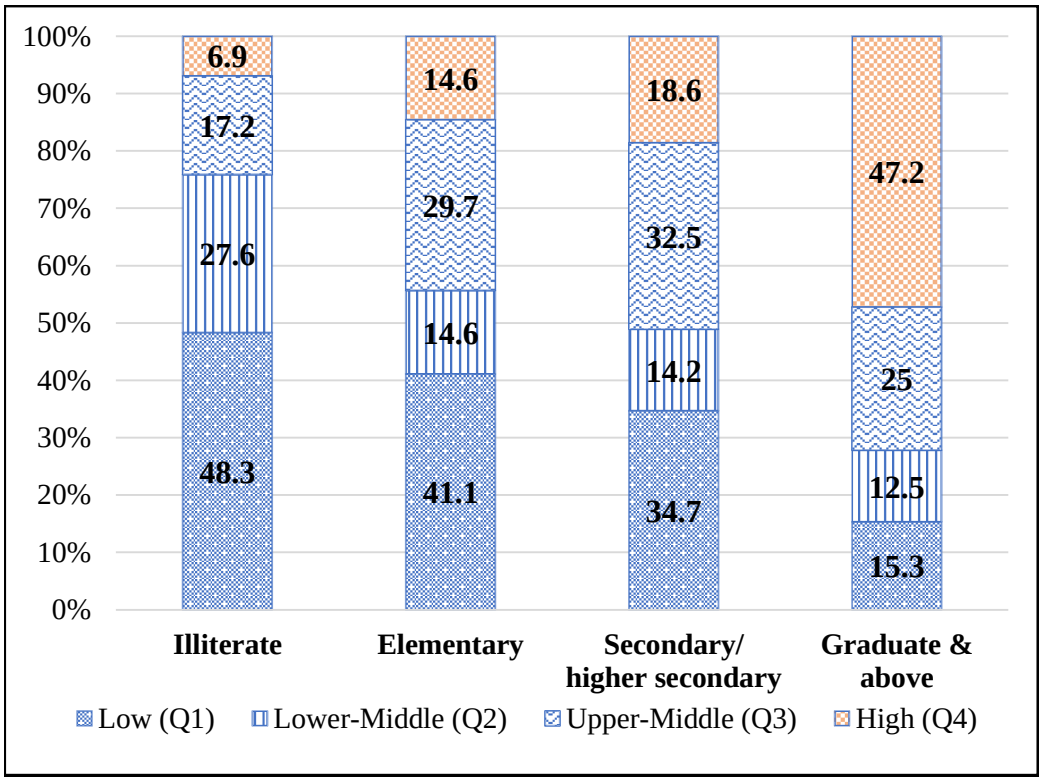
Table 5.4: Results of the Kruskal-Wallis Test for Female Education and Monthly Family Income

Kruskal-Wallis Statistic	p-value
54.811	0.0000***

Source: Calculations based on primary survey data
**** denotes p<0.001 (significant at 0.1% level)*

The monthly family income, a continuous variable was divided into four quartiles: Q1- the Low-income quartile consisted of those with income up to ₹10,000, Q2- the Lower-middle income quartile with income from ₹10,001–₹20,000, Q3- the Upper-middle income quartile with income from ₹20,001–₹30,000 and Q4- the High-income quartile had respondents with the income above ₹30,000. Among illiterate women, 48.3 per cent belonged to the low-income quartile, whereas only 6.9 per cent belonged to the high-income quartile (Figure 5.8).

Figure 5.8: Association between the Education Level and Family Income



Source: Primary survey data

Furthermore, over 41 per cent of women participants with elementary education belonged to the low-income quartile. Women with secondary/higher secondary education were more evenly distributed across various income quartiles, with 18.6 per cent belonging to the high-income quartile. Nearly half of the respondents with graduation and higher educational attainment (47.2%) belonged to the high-income quartile, whereas only 15.3 per cent belonged to the low-income quartile.

This result was strongly supported by the results of the multinomial logistic regression model (Table 5.5). As the women's educational level increased, the probability of them being in the high-income quartile increased compared to the low-income quartile. Women with

higher education had 1.4 times higher chances of belonging to the high-income group than those in the low-income group (OR = 1.395, p = 0.024 < 0.05).

Table 5.5: Results of the Multinomial Logistic Regression Model for Female Education and Family Income Quartiles

Income Quartiles	Odds Ratio (OR)	95%CI	p- value
Q1 vs. Q4 (low vs. high)	1.395	1.045 - 1.861	0.024*
Q2 vs. Q4 (lower-middle vs. high)	1.634	1.161 - 2.299	0.005**
Q3 vs. Q4 (upper-middle vs. high)	2.878	2.049 - 4.043	0.000***
Model Fit Statistics			
Likelihood Ratio $\chi^2 = 41.953$, $p < 0.001$			
Nagelkerke $R^2 = 0.076$			

Source: Calculations based on primary survey data
****, ** & * denotes significant at 0.1%, 1% & 5% levels*

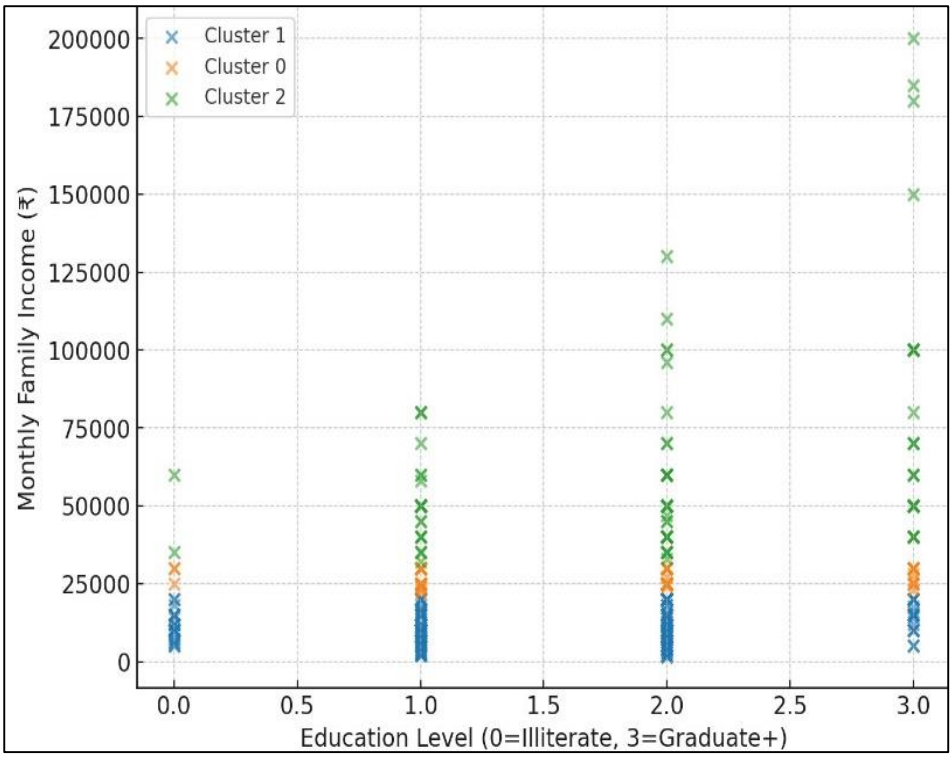
Additionally, higher education significantly increased the odds of women being in the high-income quartile by 1.63 times compared to the lower-middle income group (OR = 1.634, p = 0.005 <0.01). Similarly, women with a graduation or higher degree had nearly three times higher probability of being in the high-income quartile than those in the upper-middle income quartile (OR = 2.878, p = 0.000 < 0.001). Thus, the results clearly indicate that higher education substantially increases women's odds of being in higher-income groups compared to lower-income groups. All these findings clearly infer that, in general, women's family income has positive association with their education level.

5.3.1d Economic Status by the Level of Female Education

The economic status measured in terms of family income and nature and status of employment is supposed to have a relation.

K-means clustering analysis was used to simultaneously examine the association between women's educational level, household income, and nature and status of employment. Three clusters were formed by obtaining the median of each of these variables. Educational level was plotted on the X-axis and monthly family income (₹) on Y-axis (Figure 5.9).

Figure 5.9: Scatterplot of Clusters: Education vs. Income



Source: Primary survey data

Cluster 0 consisted highly educated respondents belonging to the middle-income group who were mostly homemakers/self-employed, indicating mixed employment status. Cluster 1 included respondents with lower educational attainment and lower family income who were either homemakers / unemployed or working in the informal sector. Cluster 2 represented empowered women with higher education levels and higher family income who were regularly employed or employed in the organized sector. Cluster 2 had the highest median income (₹30,000), whereas cluster 1 had the lowest (₹15,000). This indicates that income distribution significantly differs across clusters.

Hypothesis 1: The association between the level of female education and their economic status, is hypothesised as follows:

H_0: The education level of women doesn't have an impact on their economic status
H_1: The education level of women has a positive impact on their economic status.

To test this hypothesis, the Economic Status index (ES Index) was constructed using a scoring and normalization method. The ES index was divided into three groups: low ES (T1), medium ES (T2), and high ES (T3) based on three thresholds T1=0-8.33, T2=8.34-

33.33, and T3 greater than 33.33. (Please see Chapter III for the detailed methodology) and then, linear regression model was applied to examine the association between women's education and the ES index.

Table 5.6: Results of Linear Regression Analysis for Female Education and Economic Status

Variable	Coef.	Std. Error	t-Statistics	p-value
Intercept	-6.276	3.984	-1.575	0.116
Education Level	11.754	1.444	8.141	< 0.001***
Model Fit Statistics				
R^2 =0.101	Adj. R^2 =0.099		F-Statistic =66.27	p-value (F-test) $=2.33 \times 10^{-15}$

Source: Calculations based on primary survey data
**** indicates significant at 0.1% level*

The linear regression model indicated a positive coefficient of 11.75, implying that the ES index increased by 11.75 points on the 0-100 scale with each additional education level (Table 5.6). This result provides much stronger evidence in favour of rejecting the null hypothesis- "The education level of women does not have an impact on their economic status" as p-value is less than 0.001 ($p < 0.001$). Therefore, the research hypothesis (H_1) of the study that states, "The education level of women has a positive impact on their economic status" is accepted. Thus, it confirms that economic status may be predicted by the educational level. These results were congruent with the findings of the Kruskal-Wallis test (Table 5.4). Higher economic status has been exhibited by the women with higher education which may be due to their better access to regular employment, capacity to earn higher income, and better decision-making power in the household, which in turn strengthens the overall economic position of women in the society.

5.3.1e Discussion

The above results indicated that the percentage of illiterate and elementary educated women was higher in rural areas, whereas a larger percentage of women with secondary and above levels of education was found in urban areas. This could be due to the availability of better educational facilities and opportunities, more exposure to the educated environment in urban

areas than in rural areas. This inference strengthens the findings of earlier studies (Kamble, 2009; Som & Mishra, 2020).

A larger proportion of women belonging to the general and OBC groups had a higher educational attainment, whereas SC / ST women had a larger share in lower education, highlighting inequality in educational attainment based on social categories. Factors such as having better access to educational facilities, superior socio-economic, demographic, and cultural factors could be responsible for better educational attainment among women belonging to the general and OBC categories. Previous studies have revealed that ST women (Krishnamma, 1991; Daripa, 2018; Chavhan, 2019; Som & Mishra, 2020; Muthamma, 2022) and SC women had very poor educational status (Krishnamma, 1991; Sardar, 2020).

The results of multiple statistical tools and models in the present study confirmed a strong and highly significant association between women's education and their socio-economic status. First, Kruskal-Wallis test revealed a highly significant direct relationship between women's education and family income, with highly educated women having a greater chance of belonging to higher-income groups. A multinomial logistic regression model confirmed that the probability of women belonging to the high-income quartile increased as their educational level increased. The robustness of this relationship was further confirmed by model fit statistics (LR $\chi^2 = 41.953$, Nagelkerke $R^2 = 0.076$, $p < 0.001$). This result confirms the finding that women's educational level is important in enhancing the family income and wealth and validates the findings of previous research that revealed an increase in household income with an improvement in women's education (Maisnam, 2008; Awan & Munir, 2016; Miller et al., 2017; Ge, T. et al., 2022).

The results of linear regression analysis exhibited that the ES index increased by around 11.75 points with every additional educational level, confirming that educational level is a predictor of economic status.

Educational level also demonstrated a strong association with employment outcomes. K-means clustering analysis was performed to obtain a holistic view of the interlinkages among education, family income, and nature and status of employment. The results unveiled that highly educated women had a mid-range family income (median income: ₹20,000) when they were homemakers or self-employed.

Collectively, these findings confirm that education is an imperative factor in determining women's socio-economic status. However, clustering analysis showed that higher education alone is not enough, its benefits are reaped only when it is combined with formal employment. Thus, women's socio-economic status significantly improves through higher education by ensuring better access to employment opportunities.

5.3.2 The Workforce Participation of Women with respect to their Levels of Education by Social Category.

Empowerment of women depends on their economic independence, which in turn relies on their work participation. A focal role is played by educational attainment in encouraging participation in the labour market, where highly educated individuals have a strong association with increased labour force participation (OECD, 2025). However, a previous report pertaining to the individuals with tertiary education revealed that employment rates were lower for women as compared to men (OECD, 2015).

Nearly 60 per cent of women have been employed in unorganized sector over the world whereas in low-income countries, more than 90 per cent of women are working in the informal sector. Additionally, on average, working women are paid 80 cents for every dollar earned by men (United Nations, 2024).

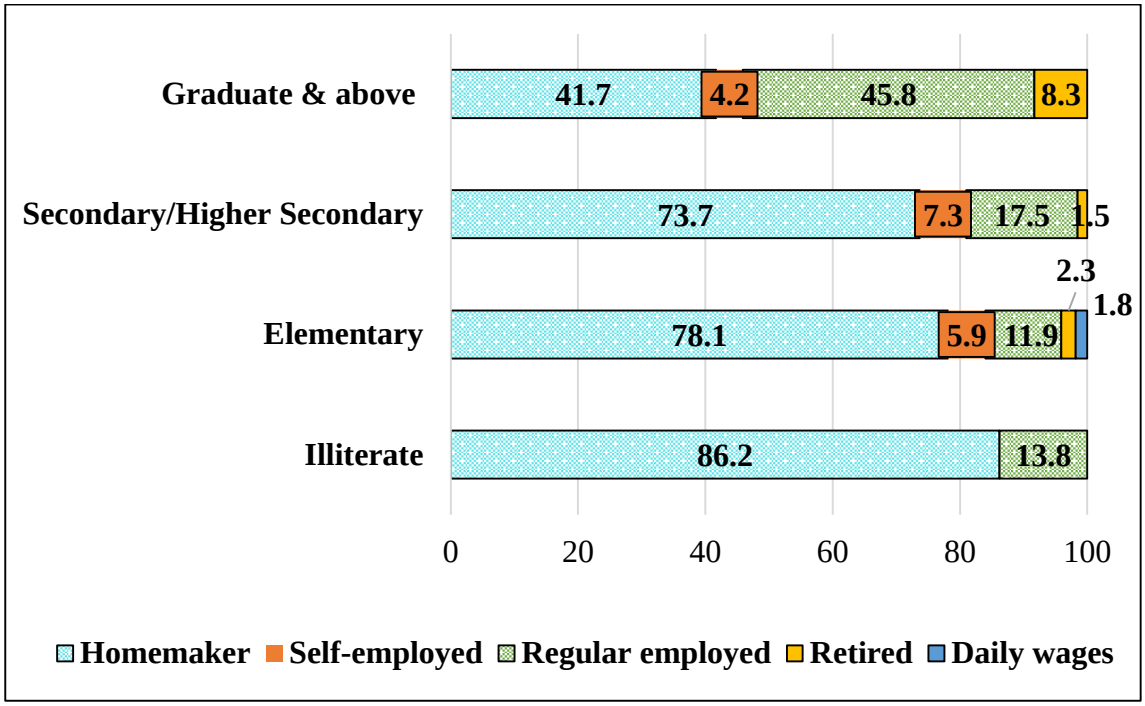
To assess women's workforce participation by education and social category, the study applied a logistic regression model along with the chi-square test and hierarchical logistic regression analysis.

5.3.2a Employment Status of Women by their Educational Level

Women's educational level plays an indispensable role in determining their employment status. This is perceptible from the study that maximum homemakers were found among illiterate respondents (86.2%), followed by women with elementary education (78.1%), and secondary/higher secondary education (73.7%), while the proportion of respondents stating as homemakers was the minimum among graduate and above educated (41.7%) (Figure 5.10). The respondents with regular employment was the highest with 45.8 per cent among highly educated while it was the lowest with 11.9 per cent among elementary educated. The proportion of regularly employed women was positively related to education level, except

for women with elementary education (which was less than illiterate women). Thus, women were more presumably a part of the labour market when their education level improved.

Figure 5.10: Employment Status of Female Respondents by Education Levels (in percentages)



Source: Primary survey data

5.3.2b Employment Status of Women by Education and Social Category

The associations between women's educational level and employment status, educational level and social category were tested using the chi-square test. A highly significant association was discovered between the women's educational level and their employment status ($p=0.000$ <0.001) as well as between female education and social category ($p=0.000$ <0.001) as indicated by the p-values of the test results. Women's participation in employment was heavily reliant on their educational level. There was relatively high probability of women with higher education levels to be in more stable or formal employment. A notable variation was observed across different social categories, with women from the General and OBC categories being predominantly concentrated in higher education groups, whereas SC/ST women were predominantly found in lower education groups. It is apparent that the probability of women's participation in the workforce increased substantially with the increase in education level (Table 5.7).

Table 5.7: Chi-Square Test Results for Association of Women's Education with Employment Status and Social Category

Variable	Chi-Square Statistic	df	p-value
Employment Status	70.51	15	0.000***
Social Category	47.24	9	0.000***

Source: Calculations based on primary survey data
**** indicates significant at 0.1% level*

A stratified logistic regression model was used to assess the relationship between female education and employment status by social category wherein a separate logistic regression was carried out within each social category. An Adjusted Odds Ratio (AOR) here estimates the association between female education and their social category while controlling potential confounding variable, i.e., an unmeasured variable that influence both the dependent and explanatory variables. The results of the model highlighted a distinct variation in the role of education in women's workforce participation across various social categories (Table 5.8).

Table 5.8: Results of Stratified Logistic Regression Analysis for Employment Status by Education Level and Social Category

Social Category	Adjusted OR	95% CI	p-value
General	1.553	1.027–2.347	0.0368*
OBC	2.263	1.211–4.232	0.0105*
SC/ST	0.961	0.510–1.811	0.9025

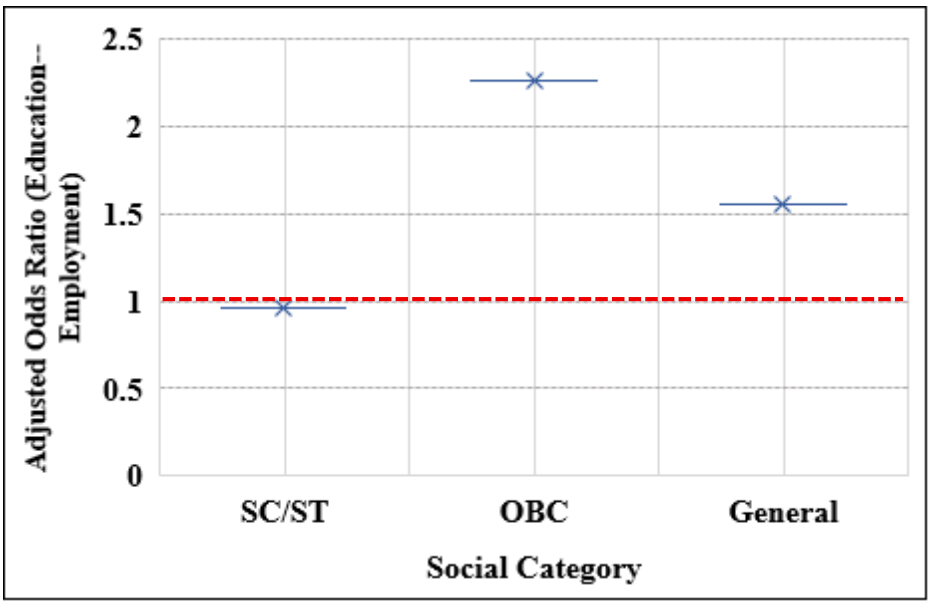
Model Fit Statistics	General	OBC	SC/ST
Pseudo R^2 (Nagelkerke)	0.042	0.059	0.009
Log-Likelihood	–283.56	–265.42	–156.77
AIC	581.12	546.84	325.54
No. of observations	240	207	127

Source: Calculations based on primary survey data
** indicates significant at 5% level*

A moderate positive improvement in employability was noted due to education among women in the general category, and the results are found to be statistically significant with the AOR=1.55, and p= 0.037<0.05. The odds of being employed for women in the general category increased by 1.55 times with every increase in educational level. A strong and statistically significant direct relationship existed between education level and employment status of OBC women as the chances of them being in employment increased by 2.26 times with each increase in their education level (AOR=2.26, p= 0.011<0.05). However, education did not divulge any statistically significant impact on the employability of SC/ST women as the p-value = 0.90 >0.05 and AOR = 0.96.

The AOR for the impact of education on employment across social categories is plotted on the y-axis. The red dashed line at AOR=1 shows no effect, and the marked points indicate the AOR values (Figure 5.11).

Figure 5.11: Effect of Education on Women's Workforce Participation by Social Category



Source: Results based on primary survey data

The figure given above clearly shows a greater role of education in increasing the employability of women belonging to the OBC and the general category compared to SC/ST women. These outcomes convey that education enhances women's employability in relatively advantaged social groups but does not generate similar results for women belonging to socially disadvantaged (SC/ST) groups. This could be due to other factors

influencing women opting for employment like their age, dependent family members, husband's employment status, taking care of children. It can be noted that 59.8 per cent of ST and 42.8 per cent of SC women were 45 years and above, and nearly 61 per cent of ST and 57.1 per cent of SC respondents' husbands were regularly employed.

To investigate the relationship between women's educational level and employment status, a hierarchical logistic regression model was used. This helped to understand how the addition of control variables affected the predictive power of the model in separate blocks (Table 5.9).

Table 5.9: Hierarchical Logistic Regression Model for Women's Education and Employment Status along with Control Variables

Model	Pseudo R^2	Log-Likelihood	AIC	BIC
Model 1 (Base Model)	0.0125	-320.37	646.73	659.79
Model 2 (Interaction: Education × Social Category)	0.0183	-318.48	644.97	662.38
Model 3 (+ Marital Status)	0.0207	-317.69	645.38	667.15
Model 4 (+ Age Group)	0.0424	-310.65	633.31	659.42
Model 5 (+ Household Income)	0.0837	-297.28	608.56	639.02

Source: Results based on primary survey data

The first model considered only education level and social category as predictors of women's employment status. This model assessed whether the impact of educational attainment on employment changes according to the social category. A very small variation in employment was explained by education and social categories (Pseudo $R^2 = 0.0125$).

In the second model, an interaction effect (Education × Social category) was added to assess whether the impact of education on employment differed across social categories. The results evinced that the model fit slightly improved after the interaction effect was added, but the predictive power was not significantly improved. There was a slight improvement in Pseudo R^2 (0.0183) value, reflecting that the impact of education on employment was not strongly moderated by the social category.

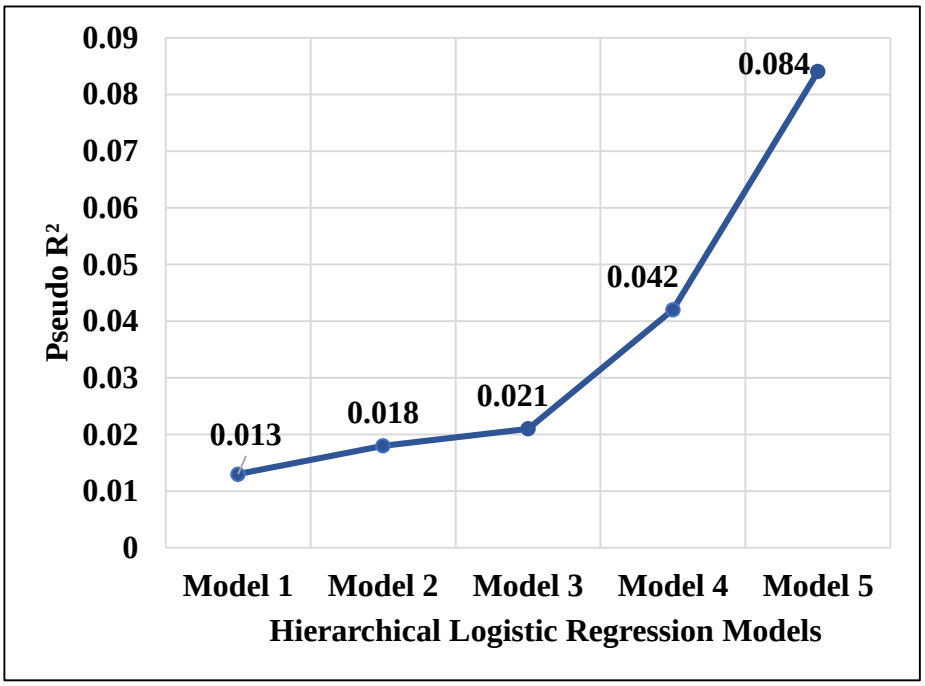
The inclusion of marital status in Model 3 improved the model further slightly (Pseudo R^2 =0.0207), with a minor impact on the employment prediction. The study found that widowed women had a higher likelihood of being employed than married women.

In Model 4, the age group was added to examine how the probability of being employed changes over time, it was demonstrated that there was a significant increase in the predictive ability of the model with a rise in Pseudo R^2 to 0.0424. Hence, employment was significantly influenced by women's age as shown by further improvement in model fit. Age had a significant and negative impact on employment, indicating a lower likelihood of older women being employed.

In the final model 5, household income was added. It reveals that there was a significant improvement in model fit showing employment being strongly predicted by household income. Household income was the most influential factor determining women's employability. A strong and positive relationship was reported between family income and employment. Thus, this was the best model with the lowest Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) values, the highest Pseudo R^2 of 0.0837, and a significant improvement in log-likelihood with a value of -297.28.

Five Hierarchical models after adding predictors step by step are plotted on X-axis while Pseudo R^2 values on Y-axis (Figure 5.12).

Figure 5.12: Improvement in Pseudo R^2 across Models



Source: Results based on primary survey data

A steady increase in explanatory power was shown by the upward rising curve in which a big jump occurred when age in Model 4 and household income in Model 5 were added. The line graph showed an improvement in Pseudo R^2 from Model 1 to Model 5, demonstrating that explanatory power had increased substantially due to the inclusion of age and household income in the model. This result confirmed that age and household income were critical factors in predicting women's chances of being in the workforce.

5.3.2c Discussion

The multi-tiered approach provided a vigorous understanding of women's participation in the workforce by their education level and social category. A sequential analytical approach was adopted in which a cross tabulation indicated an increase in the share of regularly employed women and a decline in that of homemakers with an improvement in educational level. The chi-square test confirmed a highly significant association between women's educational level and employment status. This finding validates past studies that indicated an improved participation of women in the labour market with an improvement in their level of education. Highly educated women were more doubtlessly to be employed in the labour market than women with lower or no education (Cameron et al., 2001; Benefo & Pillai, 2003; Ince, 2010; Sinha Mukherjee, 2015; Chatterjee et al., 2018; Akhtar et al., 2020; Iheonu et al., 2020; Shah & Riaz, 2020; Tsaniyah & Sugiharti, 2021; Backhaus & Loichinger, 2022; Lari et al., 2022 and Mariel, 2022).

Logistic regression analysis which was performed to assess the probability of employment across social groups, highlighted the education's role in enhancing the employability of women belonging to the general and OBC categories compared with that of SC / ST women. This may be due to the fact that SC / ST women belonging to low socio-economic status, have higher chances of having low access to English medium education at primary level, lack of exposure and skills, spouses being in regular employment vis-a-vis prevalence of low paid temporary / contractual employment, lack of awareness about job availability, especially in the private sector, and other issues.

Finally, to evaluate how demographic and economic factors mediate the impact of women's education on their workforce participation, hierarchical logistic regression was applied to obtain a deeper insight by introducing contextual variables. The findings of this model manifested that education level or social category does not significantly determine the

participation of women in workforce but other factors, such as marital status, age, and family income determine their workforce participation. It was exhibited that widowed women had higher odds of being employed as compared to married women, which might be due to reasons such as pressure to bear financial responsibility / burden of family, appointment on compassionate ground in spouse's regular job, etc. Older women had a lower chance of being in job possibly due to care taking responsibilities of small children and older family members, age-related health issues, lower levels of education, lack of job oriented skills, etc. Women belonging to the higher household income group had a higher likelihood of being in employment. The possible reasons for this result might be access to quality higher education, including professional courses, better exposure, positive attitude toward women's employment, feasibility to hire domestic help and care takers, etc. As the SC / ST category women belonged to higher age and relatively low income groups, the impact of education on their employment was relatively less.

Thus, this model figured out that education can expand one's employment opportunities, but it does not guarantee employment unless accompanied by favorable socio-economic circumstances. This result supported the conclusion from the clustering analysis that many educated women were homemakers. The possible reasons for this could be educated women not getting regular employment opportunities, child and family responsibilities, low payments with temporary and contractual jobs in the private and informal sectors, expensive care taker and domestic help services compared to the low payment jobs, etc. Previous studies have shown that secondary educated women had a lower chance of being employed as compared to illiterate women (Chatterjee et al., 2018), and the declining participation of secondary and tertiary educated women in labour force resulting in increased unemployment among educated women (Assaad et al., 2020).

5.3.3 Impact of Female Education on Health by Employment Status and Social Category

Female education positively influences women's health knowledge and behaviour. Women with education are more inclined to have heard about HIV/AIDS and more conversant with menstruation than those without formal education (Long et al., 2013).

Education improves women's life expectancy at birth, indicating a better health status among them (Kumara, 2016; Rahman & Alam, 2021). The higher educational level of

women influences their nutritional status, and they are less prone to being underweight than those without education (Islam et al., 2016; Biswas et al., 2017). Moreover, they have sparse chances of suffering from anaemia (Sunuwar et al., 2020). Less educated women are more probable to have poor health status (Chavhan, 2019) and have a higher occurrence of heart failure (HF) hospitalization as compared to those with a graduation or higher degree (Shah et al., 2011). The adult mortality rate among women also reduced due to improvements in female education (Hurt et al., 2004; Rahman & Alam, 2021).

Prenatal care and antenatal care visits are expected to increase with a rise in the educational attainment of the mother (Joshi et al., 2014; Mohammad et al., 2018; Wang et al., 2021), wherein, the odds of seeking antenatal care earlier were higher among mothers with secondary or tertiary education (Tayie & Lartey, 2008). The chances of an educated pregnant woman consulting a healthcare professional for prenatal visits were higher compared to women with no education (UNICEF, 2015). Women's educational level significantly affects the usage of antenatal care and institutional delivery services (Sultana et al., 2017), wherein the chances of women with higher educational status delivering their baby in a health facility are higher as compared to those with low or no education (Kitui et al., 2013; Dankwah et al., 2019; Gangtaba et al., 2021; Gebremichael & Fenta, 2021).

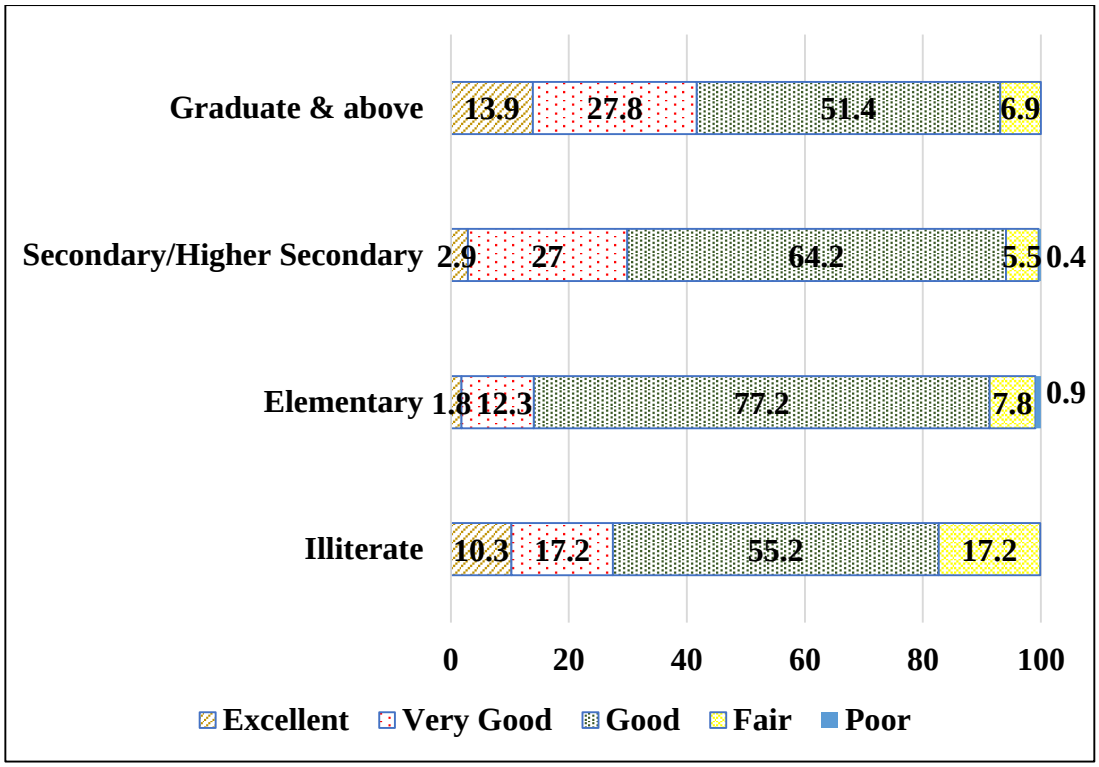
It is further observed that women's education is significantly and negatively related to fertility (Al-Kandari, 2007; El Alaoui, 2016; Ifelunini et al., 2018; Goh et al., 2020; Olayiwola et al., 2021). Women's educational level plays a prominent role in deciding the number of children that would be born to them during their lifetime (Alene & Worku, 2008). Women with higher education have significantly fewer children than those with less or no formal education (Alene & Worku, 2008; Kim & Sung, 2013; Boateng et al., 2023). Education is one of the distinct factors that determine the use of contraceptives among women (Gafar et al., 2020; Kistiana et al., 2020; Meherali et al., 2021). Highly educated women tend to use more contraceptives (Viswan et al., 2017; Gafar et al., 2020; Meherali et al., 2021), and have 3.38 times more chances to make decisions on their own about contraceptive use than illiterate women (Belachew et al., 2023). Education increases the chances of women using contraceptives and promotes better reproductive health practices (Samarakoon & Parinduri, 2015; Olayiwola et al, 2021), and reduced overall fertility rates (Hill & King, 1995; Maisnam, 2008; UNICEF, 2015; Som & Mishra, 2020; Bradshaw et al., 2023).

The present study used the chi-square test to evaluate the impact of women's education on their health, and Structural Equation Modelling to assess the impact of female education on their body mass index (BMI).

5.3.3a Women's Self-reported Health Status by Educational Level

The maximum proportion of the respondents reported their health status as good, ranging from a minimum 51 per cent of graduate and above educated to a maximum 77 per cent of the elementary educated women respondents (Figure 5.13).

Figure 5.13: Self-reported Health Status of the Respondents by the Level of Education (in percentages)



Source: Primary survey data

On the contrary, 27.5 per cent of illiterate women had informed having excellent or very good health status while 41.7 per cent of women with graduation or higher degree stated of having excellent (13.9%) or very good (27.8%) health status. This implied that women with higher education levels had better self-reported health status than illiterate or less educated women.

Table 5.10:Chi-square Test Results for Self-reported Health Status of Women by their Education Level

Chi-Square Statistic	df	p-value
50.459	12	0.0000***

Source: Primary survey data ***Significant at 0.1% level*

Hypothesis 2: The study had the following hypothesis pertaining to the level of education of women and their health status.

H_0: Women's education level does not have any impact on their health status.

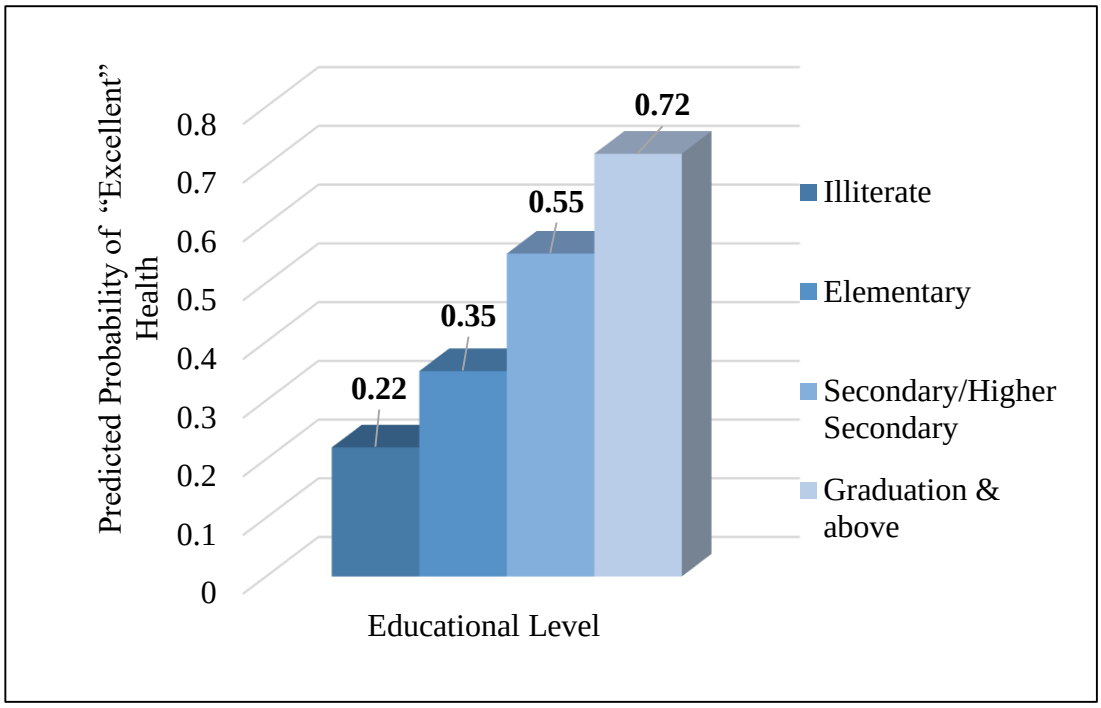
H_1: Women's education level has a positive impact on their health status.

The chi-square test was used to verify the association between educational attainment and self-reported health because both are categorical variables. The results suggest a statistically highly significant association with p-value = 0.0000 ($p < 0.001$) and reveal that women with higher education levels were more expected to report better health status than illiterate or less educated women (Table 5.10).

The predicted probabilities of reporting self-rated health as "Excellent" across various levels of education are shown in a bar chart (Figure 5.14), controlling for employment status, social category, and household income (set to mean values). The probability of reporting excellent health steadily increased with an improvement in education, rising from 22 per cent among illiterate women to 72 per cent among graduate and highly educated women. This indicates that education play a powerful role in improving women's health outcomes.

Consequently, the null hypothesis that women's education level does not have any impact on their health cannot be accepted, and the alternative hypothesis that states "the education level of women has a positive impact on their health" is accepted.

Figure 5.14: Impact of Education on the Probability of Reporting Excellent Health



Source: Based on primary survey data

5.3.3b Self-reported Health Status of Women by Education and Social Category

A moderating impact of social category on the association between women's education and her self-reported health was analysed by using a stratified chi-square analysis (Table 5.11). A strong and statistically significant association was indicated between educational attainment and self-perceived health among women belonging to the general and OBC groups ($p<0.01$).

Table 5.11: Results of the Chi-square Test for Self-reported Health Status by Education and Social Category

Social Category	Chi-square Statistic (χ^2)	df	p-value
General	32.7	12	0.001***
OBC	36.11	12	0.0003***
ST	14.6	9	0.102
SC	7	4	0.136

Source: Calculated from primary survey data.
**** Significant at 1% level.*

The chances of reporting good or very good health were higher among highly educated women within these groups, highlighting the role of education in enhancing health awareness and self-evaluation among socio-economically advantaged groups. Conversely, a weaker and statistically insignificant association was revealed between education and self-reported health status among SC /ST women ($p>0.05$). Thus, an increase in education resulted in an improvement in perceived health status only among women belonging to socially advantaged groups, whereas the visible benefits of education on better health perception were lower for women of socially disadvantaged groups. It can be noted that 85.7 per cent of SC and 68 per cent of ST women had family income of ₹20,000 or less. Over 71 per cent of SC and 55.7 per cent of ST women were either illiterate or elementary educated and, 71.4 per cent and 73.8 per cent of women belonging to the SC and ST categories, respectively, were either homemakers /daily wage earners.

5.3.3c Self-reported Health Status of Women by Education and Employment Status

The relationship between women's education and self-reported health, considering their employment status, was tested using a stratified chi-square analysis. Higher education and improved self-reported health were significantly associated among employed women ($p<0.05$) whereas the relationship between education level and self-reported health was statistically insignificant among unemployed women ($p> 0.05$). Higher health awareness and more proactive health behaviour were observed among educated working women, whereas the self-perceived health was not significantly influenced by education level among unemployed women (Table 5.12).

Table 5.12: Results of the Chi-square Test for Self-reported Health by Education and Employment Status

Employment Status	Chi-square Statistic (χ^2)	df	p-value
Employed women	21.47	12	0.043 *
Unemployed women	12.83	12	0.38

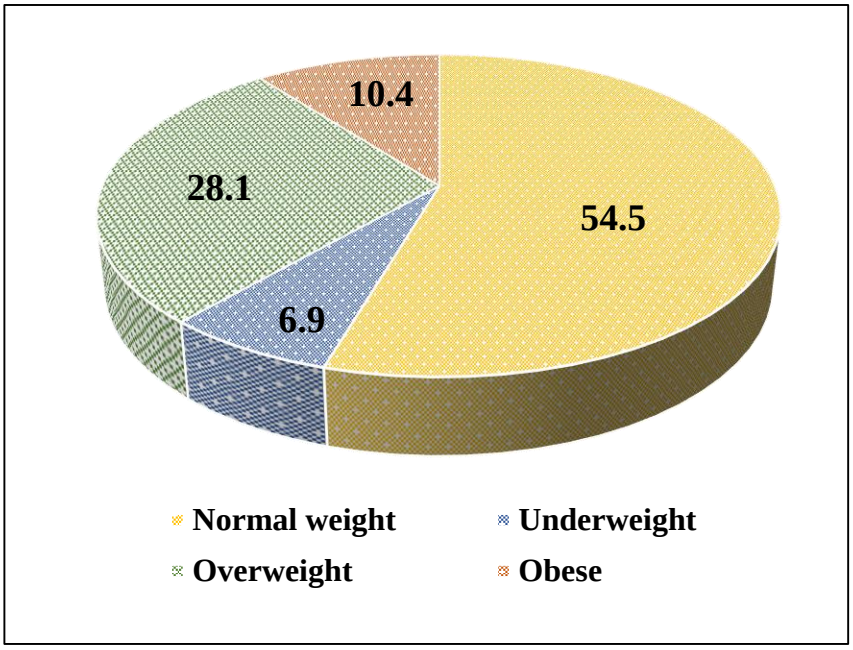
Source: Calculated from the primary survey data
** Significant at 5% level*

Anthropometric Measurements

Anthropometric measurements are one of the important indicators of nutritional status. Body mass index, one of the indicators of nutritional status, enables a quick, safe, and reliable measures to evaluate a person's weight relative to his /her height (WHOa, 2024).

It can be observed that 54.5 per cent of women respondents had normal weight, whereas 6.9 per cent of them were underweight (Figure 5.15). The proportion of overweight and obese women was 28.1 per cent and 10.4 per cent respectively. This indicated a higher prevalence of overweight and obesity among women (38.5%),which is comparable to all Goa average of 36.1 per cent as per the NFHS V data. The proportion of underweight respondents was lower than the all-Goa average of 13.8 per cent (NFHS V).

Figure 5.15: Nutritional Status of Women



Source: Based on primary survey data

To examine the impact of female education on their BMI, along with other variables, Structural Equation Modelling (SEM) was employed that helps to assess the complex relationships between the outcome and independent variables simultaneously in a single model (Table 5.13).

Table 5.13: Results of the Structural Equation Modelling

Equation 1: BMI Regression	**Coef. (β)**	**Std. Error**	**t-value**	**p- value**	**95% CI Lower**	**95% CI Upper**
Intercept	24.158	0.521	46.41	0.000***	23.136	25.181
Education	-0.449	0.193	-2.33	0.02*	-0.828	-0.070
Employment status	-0.262	0.207	-1.26	0.207	-0.670	0.145
Social category	-0.702	0.224	-3.13	0.002**	-1.143	-0.261
Monthly family income	0.000022	7.7E-06	2.95	0.003**	7.6E-06	3.78E-05
Age	0.647	0.174	3.72	0.000***	0.305	0.989

Source: Calculations based on primary survey data
****, ** & * denotes significant at 0.1%, 1% & 5% levels*

Equation 2: Income Regression	**Coef. (γ)**	**Std. Error**	**t-value**	**p- value**	**95% CI Lower**	**95% CI Upper**
Education → Income	5000.21	-	-	0.002**	-	-

Source: Calculations based on primary survey data *** denotes significant at 1% level*

(Model Fit Statistics: χ^2 (df = 7) = 12.84, p < 0.001, RMSEA = 0.041, CFI = 0.956, TLI = 0.932, SRMR = 0.048)

The final equation of this model with coefficients is as follows:

Equation 1:

$$BMI = 24.2 - 0.45\ Education - 0.26\ Employment - 0.70\ Social\ category + 0.00002\ Income + 0.65\ Age + \epsilon_1$$

Equation 2:

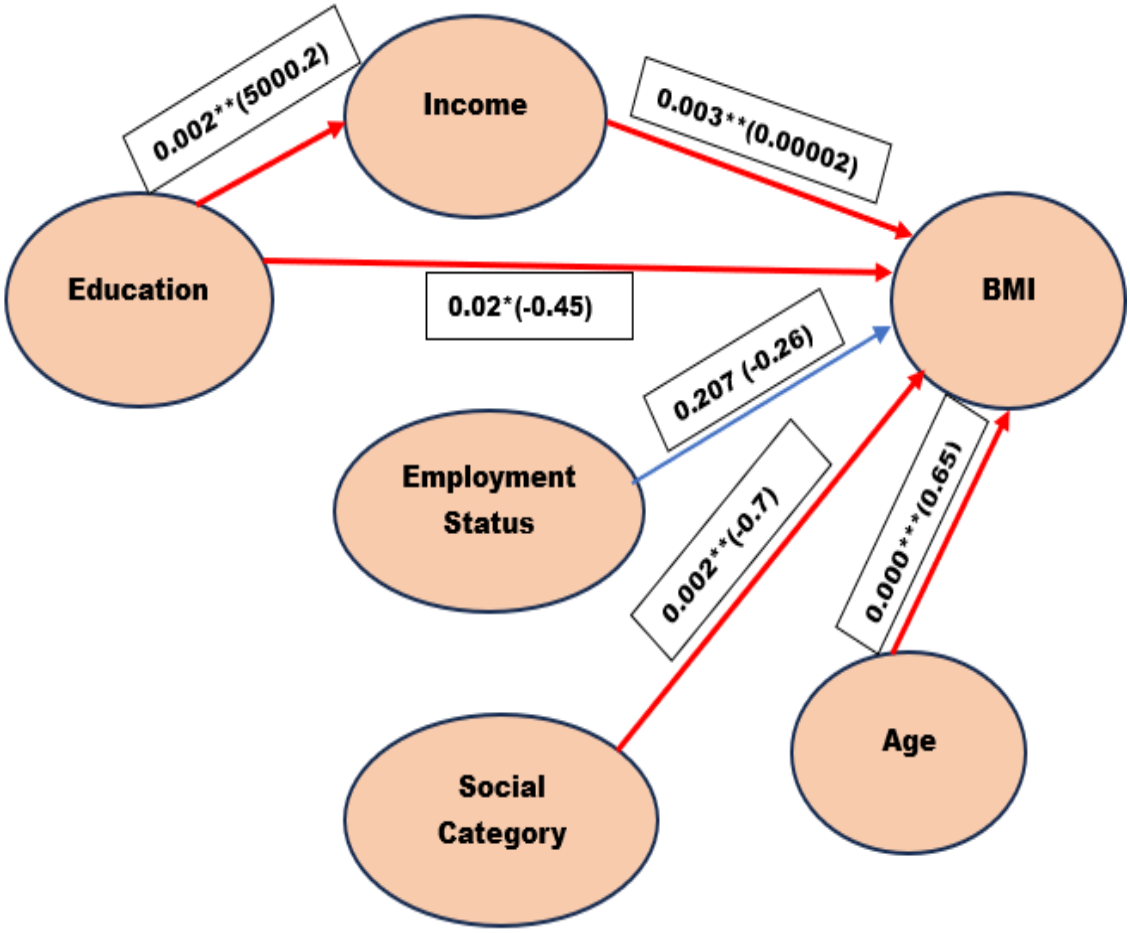
$$Household\ Income = \gamma_0 + 5000.2\ Education + \epsilon_2$$

In the first equation, BMI is a function of female education, employment status, income, social category, and age. In the second equation, household income was used as a mediator between female education and BMI. Household income was predicted using education to check the mediation effect.

The baseline BMI was approximately 24.2 kg/ m^2, falling within the normal weight range, indicating that the women in the sample had maintained a healthy BMI on average ($p < 0.001$). Women's education significantly influenced family income (Figure 5.16). The positive relationship between women's education and family income accounted for significant increase in her family income by Rs. 5000.2 with a rise in the level of education, the result of which was statistically highly significant at one per cent level ($p = 0.002 < 0.01$, $\Upsilon_1 > 0$). Thus, education increases the likelihood of earning a higher income. Considering the impact of family income on BMI, it was pointed out that there was a small rise in BMI after every ₹10,000 increase in monthly household income ($\beta = 0.00002$) depicting a positive association between them, the result of which was statistically highly significant ($p = 0.003 < 0.01$) reflecting that higher household income resulted in a slightly increased BMI. This shows an improved access to food with better nutrition among households and changes in lifestyle with higher income.

An inverse association was indicated between education and BMI, implying that BMI significantly reduced with an improvement in education level. Each unit increase in education level resulted in a 0.45 unit decrease in BMI ($\beta = -0.45$) suggesting that women with higher education had a lower chances of being overweight or obese and the result was statistically significant at 5 per cent level ($p = 0.02 < 0.05$). Employment status didn't indicate a statistically significant impact on BMI ($\beta = -0.26$, $p = 0.207 > 0.05$). Being employed or unemployed did not independently predict the overweight/obesity status of women revealing that employment was not significantly related with BMI. Further, a negative and statistically significant relationship between social category and BMI was reported. Women belonging to SC/ST categories were more anticipated to have a lower BMI and the results indicate that BMI was influenced by social category which was highly significant at 1 per cent level ($\beta = -0.702$, $p = 0.002 < 0.01$). Similarly, age was positively associated with BMI, wherein the BMI increased by 0.65 units for each additional age group and the result was statistically significant at 1 per cent level ($\beta = 0.65$, $p = 0.000 < 0.01$) suggesting the likelihood of having higher BMI was higher among older women.

Figure 5.16: Simplified SEM Path Diagram



Source: Based on primary survey data

5.3.3d Discussion

The results of the chi-square test revealed that women's educational level had a statistically significant connection with their self-reported health status, with highly educated women reporting a better health status than illiterate or less educated women. This finding is supported by earlier studies that demonstrated a direct association between education and health status among women (Curtis, 2001; Menon, 2007; Kumar, 2013; Angba & Angba, 2015; Chavhan, 2019; Zhu & Ye, 2020; Rahman & Alam, 2021; Devi, 2022; Muthamma, 2022). However, less educated, income-earning women with health awareness also had an improved health status (Long et al. 2013).

The probability of reporting an excellent health status improved with an increase in education levels. The results of stratified chi-square analysis indicated that self-perceived health improved with an increase in education level only among general and OBC category women, whereas the association between education and perceived health status was insignificant among SC /ST women. This might be due to lower family income resulting in poor living conditions, inadequate nutrition, lack of access to quality healthcare services, lack of health awareness, etc. Higher education was significantly associated with improved self-reported health among employed women but not among homemakers /unemployed women, possibly due to inadequate access to health information or services, lower physical activity among homemakers /unemployed women.

Structural Equation Modelling revealed that women's BMI was inversely associated with their education level indicating a lower chances among highly educated women being overweight or obese. This finding is supported by the literature showing a decline in overweight /obesity with an increase in education levels (Nguyen et al., 2007; Steele et al., 2017; Oguoma et al., 2021; Oseni et al., 2023; Sadeghi et al., 2023). Similarly, overweight /obesity among women had reduced at higher educational levels (Duvigneaud et al., 2007; Lee et al., 2011; Mpofu et al., 2016; Murakami et al., 2017). This might be due to greater health awareness, healthier lifestyles, and improved dietary practices among educated women.

However, educational attainment was found to be directly associated with the likelihood of women being overweight or obese according to NFHS data which considers only 10 or more years of schooling and illiterate /lower levels of education were excluded. This result supports few studies indicating a positive relationship between educational level and overweight/obesity (Biswas et al., 2017; Ariaratnam et al., 2020), and highly educated women had a higher risk of being overweight/obese (Mangemba & San Sebastian, 2020; Mengesha Kassie et al., 2020; Ezenweke et al., 2022 and Asosega et al., 2023).

In addition to education, social category and age had a significant impact on BMI, whereas employment status had an insignificant impact on BMI.

Taken together, the above analysis highlights the significant, independent, and multidimensional impact of education on women's health. Although employment status and social category contributed to varying circumstances, they did not negate the impact of education. Thus, improving community health and achieving equitable well-being across different occupational and social groups heavily rely on promoting education and health awareness among women.

5.3.4 Impact of Female Education on the Health of her Husband and Children.

Female education can influence the health status of her husband and children. Therefore, this section tries to analyse the influence of education of female respondents on the health status of their husbands and children. This section is divided into two sub-sections: the first one deals with the impact of female education on the husband's health and the probability of them being overweight /obese, whereas the second one analyses the impact of female education on the nutritional status of her children.

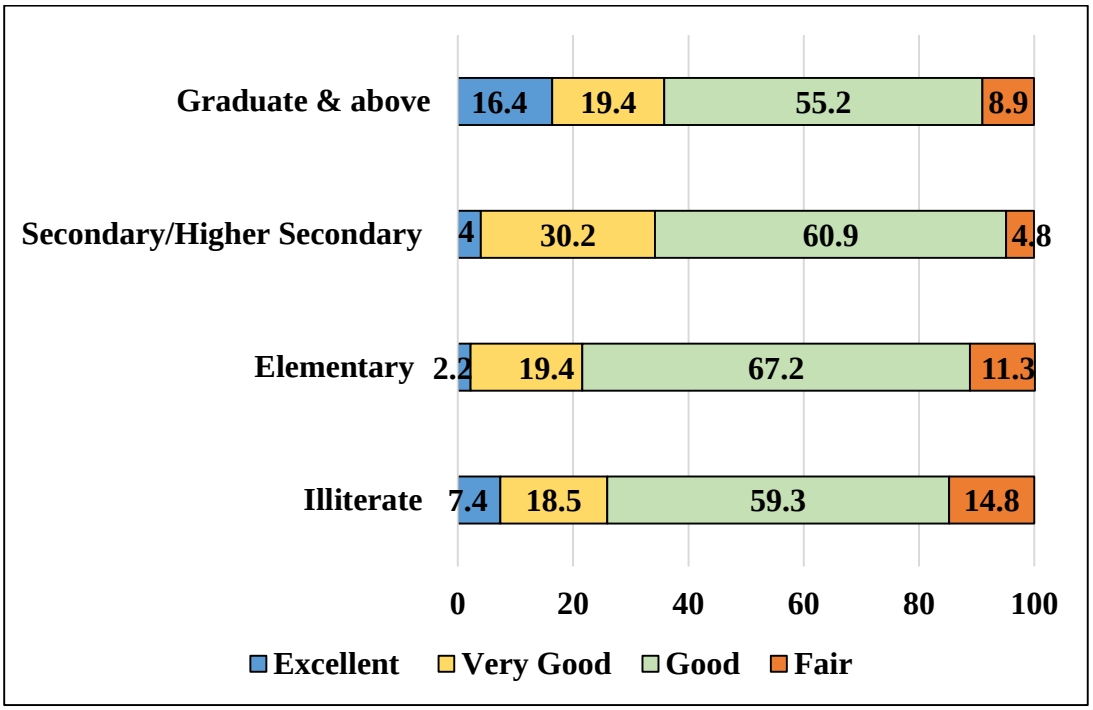
5.3.4a The Impact of Female Education on Husband's Health Status and being Overweight /Obese

A few studies have indicated that female education has a positive influence on the health status of households (Menon, 2007), and husbands tend to have an additional survival advantage when their wives are educated (Hurt et al., 2004).

To assess the impact of the wife's education on their husband's self-reported health in this study, chi-square test was used, while to analyse the impact of the wife's education on the probability of her husband being overweight /obese, the binary logistic regression model was applied.

Husband's excellent or very good health status was reported by 35.8 per cent of women with graduation and higher education level, followed by 34.2 per cent of secondary /higher secondary educated women, while it was lowest 21.6 per cent in the case of husbands of women with elementary education (Figure 5.17). The health status of husbands graded as good was the maximum in the case of women with elementary education (67.2%) compared to women with other levels of education.

Figure 5.17: Husband's Self-reported Health by Wife's Education Level (in percentages)



Source: Primary survey data

Fair health was the highest (14.8%) among husbands of illiterate women compared to those having educated wives. This shows that better health among husbands was linked to the wife's higher education level.

The chi-square test indicated a statistically highly significant association between the wife's education and her husband's self-reported health, with a p-value= 0.00004 < 0.001 (Table 5.14). Thus, it can be inferred that the wife's education level has a positive influence on the husband's health status.

Table 5.14: Chi-square Test Results for Husband's Self-reported Health by Wife's Education Level

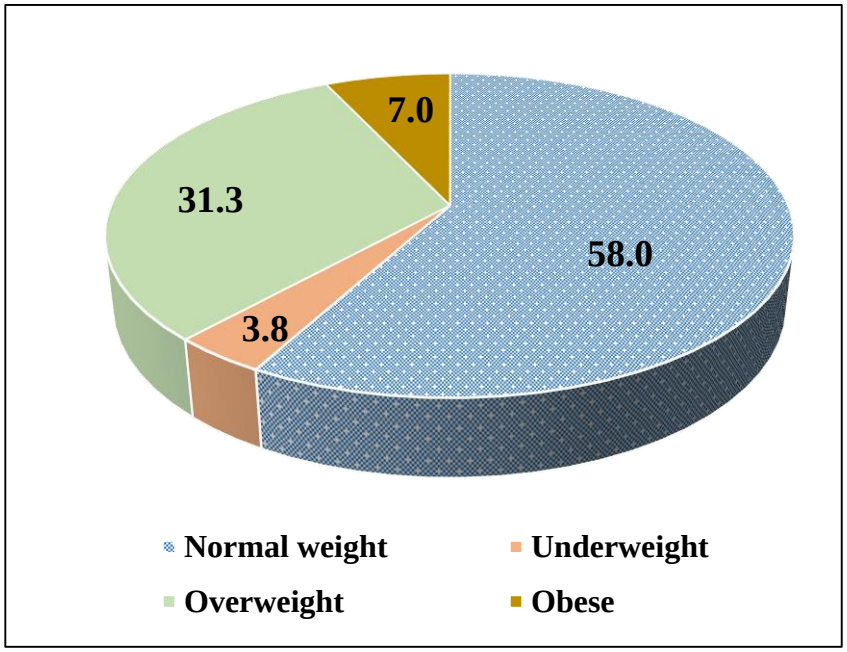
Chi-square Statistic	df	p-value
35.74	9	0.00004***

Source: Primary survey data
**** denotes Significant at 0.1% level*

It can be noted in figure 5.18 that 58 per cent of the respondents' husbands had normal weight, indicating that the majority of them maintained a healthy BMI. A small proportion

(3.8%) of them were underweight while a significantly high proportion (38.3%) of them were overweight and obese.

Figure 5.18: Nutritional Status of Husbands



Source: Primary survey data

A binary logistic regression model was used to examine the association between the wife's educational level and husband being overweight or obese.

Even though the odds ratio of 0.939 indicated that the probability of the husband being overweight /obese declined with an increase in the wife's educational level (Table 5.15), the finding was statistically insignificant as the p-value was 0.305>0.05.

Table 5.15: Results of the Binary Logistic Regression Model for Wife's Education and Husband being Overweight /Obese

Variable	Odd Ratio	p-value	95% CI
Constant	37.53	0.000***	15.89-88.58
Wife's Education	0.939	0.305	0.83-1.06

Source: Author's calculations based on primary data
**** denotes significant at 0.1% level*

5.3.4b Impact of Mothers' Education on the Nutritional Status of their Children

Each and every child has a right to live a healthy life irrespective of having any developmental delays or disabilities (UNICEFf, n.d.). Hence, it is very important to protect and improve the health of children (WHOc, n.d.). Investment in child nutrition is crucial for human capital formation since the nutrition and diet given to the child determines their growth, cognitive development, performance at school, and future productivity (UNICEF, 2019).

A proper diet provided to the child in the first two years of his /her life promotes healthy growth and improves their cognitive development. In addition, the risk of becoming overweight or obese and developing NCDs also lowers later in life (WHO, 2020). Undernourished children are more likely to be at risk of disease and death (WHO, 2024a). About 45 per cent deaths occurring among children are linked to undernutrition. In 2022, it was estimated that globally 149 million children under the age of five years were stunted, 45 million were wasted, and 37 million were overweight or obese (WHO, 2023b). Initially, obesity among under five years children were the problem existing in high income countries but is now also increasing in low- and middle-income countries. In 2022, nearly 50 per cent of under 5 years overweight or obese children were living in Asia (WHO, 2024b).

Although there has been a considerable decline in the proportion of children suffering from undernourishment, another burden that children face today is overweight and obesity which have been continuously rising over the years. Globally, millions of children and adolescents are not fed or consuming a minimum diverse diet which is important for their healthy growth and development while there has been a rise in the consumption of many unhealthy foods that contain high sugar, salt, and saturated fat (UNICEF, 2021). Worldwide, unhealthy diet and physical inactivity pose a major risk to health (WHO, 2020). It has been reported that more than 1 in 3 children are not growing well because of malnutrition while over 340 million children have been suffering from deficiencies of essential vitamins and minerals over the world (UNICEF, 2019).

The WHO's global targets, 2025 aiming at improving the nutrition of infant and young child includes reducing child's stunting, wasting, and low birth weight by 40 per cent, less than 5 per cent and 30 per cent, respectively, as well as restricting childhood overweight (WHO, 2024c).

A mother's education significantly affects her children's lives. Notably, there are more chances of children attending school whose mothers are highly educated. In addition, more educated mothers tend to adopt better health-related practices for their children, such as regular vaccination, consulting a doctor when they are sick, etc (UNICEF, 2015). Mothers' education was highly and significantly correlated with children's immunization status (Browne & Barrett, 1991; Desai & Alva, 1998, Raghupathi & Raghupathi, 2020; Som & Mishra, 2020). Highly educated mothers see that their children are vaccinated more correctly than uneducated mothers, showing the importance of a mother's educational level on increasing vaccination rates (Hobcraft, 1993; Ibnouf et al., 2007; Mondal et al., 2014). Improvement in maternal education significantly reduces infant mortality, neonatal deaths (Browne & Barrett, 1991; Singh et al., 2011; Global Partnership for Education, 2016; Islam & Biswas, 2021), child mortality (Hobcraft, 1993; Tulasidhar, 1993; Dreze et al., 1996; Desai & Alva, 1998; Fuchs et al., 2010; WHO, 2011; UNICEF, 2015), and the low-birth-weight rate (Elshibly & Schmalisch, 2008).

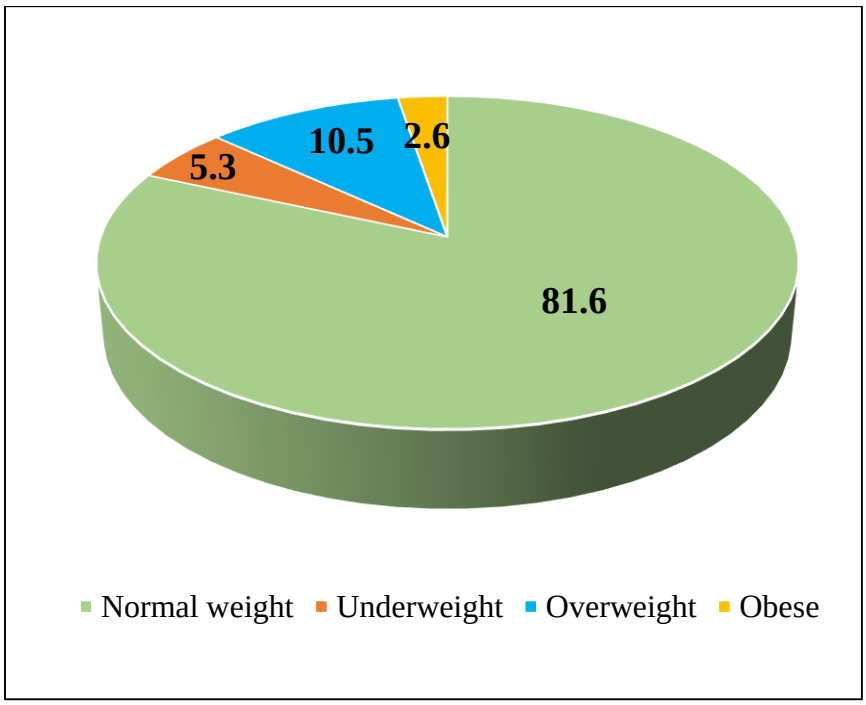
The educational level of mother is an effective tool that determines the health and nutritional status of her children (WHO, 2011; Sonego et al., 2013; Mondal et al., 2014; Miller et al., 2017). Diarrhoea (Ugboko et al., 2021) and malnutrition are infrequent among children of mothers with more education (WHO, 2011; Al-Zangabila et al., 2021). Children of educated mothers are less prone to stunting, wasting, and being underweight (Global Partnership for Education, 2016; Ali et al., 2019; Kumari & Gupta, 2022). Mothers' education is a primary factor that determines the dietary habits of their children (Pałkowska-Gozdzik et al., 2023). Children of highly educated mothers are more anticipated to have an adequate intake of micronutrients (Dalimunthe, et al., 2022), have a higher consumption of plant-, bread-, cereal-, and vegetable-derived proteins (Lin et al., 2011), and have a higher Dietary Diversity Score than those of uneducated mothers (Ali et al., 2019). The intake of fish (Pałkowska-Gozdzik et al., 2023), fruits, and vegetables was found to be higher among children whose mothers had higher educational attainment (van Ansem et al., 2014; Sotero et al., 2015; Nubani-Husseini et al., 2016; Pérez-Farinós et al., 2017). Meanwhile, children of mothers with lower educational attainment had a higher intake of unhealthy food (Perez-Farinos et al., 2017; Zhao et al., 2017; Amer & Kateeb, 2021; Cardenas-Fuentes et al., 2022).

In this background, this sub-section attempts to analyse the impact of mothers' education on the nutritional status of children by classifying them into three categories based on the age groups of children: (i) 5 years or below (ii) 6-14 years and (iii) 15-21 years.

i) Nutritional Status of Children aged 5 Years or Below

A majority (81.6%) of children aged 5 years or below had normal weight showing a healthy BMI count (Figure 5.19). The proportion of underweight among them was 5.3 per cent while 10.5 per cent and 2.6 per cent were overweight and obese respectively.

Figure 5.19: Nutritional Status of Children aged 5 Years or Below

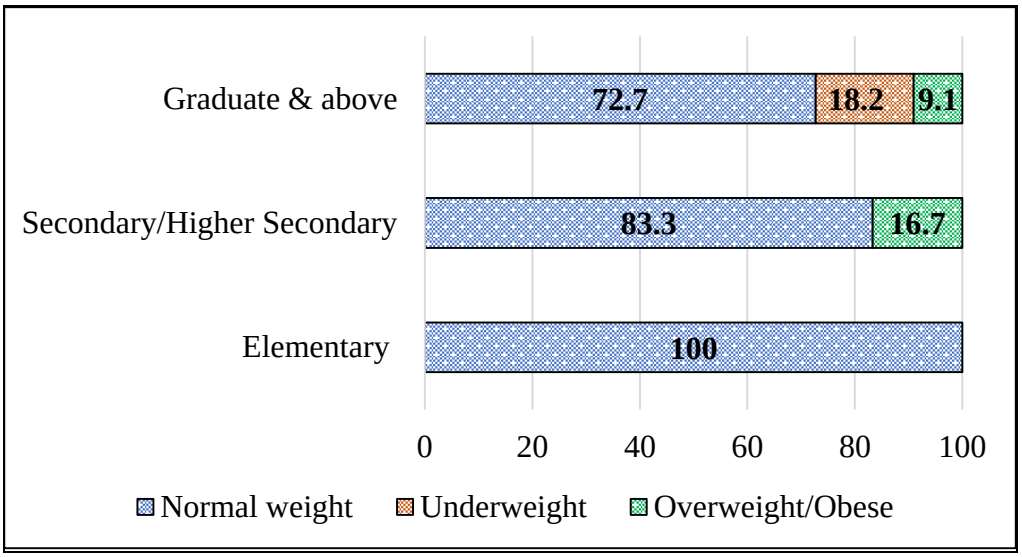


Source: Primary survey data

Impact of Mothers' Education on the Nutritional Status of Children aged 5 Years or Below

The proportion of children aged 5 years or below having normal weight declined from 100 per cent to 72.7 per cent with an improvement in the mother's education level from elementary to graduation and above level of education (Figure 5.20). The prevalence of overweight /obesity can be seen among children of mothers with secondary /higher secondary (16.7%) and graduation and above education level (9.1%).

Figure 5.20 : Nutritional Status of Children aged 5 Years or Below by Mother's Education Level



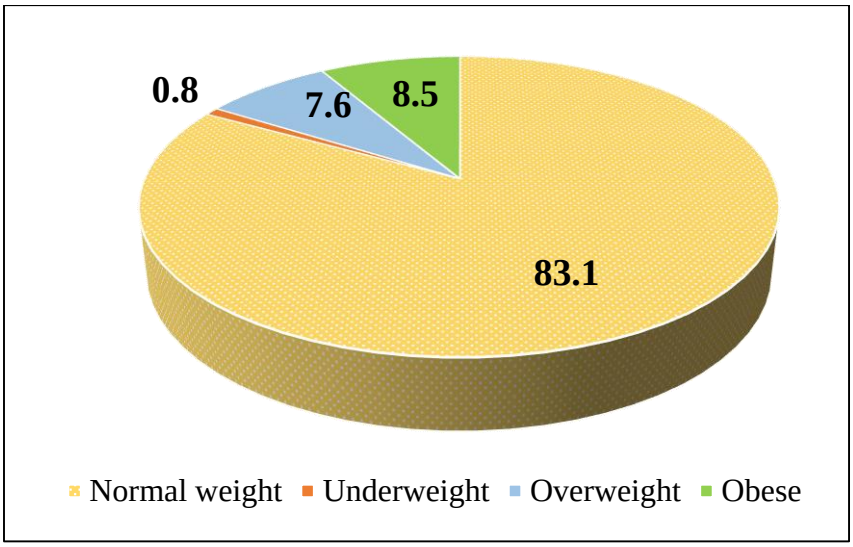
Source: Primary survey data

In this category, only mothers with graduation and above educational attainment (18.2%) had underweight children. None of the children in this age group had illiterate mothers.

ii) Nutritional Status of Children aged 6-14 Years

The proportion of children aged 6-14 years having normal weight was 83.1 per cent followed by 8.5 per cent being obese and 7.6 per cent were overweight, while 0.8 per cent were underweight (Figure 5.21). This indicates high prevalence of overweight and obesity (16.1%) among these children.

Figure 5.21: Nutritional Status of Children aged 6-14 Years

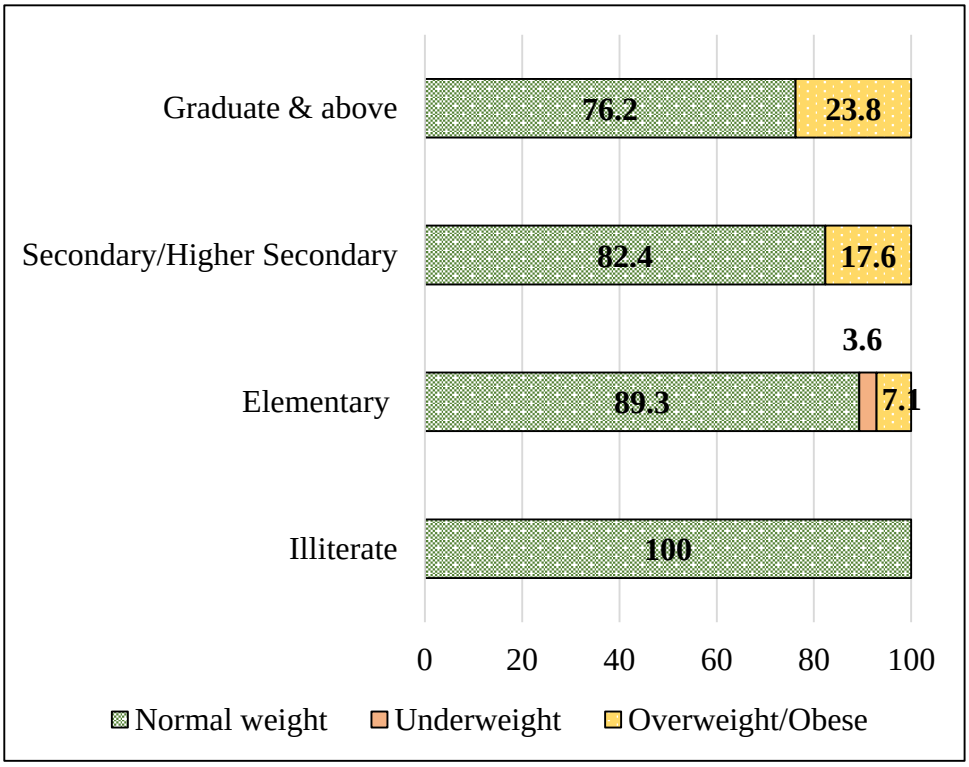


Source: Primary survey data

Impact of Mothers' Education on the Nutritional Status of Children aged 6-14 Years

An increase in the mothers' educational level resulted in a decline in the proportion of children aged 6-14 years having normal weight from 100 per cent to 76.2 per cent. However, overweight /obesity among children increased from 7.1 per cent to 23.8 per cent with a rise in mothers' educational level from elementary to graduation and above. Only mothers with elementary education had 3.6 per cent of underweight children. This indicates that mothers' higher education levels are related to overweight /obesity among children in this age group (Figure 5.22).

Figure 5.22 : Nutritional Status of Children aged 6-14 Years by Mothers' Education Level

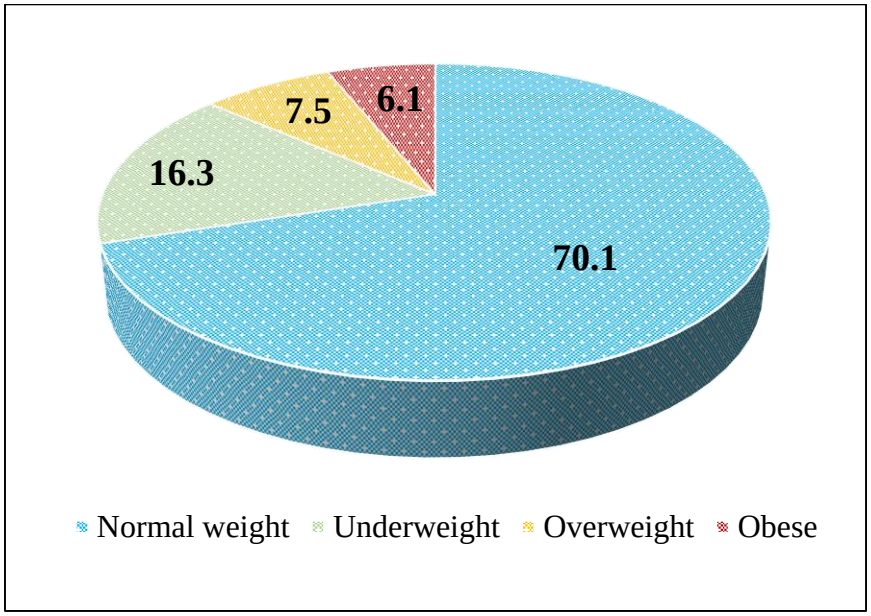


Source: Primary survey data

iii) Nutritional Status of Children aged 15-21 Years

Among the children in the age group of 15-21 years, 70.1 per cent had normal weight, followed by a significant proportion of them (16.3%) being underweight. The prevalence of overweight and obesity among them was 7.5 per cent and 6.1 per cent respectively (Figure 5.23).

Figure 5.23: Nutritional Status of Children aged 15-21 Years



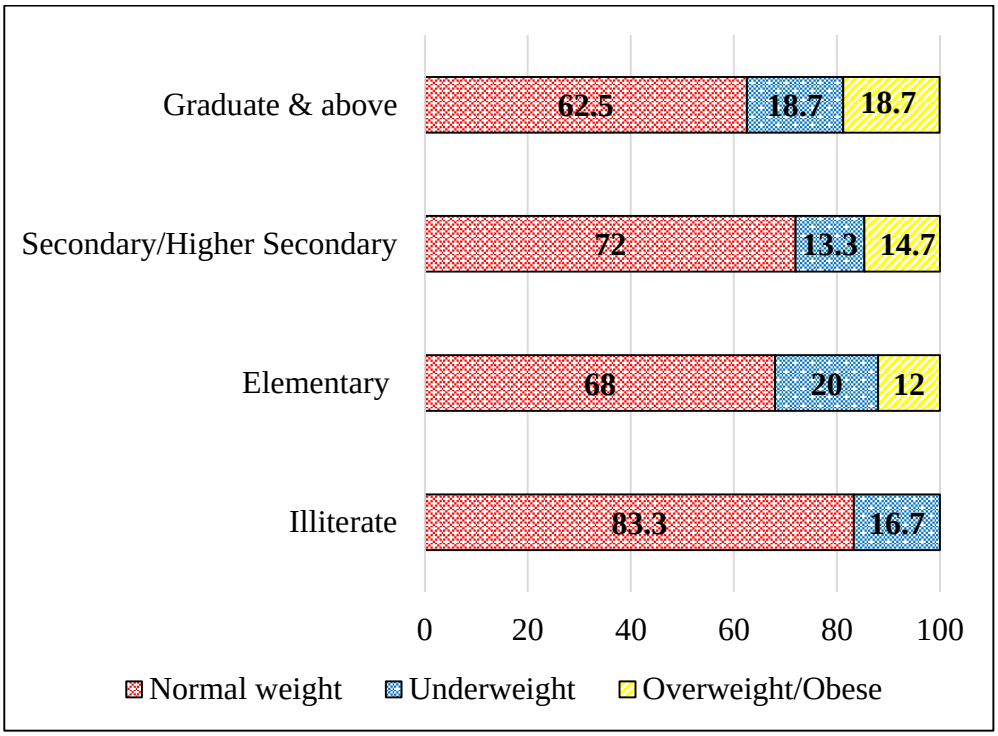
Source: Primary survey data

The prevalence of underweight, overweight, and obesity is a cause of concern in this age group, as this age group forms /going to form the productive workforce.

Impact of Mothers' Education on the Nutritional Status of Children aged 15-21 Years

The percentage of children in the age group of 15-21 years having normal weight ranged between the highest 83.3 per cent with illiterate mothers and the lowest 62.5 per cent with graduation and above educated mothers (Figure 5.24). This indicates that the proportion of children with normal weight reduced with an increase in the mother's level of education with an exception of mothers with secondary /higher secondary education. The proportion of underweight children was maximum 20 per cent in the case of children with elementary educated mothers while minimum 13.3 per cent among children with secondary /higher secondary educated mothers. Thus, these figures do not reveal any specific relation between mother's educational level and the children being underweight in this age group. Further, the presence of overweight /obesity increased from nil to 18.7 per cent with a rise in the level of mother's education from illiteracy to graduation and above educational attainment.

Figure 5.24: Nutritional Status of Children aged 15-21 Years by Mother's Education Level



Source: Primary survey data

Impact of Mothers' Education on Children aged 15-21 Years being Overweight or Obese

In the binary logistic regression model, it can be perceived that the mother's educational attainment had a positive relationship with the adolescent's overweight /obesity (β_1 =1.12). Adolescents of highly educated mothers had three times higher risk of being overweight or obese than those of mothers with lower education (Table 5.16). This showed an increased odds of adolescent being overweight or obese with each increase in the level of mother's education which was statistically significant at 5 per cent level (OR= 3.07, p =0.041 <0.05).

Table 5.16: Results of the Binary Logistic Regression Model for Mother's Education and Adolescents aged 15-21 Years being Overweight or Obese

Predictor	Coef. (β)	Std. Error	95% CI (β)	Odds Ratio (OR)	95% CI (OR)	p-value
Intercept	-4.41	3.41	-11.09, 2.28	-	-	0.197
Mother's Education	1.12	0.55	0.05, 2.19	3.07	1.05,8.93	0.041*

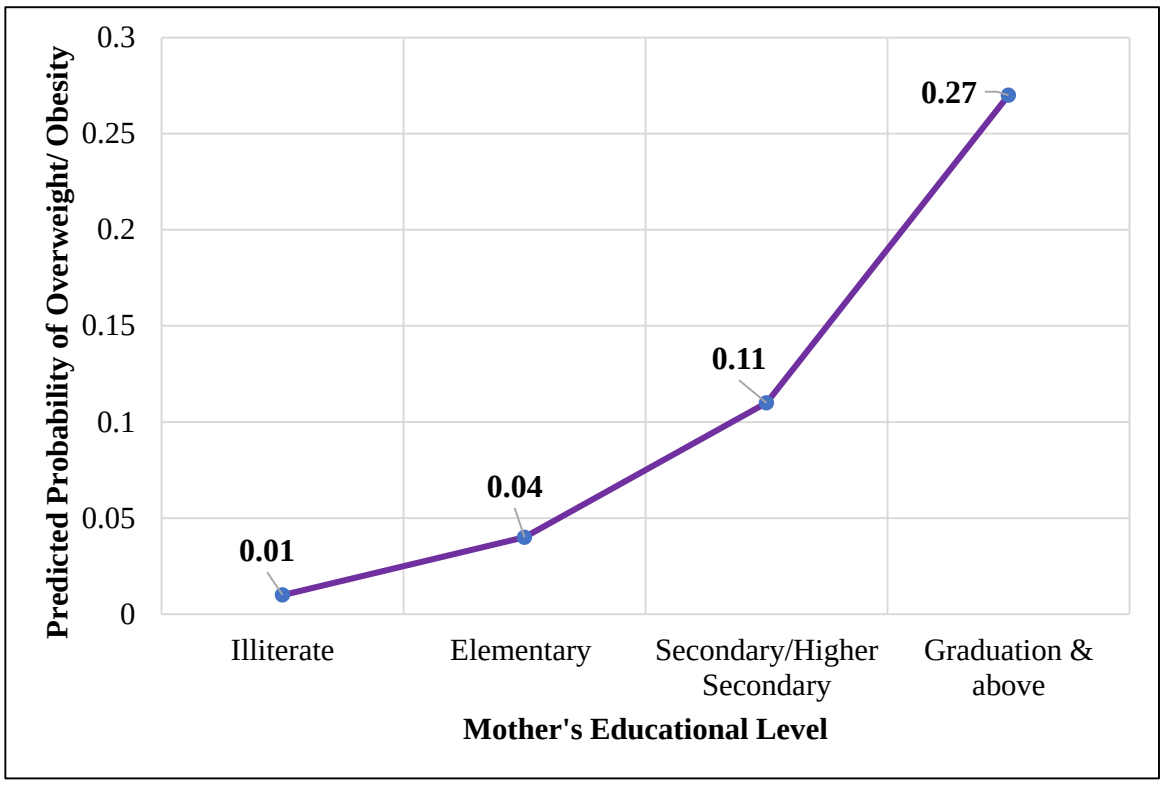
Source: Author's calculations based on primary data ** denotes significant at 5% level*

The fitted model with coefficients is as follows:

$logit(P) = -4.41 + 1.12\ Mother's\ Education + \varepsilon$

Figure 5.25 shows the predicted probabilities of overweight /obesity among adolescents aged 15-21 years across various levels of mother's education, controlling for socio-economic characteristics. It can be noted that the probability of being overweight /obese was very low, i.e., 1 per cent among adolescents of illiterate mothers, which increased to 27 per cent among adolescents having mothers with graduation or above levels of education.

Figure 5.25: Predicted Overweight /Obesity among Adolescents aged 15-21 Years by Mother's Education Level



Source: Based on primary survey data

The upward sloping curve indicates a strong positive relationship between mothers' educational attainment and the risk of adolescent children being overweight /obese. This indicated that the odds of overweight /obesity among adolescents increased with an improvement in maternal education. Adolescents of highly educated mothers had more than 25 times the risk of being overweight /obese than those who had illiterate mothers.

5.3.4c Discussion

It is observed that wife's education had a statistically significant association with her husband's self-reported health as per the chi-square test results revealing that husbands of highly educated women had better health status. This could be due to the influence of women's education on healthy behaviour, diet, healthcare utilisation and health awareness, thereby improving their husband's self-reported health. According to NFHS data, the proportion of women with 10 or more years of schooling had a positive relationship with overweight or obesity among men, where each level of education was not considered. However, the binary logistic regression found that with every unit rise in the wife's education, the odds of husband being overweight /obese declined. This shows that women's educational level played a crucial role in making healthier practices and lifestyle choices at home. Thus, women's education has the potential of creating a positive impact on their husband's health. This finding is consistent with a few previous studies where the husbands of women with higher levels of education were found to have better health status (Strogatz et al., 1988; Hurt et al., 2004; Putri, 2019) and household's health status improved with an increase in female education (Menon, 2007).

The above analysis has shown a significant influence of women's education on husband's health and the risk of being overweight and obese among husbands. This highlights the critical role of women's education in sculpting their family's health outcomes. A better health status among husbands and a lower risk of being overweight /obese are linked to higher education levels among women. This indicates a greater health awareness, healthy diet and lifestyle practices among households having women with higher educational attainment.

The assessment of underweight children belonging to different age groups by mother's education level highlighted diverse results.

Children aged 5 years or below being underweight belonged to mothers with graduation or higher level of education. This could be because the mothers' who are employed are unable to provide personal care to their children.

In the age group of 6-14 years, all the underweight children belonged to mothers with elementary education. In the case of children aged 15-21 years, the mother's educational level did not show any association with the child being underweight. These results show that

the mother's education is not the sole factor that determines the child being underweight but other factors, such as the mother's employment status, medical conditions, genetic factors, etc. could be responsible for underweight children.

Among adolescents the probability of being overweight or obese had significantly increased with every rise in mother's education level. This could be the result of reduced parental control and monitoring, greater access to calorie rich food, increased academic pressure, sedentary lifestyle, hormonal changes, mothers' employment status, etc. Previous studies have found that children of highly educated parents had a lower chance of being overweight (Perez-Farinos et al., 2017). In different circumstances, it was also spotted that children of mothers with higher education had a significantly greater probability of being overweight /obese (Chesti et al., 2022).

Thus, the association between mother's education and the risk of being overweight /obesity among children varies by age. Overall, women's education is crucial in determining the family's health; however, age-specific policies for children are required to address the increasing risk of overweight /obesity among older children and reduce the extent of underweight.

5.3.5 The Lifestyle Patterns and Prevalence of NCDs among Households by Level of Female Education.

This sub-section first deals with the lifestyle patterns and the prevalence of NCDs among women by their educational level and then the lifestyle patterns and the presence of NCDs among husbands of the women respondents by their educational level.

People with higher levels of education are more likely to consume a healthier diet (Biesbroek et al., 2018; Azizi Fard et al., 2021; Islam & Sim, 2021), healthy food items more frequently, such as fruits (Cai et al., 2007; Biesbroek et al., 2018; Azizi Fard et al., 2021), vegetables, and fish (Biesbroek et al., 2018; Azizi Fard et al., 2021), while the consumption of unhealthy foods, such as meat, French fries, and sugar-containing soft drinks, was found to be lower among them (Biesbroek et al., 2018).

In this study, the impact of education on the presence of NCDs among women and their husbands was analysed by using the binary logistic regression model. The association

between education and Healthy Lifestyle Index (HLI) was examined using the ordinal logistic regression model.

Eight variables were considered to calculate the HLI score, including intake of vegetables /fruits, consumption of fish /eggs, intake of fast food /food items high in salt, sugar, and fat, engagement in exercise/yoga, screen time, smoking, alcohol intake, and tobacco use. The HLI score was obtained by adding the total score of every respondent, which was then grouped into three categories: i) Low HLI (0-17), ii) Moderate HLI (18–21), and High HLI (22–24) (Please refer to Chapter III for detailed methodology).

5.3.5a The Lifestyle Patterns and Prevalence of NCDs among Women by their Education Level

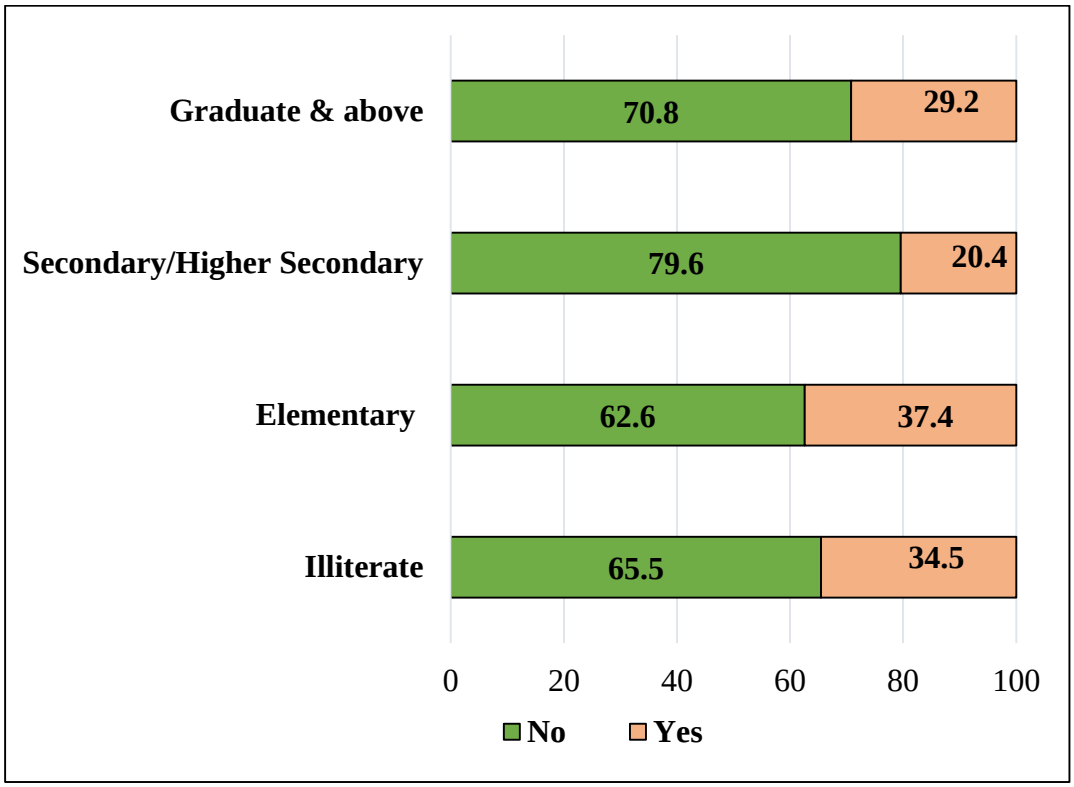
In modern times, noncommunicable diseases have emerged as the major cause of death and disability. The present study tried to relate the prevalence of NCDs with a focus on diabetes and high blood pressure. A healthy diet determines the health status of the individuals. Intake of healthy diet prevents the occurrence of disease and disability. The lifestyle patterns adopted by the people determines the presence of NCDs. Risk factors such as physical inactivity, alcohol intake, tobacco use, and unhealthy diets to be blamed for most of the NCD deaths occurring worldwide. Inadequate physical activity and intake of unhealthy food result in obesity, high blood pressure, etc. Hence, it is important to reduce these risk factors to minimise the incidence of NCDs.

The incidence of long-term disabilities was higher among people with lower education than those with higher education (WHO, 2013). The negative effects of cardiometabolic conditions on the quality of life (Gonzalez-Chica et al., 2017), the risk of death due to heart failure (Ge, Y. et al., 2022), and the risks of cardiovascular diseases and coronary heart diseases were observed to be greater among less educated than those with higher education (Petrelli et al., 2022).

i) Presence of Diabetes or High Blood Pressure among Women by their Education Level

This section examines the prevalence of diabetes or high blood pressure among women considering their education level.

Figure 5.26: Presence of Diabetes or High Blood Pressure among Women by their Education Level



Source: Based on primary survey data

Figure 5.26 clearly indicates the lowest prevalence of diabetes or high blood pressure among women with secondary /higher secondary education (20.4%), followed by women with graduation and above education (29.2%). However, this prevalence was significant among elementary educated (37.4%) and illiterate (34.5%) women. Thus, the prevalence of diabetes or high blood pressure among women with secondary and above levels of education was relatively lower compared to below secondary educated women.

The probability of women suffering from diabetes or high blood pressure reduced with a rise in their educational level as evident from odds ratio of 0.715 and negative education coefficient of 0.335 in the model. These results were found to be highly significant at 1 per cent level ($p = 0.006 < 0.01$) (Table 5.17).

Table 5.17: Results of the Binary Logistic Regression Model for Women's Education and Presence of Diabetes or High Blood Pressure

Variable	Coef. (β)	Std. Error	Odds Ratio (OR)	95% CI	p-value
Intercept	–0.382	0.214	0.683	0.449, 1.039	0.075#
Education	–0.335	0.123	0.715	0.562, 0.910	0.006**
Model Fit Statistics					
Omnibus Likelihood Ratio Test $\chi^2 = 7.55$, $p < 0.006$					
Cox and Snell R^2 =0.012			Nagelkerke $R^2 = 0.018$		

*Source: Primary survey data ** & # denotes Significant at 1% & 10% level*

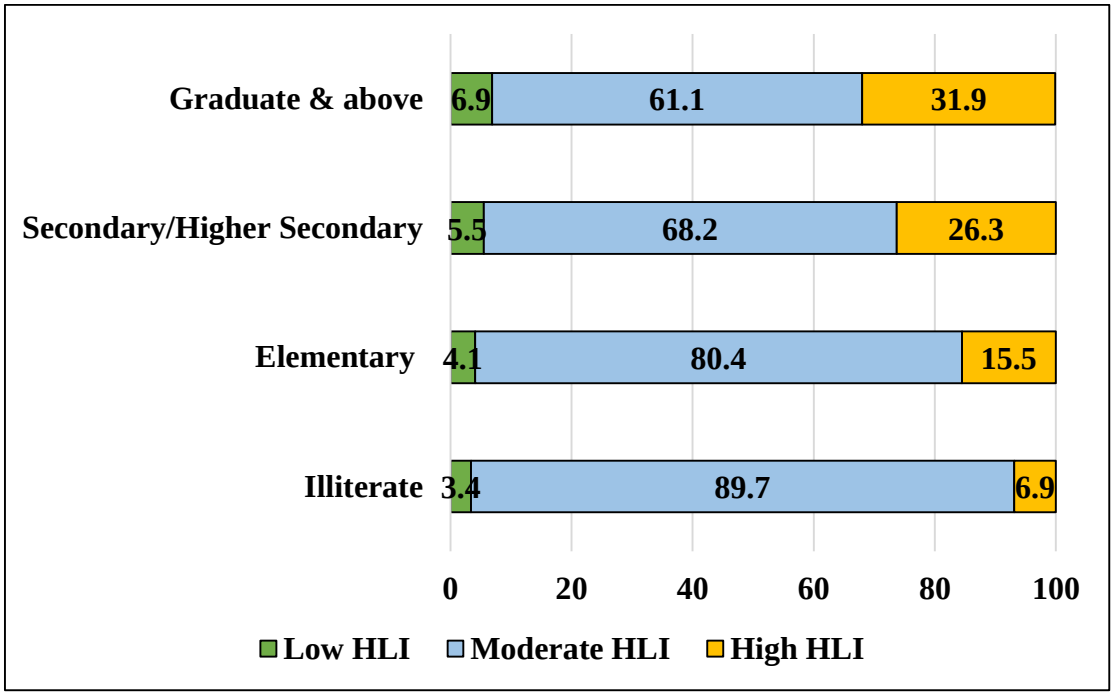
The fitted model with coefficients is given below:

$$logit(P) = -0.382 - 0.335\ Education + \varepsilon$$

ii) The Healthy Lifestyle Index (HLI) among Women by their Education

This section analyses the lifestyle patterns of women according to their educational attainment.

Figure 5.27: Healthy Lifestyle Index (HLI) among Women by their Education Level



Source: Based on primary survey data

A positive relationship between women's education and HLI can be noted wherein the percentage of women with high HLI increases and the percentage of women with moderate HLI decreases with an increase in their education level (Figure 5.27).

The results of the ordinal logistic regression model manifested that education was significantly associated with a healthier lifestyle among women (Table 5.18).

Table 5.18: Results of the Ordinal Logistic Regression Model for Women's Education and HLI

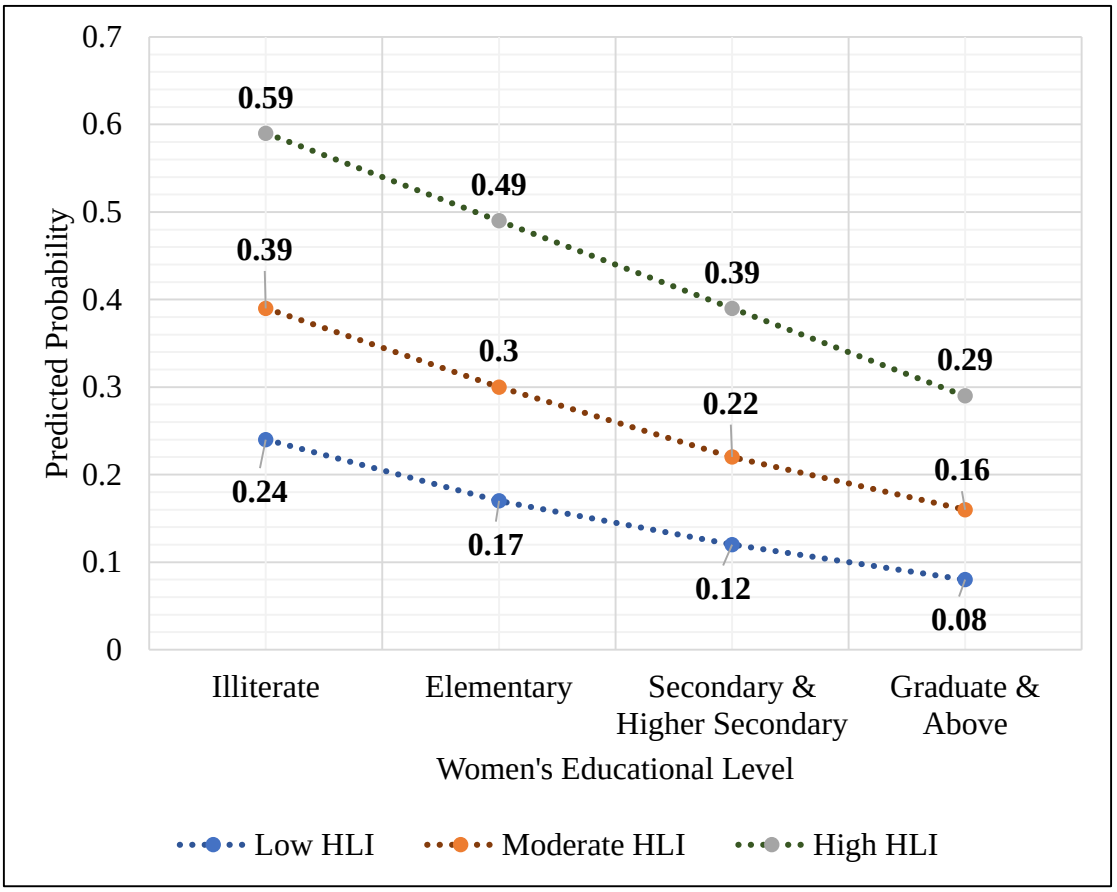
Variable	Coef. (β)	Std. Error	Odds Ratio (OR)	95% CI	p-value
Education	0.378	0.123	1.46	1.15,1.86	0.002**
Model Fit Statistics					
Omnibus Likelihood Ratio Test $\chi^2 = 9.52$, $p < 0.002$					
Cox and Snell $R^2 = 0.005$					
Nagelkerke $R^2 = 0.014$					
McFadden $R^2 = 0.011$					

*Source: Primary survey data ** denotes Significant at 1% level*

Highly educated women had 1.46 times higher odds of having a higher healthy lifestyle than those without education or with lower education. This result was statistically significant at one per cent level (OR= 1.46; p =0.002<0.01).

Figure 5.28 shows that the predicted probability of women suffering from diabetes /high blood pressure steadily declined with an improvement in their educational level across all HLI groups. Illiterate women with high HLI had the highest predicted probability (0.59) of diabetes /high blood pressure, whereas graduated women with low HLI had the lowest predicted chances (0.08) of these health issues, highlighting education as a strong protective factor. The probability of having diabetes /high blood pressure was lower among women with higher educational attainment, irrespective of HLI category. This could be because a person with NCD incidence is bound to follow a healthy lifestyle compared to a person who is already healthy or without an NCD.

Figure 5.28: Predicted Probability of Diabetes /High Blood Pressure among Women by Educational Level and Healthy Lifestyle Index (HLI)



Source: Based on primary survey data

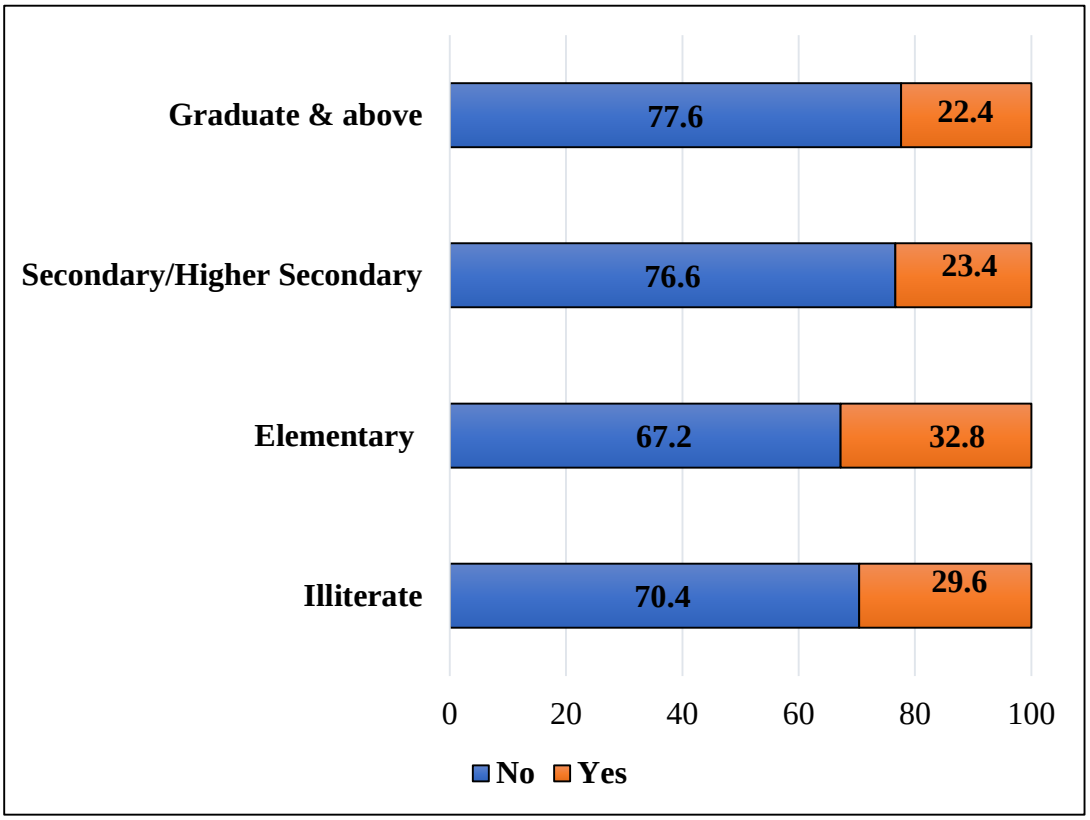
5.3.5b The Lifestyle Patterns and Prevalence of NCDs among Husbands by Women's Educational Level

Usually, it is wife who can shape the lifestyle patterns of husband and can help in controlling the risk factors of NCDs. It would be probably more so, if wife is more educated and has better awareness about the healthy lifestyle and risk factors of NCDs.

i) Women's Education and the Presence of Diabetes or High Blood Pressure in Husbands

The presence of diabetes or high blood pressure was the highest 32.8 per cent among husbands with elementary educated wives, followed by illiterate wives (29.6%). Husbands whose wives had a secondary or above level of education had a lower prevalence of these health issues (secondary /higher secondary=23.4% and graduation and above =22.4%) (Figure 5.29).

Figure 5.29: Presence of Diabetes or High Blood Pressure among Husbands by Women's Education Level



Source: Based on primary survey data

The prevalence of diabetes or high blood pressure among husbands according to the level of the wife's education is examined using the binary logistic regression model.

Table 5.19: Results of the Binary Logistic Regression Model for Women's Education and the Prevalence of Diabetes or High Blood Pressure among Husbands

Variable	Coef. (β)	Std. Error	Odds Ratio (OR)	95% CI	p-value
Intercept	–0.575	0.231	0.563	0.358, 0.885	0.013*
Women's Education	–0.260	0.130	0.771	0.598, 0.996	0.046*
Model Fit Statistics					
Omnibus Likelihood Ratio Test $\chi^2 = 4.01$, $p < 0.045$		Cox and Snell R^2 =0.007		Nagelkerke $R^2 = 0.011$	

Source: Primary survey data ** denotes Significant at 5% level*

The fitted model substituting coefficients is given below:

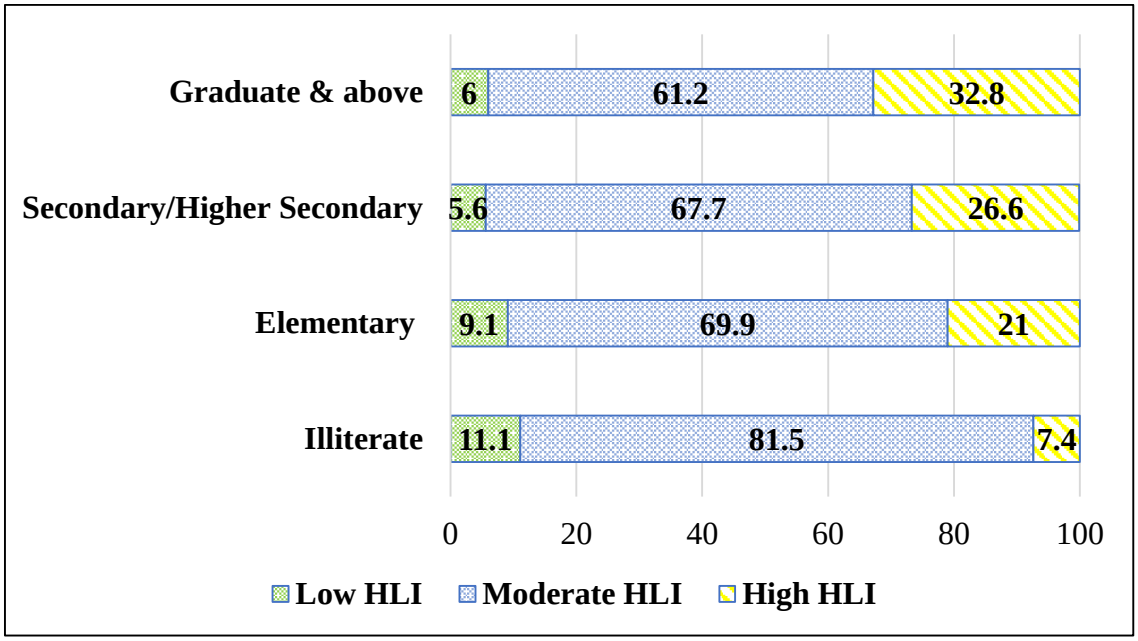
$$logit(P) = -0.575 - 0.260\ Women's\ Education + \varepsilon$$

The odds ratio of 0.771 and a negative coefficient of 0.26 reveals that women with higher education had a significantly reduced probability of their husbands suffering from diabetes or high blood pressure (Table 5.19). The odds of having these health issues declined by 23 per cent among husbands at higher levels of women's education, which was statistically significant at 5 per cent level (OR=0.771; p=0.046< 0.05).

ii) HLI among Husbands according to Women's Education

The ratio of husbands with high HLI increased from 7.4 per cent to 32.8 per cent, whereas those with moderate HLI decreased from 81.5 per cent to 61.2 per cent with an increase in their wife's educational attainment, as shown in Figure 5.30.

Figure 5.30: Husband's HLI by Women's Education Level



Source: Based on primary survey data

Women's education had a significant association with her husband belonging to the higher HLI group [OR=1.45, 95%CI (1.14, 1.85), p=0.003<0.01]. The odds of husbands being in the higher HLI group increased by 1.45 times with an improvement in women's education (Table 5.20). Thus, the husband's lifestyle index was positively influenced by the wife's education, thereby, increasing their chance of belonging to the high HLI group.

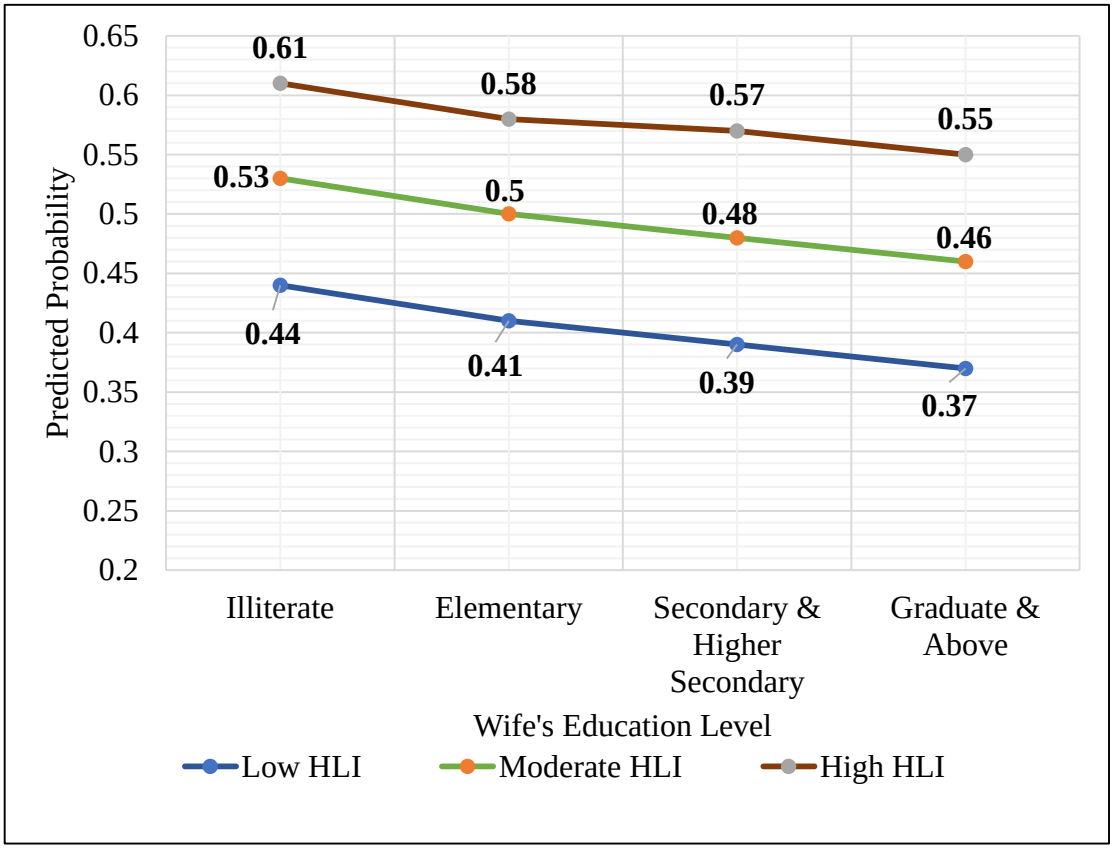
Table 5.20: Results of the Ordinal Logistic Regression Model for Women's Education and Husband's HLI

Variable	Coef. (β)	Std. Error	Odds Ratio (OR)	95% CI	p-value
Women's Education	0.370	0.123	1.45	1.14,1.85	0.003**
Model Fit Statistics					
Omnibus Likelihood Ratio Test χ^2 = 9.09, p < 0.003			Cox and Snell R^2 =0.005		
Nagelkerke R^2 = 0.013			McFadden R^2 =0.010		

*Source: Author's calculations based on primary data ** denotes significant at 1% level*

The predicted probability of a husband suffering from diabetes or high blood pressure had reduced slightly with a higher level of wife's education across all HLI groups (Figure 5.31).

Figure 5.31: Predicted Probability of Diabetes /High Blood Pressure among Husband by Healthy Lifestyle Index (HLI) and Wife's Education



Source: Based on primary survey data

The probability of husbands suffering from these health issues was lowest among women with higher education (0.37) and highest among husbands of illiterate wives (0.61). Hence, the probability increased with HLI within each educational level, reflecting that those who suffered from these health issues had adopted healthier lifestyle, thereby improving their HLI scores.

5.3.5c Discussion

The probability of women suffering from diabetes or high blood pressure was relatively lower among more educated women. The reason for this may be the association of higher education with better access to health information, regular health checkups, and the adoption of healthier lifestyles. This finding supports the findings of previous studies that found a greater risks and NCD presence among less educated people than those with higher education (Nagel et al., 2008; Chung et al., 2015; Ghazali et al., 2015; Rawal et al., 2017; Dutta et al., 2022). Similarly, a negative association was reported between educational level and the prevalence of hypertension (Mpofu et al., 2016; Ghosh & Kumar, 2019; Lalu et al., 2021) and diabetes (Williams et al., 2010; Lee et al., 2011; Addo et al., 2017; Kim et al., 2017; Steele et al., 2017; Wu et al., 2019). However, it contradicts the result obtained in a few past studies that showed a positive relation of education with the diabetes prevalence (Corsi & Subramanian, 2012; Wang et al., 2014; Addo et al., 2017; Kusumaningrum & Ricardo, 2022).

Women with higher education were more tend to have higher HLI than illiterate women or those with lower education. This indicates a crucial role played by education in adopting healthy behaviours among women. This result supports the various previous studies that highlighted an increase in the consumption of fruits and vegetables among women with higher levels of education (Mpofu et al., 2016; Costa et al., 2018; Velhinho & Perelman, 2021; Darmawan et al., 2023), gradual increase in fish intake among women with an increase in their educational level (Velhinho & Perelman, 2021), lower consumption of unhealthy food items among people with higher education (Blanck et al., 2007; Deshmukh-Taskar et al., 2009; Qobadi & Payton, 2017; Velhinho & Perelman, 2021), lower odd of smoking or using tobacco among highly educated people than that of illiterate or less educated people (Mpofu et al., 2016; Rawal et al., 2017; Mwangi et al., 2020; Muthamma, 2022; Zubair et al., 2022), more likely engagement in physical activity among women with graduation and

higher educational attainment than those with lower education (Lee et al., 2011; Murtagh et al., 2015; Mpofu et al., 2016; Steele et al., 2017). However, a few studies have reported a higher consumption of fast food (Hidaka et al., 2018) and a higher alcohol intake among women with higher education (Bloomfield et al., 2006; Lee et al., 2011; Grittner et al., 2013; Steele et al., 2017).

The chance of the husband suffering from diabetes or high blood pressure declined significantly with an improvement in the wife's education level. Similarly, a positive association was reported between the husband's HLI and the wife's education.

Overall, the above results indicate a key protective role played by women's education in health outcomes. Higher education may reduce the suffering from chronic health issues, especially among women. Concurrently, it promotes healthy behaviours among family members. Thus, higher educational attainment may contribute to healthier lifestyles and reduced NCD burden, suggesting the implementation of policies integrating education and public health.

CHAPTER VI

CONCLUSION AND SUGGESTIONS

6.1 Introduction

6.2 Major Findings

6.2.1 Educational and Health Status of Goa and India

6.2.2 Women's Educational Level and Socio-economic Status

6.2.3 Women's Educational Level and Workforce Participation by Social Category

6.2.4 Impact of Women's Education on their Health by Employment Status and Social Category

6.2.5 Impact of Female Education on the Health of her Husband and Children

6.2.6 The Lifestyle Patterns and Prevalence of NCDs among Households by Level of Female Education

6.3 Conclusion

6.4 Recommendations

6.5 Limitations of the Study

6.6 Scope for Further Research

CHAPTER VI

Conclusion and Suggestions

6.1 Introduction

Development of Human Capital is indispensable for the socio-economic advancement of a society. Therefore, improvement in education and health - the major sources of human capital is essential. Considering their importance, the UNDP through its Millennium Development Goals of 2000 and the Global Sustainable Development Goals has been fostering the development of Health and Education with its SDG Goal 3 and 4 respectively.

Education is one of the strongest instruments through which we can achieve equity and human development (UNDP, 2013). The role of female education is indisputable in transforming communities, countries, and the entire world (UNICEFa, n.d.).

Goa is the smallest state of India which has better socio-economic, demographic and health indicators, compared to most of the other states of India. However, the state has shown poor performance in a few health indicators, such as obesity, wasting among children, anaemia, and noncommunicable diseases.

In this background, the present study attempted to analyse the impact of female education on the socio-economic and health status of the family by using primary as well as secondary sources of data. For the empirical exploration, the State of Goa with a focus on Tiswadi taluka of North Goa district and Ponda taluka of South Goa district was chosen. Specifically, the study examined the impact of women's education on employment and household income, workforce participation, their self-reported physical health, husbands' health, and the nutritional status of their children. The study also assessed the influence of women's education level on the prevalence of NCDs and lifestyle patterns among households. This is a micro level study, however, the findings obtained here can be generalized at the macro level as well in areas with similar features.

This chapter presents the major findings of the study, draws conclusions, puts forth suggestions /recommendations to different stakeholders, discusses the limitations of the study, and highlights the scope for further research.

6.2 Major Findings

In this section, the major findings of the study based on secondary sources of data and objective-wise findings based on empirical investigation have been presented.

6.2.1 Educational and Health Status of Goa and India

- Goa, one of the advanced states of India, exhibits a remarkable increase in the per capita GSDP and rapid urbanization. The educational status has improved significantly in the state compared to the national level with a rise in the proportion of highly educated people. Importantly, the ratio of women attaining higher levels of education has also soared significantly in Goa as compared to all India average.
- Reductions in the birth rate and IMR have been observed at the state and national levels. Health indicators, including birth rate, underweight, anaemia among women, men, and children, IMR, U5MR, and stunted children, are better in Goa than in India. There has been an improvement in the state's Health Index value. However, health indicators such as anaemia prevalence and overweight or obesity among women show an increase, whereas the percentage of underweight women indicates a decline with an improvement in the proportion of women with 10 or more years of education at both the state and national levels.
- The prevalence of anaemia and overweight or obesity among men has increased, whereas the proportion of underweight men has declined along with an increase in the proportion of women having 10 or more years of schooling.
- Health indicators among children, such as IMR, U5MR, stunting, and underweight, depicted a negative trend, whereas anaemia prevalence revealed a positive relationship with the percentage of females with 10 or more years of education, while it did not reveal any connection with wasted children.

6.2.2 Women's Educational Level and Socio-economic Status

The first objective of the present research was to study the relationship between the level of female education and their socio-economic status, the main findings of which are given below.

- There was a significant association between women's educational level and the place of residence, with women residing in urban areas being highly educated than those in rural areas.
- Inequality in educational attainment was observed among women belonging to various social groups, in which general and OBC women were highly educated, whereas SC /ST women had comparatively lower levels of education.
- Education was the strongest determinant of family income, as shown by the Kruskal-Wallis test. Women with higher education had a higher family income and economic status. Hence, the odds of women belonging to higher-income groups increased with higher educational levels.
- As highlighted by K-means clustering analysis, higher education improves women's socio-economic status only when it is combined with formal employment. Thus, the findings have indicated that women's educational attainment is important for enhancing socio-economic status but education alone is not enough to improve the same.

6.2.3 Women's Educational Level and Workforce Participation by Social Category

- Higher education increased the chances of women being employed, which was statistically highly significant. However, education improved the employability of women belonging to the general and OBC categories but not of the SC /ST categories.
- Women's participation in the workforce was not significantly determined by education level or social category alone, but other factors, including marital status, age, and family income, played a major role in determining their workforce participation.

6.2.4 Impact of Women's Education on their Health by Employment Status and Social Category

- The study revealed that educational attainment had a highly significant association with self-reported health among women. This established that highly educated women had a higher chance of reporting better health than illiterate or less educated women. Similarly, they were more likely to report excellent health than others.
- Higher education improved self-perceived health of only general and OBC women and not of women belonging to the SC and ST categories. Similarly, self-perceived health improved with education only of employed women.

- Education appeared to be negatively linked with BMI among women showing a significant decline in BMI with an improvement in education. The chances of being overweight or obese were lower among women with higher education.

6.2.5 Impact of Female Education on the Health of her Husband and Children

- The wife's education was found to be significantly associated with her husband's reported health. Women's higher education level resulted in better health among husbands. However, the study could not establish a low probability of her husband being overweight /obese with an improvement in her education.
- The underweight children aged 5 years or below belonged to highly educated mothers while the underweight children aged 6-14 years belonged to elementary educated mothers. The educational level of mothers did not show any relationship with underweight children in the age group of 15-21 years.
- An increase in the risk of being overweight or obese among children aged 6–14 years was found to be significant and a positive association between mothers' education and children being obese or overweight is observed. Similarly, the odds of adolescent children of higher educated women being overweight or obese was significant.

6.2.6 The Lifestyle Patterns and Prevalence of NCDs among Households by Level of Female Education

- Women with higher levels of education had a significantly lower chance of suffering from diabetes or high blood pressure.
- The probability of women belonging to the higher HLI group increased with higher levels of education.
- A significant decline in the odds of the husband suffering from diabetes or high blood pressure was observed with an increase in the wife's education level.
- Likewise, the husband's HLI was positively associated with the wife's educational level.

6.3 Conclusion

- Goa has performed better than most of the states of India, and overall national averages in terms of socio-economic and many health indicators. However, its performance in a few health indicators, including anaemia, overweight /obesity, and wasting among

children is poor despite the improvement in female education. Disparities in educational attainment were found based on place of residence and social categories, with a larger proportion of women with higher education belonging to urban areas, and general and OBC categories. It also depicted that higher education increased the chances of women belonging to higher income groups getting regular employment, thereby improving their economic status further. Clustering analysis revealed that higher education improves family income only when women are engaged in regular employment. Thus, higher education is not the only factor that determines women's household income and socio-economic status, but their nature and status of employment also play a crucial role.

- In general, the study showed that higher education improved the employability of women, but it did not guarantee the engagement of SC /ST women in employment possibly due to inadequate skills, engagement of spouses in regular jobs, low access to quality education, lack of regular employment opportunities, low salaries in private and informal sectors vis-à-vis the wages of caregivers and domestic help, etc. The workforce participation of women was not significantly determined by education or social category, but other factors, including age, marital status, and household income also affected their participation in the labour market. Hence, women's employment status is not necessarily dependent on higher education alone, but favourable socio-economic conditions are also indispensable for women to be employed.
- A better health status was reported by women with higher education, and higher education improved the self-perceived health status mostly of women belonging to general and OBC categories and not of SC/ST women. This could be due to their lower socio-economic status leading to poor standard of living, insufficient nutrition, and inadequate access to quality healthcare services, etc. Similarly, better self-reported health status was seen mostly among employed women with higher education may be because of more physical activity, greater health awareness, access to better health facilities, and socialisation. This intimated that apart from higher education, other factors, such as social category and employment status, determine the health status of women.
- The analysis based on NFHS data revealed a direct association between women's educational level and overweight or obesity, whereas the empirical analysis emphasised that highly educated women were less probable to be overweight or obese. The reason for this contradictory result could be that the analysis based on NFHS data included all

levels of education from 10 years of schooling and above in one category. But, the consideration of all levels of female education separately in the empirical analysis facilitated to identify the significant role played by each level of education in reducing overweight or obesity among women. Although, women's health status varies by employment status and social category, the impact of education on their health cannot be ignored.

- Husbands' self-reported health status improved in the case of more educated wives, highlighting the greater impact of the wife's education on husband's diet, healthy behaviour, etc. The secondary data analysis revealed the existence of a positive relationship between the proportion of women with 10 or more years of schooling and men being overweight /obese, while the empirical analysis reported that they were less likely to be overweight /obese when their wives had higher educational attainment. The non-inclusion of different levels of education in the secondary analysis could be the reason for this contradiction. Overall, women's educational level plays an instrumental role in influencing their husbands' health status and their odds of being overweight /obese.

- It was discovered that the risk of overweight or obesity was lower among children aged 5 years or below, whereas it increased among adolescents with an increase in the mother's education level. Thus, the impact of a mother's education on a child's odds of being overweight /obese varied according to age. This could be due to the difference in the scope and the probability of mothers having a say in managing and controlling children's food intake and lifestyle as per the children's age.

- Lastly, the presence of diabetes or high blood pressure was lower among women with a higher education level, and the Healthy Lifestyle Index was found to be higher among highly educated women, indicating improved health behaviour, regular health checkups, and better access to health information and healthcare facilities, etc. among highly educated women. The risk of developing diabetes or high blood pressure was significantly lower among husbands, and they were more likely to have high HLI when their wives had higher educational attainment. Thus, women's education plays a caring role in determining the prevalence of NCDs and lifestyle patterns among them and their husbands.

6.4 Recommendations

The present study highlighted the positive implications of women's education on the socio-economic and health status of their families. The following are the recommendations based on the findings of the study, the areas of concern and requirement of improvements in the socio-economic and health status in the economy, leading to the betterment of mankind.

i) Improving the Educational Level and Socio-economic Status

- It is essential to have easy access to education, especially higher education, for socio-economically backward and/or disadvantaged classes. It is necessary to ensure that the existing government schemes intended to promote women's education, such as Post Matric Scholarships, Bursary, Fee Waiver for SC /ST students pursuing Higher Education, Interest free education loan, Manohar Parrikar Goa Scholars Scheme, Central Government Funded Schemes like PM-Vidyalaxmi, etc. reach the most deserving children. The procedure to avail these schemes should be simple and clear with appropriate virtual demonstrations. There is a need to create a wider awareness of the schemes meant for the underprivileged. Here, the higher educational institutions should play a major role in creating awareness among students and their parents. Publicising these schemes in local languages through social media /panchayats would be useful.
- Along with formal education, providing occupational skills and training, especially in the form of dual programmes as per the UGC guidelines, coaching for entrance and competitive exams would be helpful in empowering female students and enabling them to be more competitive in procuring jobs and improving their earning capacity. Educational institutions can take the initiative in this regard with the due support from the local bodies and government.
- Organising mentoring and counselling programs, for SC and ST girls and women to provide them with emotional and academic support, and tracking their enrollment, dropout, and graduation rates until the completion of their education would be helpful in educating and improving their socio-economic status. The success stories of SC /ST women with higher education should be highlighted to motivate young girls. The various schemes available will be successful only when the students are motivated and aspiring and are wholeheartedly supported by their parents.

- Thus, a comprehensive approach that integrates education with formal employment is necessary to improve women's socio-economic status with the involvement of educational institutions, NGOs, and local and government bodies.

ii) Enhancing Labour force Participation of Women

- A data base of educational attainment and the availability of job opportunities in the public and private sectors might ensure an equitable labour market scenario. It is observed that a large proportion of educated women were homemakers /unemployed, especially among socially disadvantaged groups. The establishment of job placements and career guidance services, initiating the policies that support women's workforce participation, including flexible working hours /arrangements and childcare facilities. Flexible working hours should be promoted to enable women to accommodate their family responsibilities. Adequate paternity leave should be provided in addition to the paid maternity leave so that both parents share child-rearing responsibilities without compromising the women's employment. Affordable and high-quality childcare options are needed to enable women to work without bearing high childcare costs in their absence.
- Improving employment access in rural and semi-urban areas, building professional networks, and enhancing mentorship opportunities are crucial for boosting socio-economic outcomes. Female entrepreneurship should be encouraged by improving access to credit and subsidies and creating better awareness about the various government schemes which are already in place. Entrepreneurship development organisations and funding agencies should effectively implement schemes to encourage self-employment. Panchayats, marketing agencies, and NGOs can be more effective in making the self-help groups more active in creating awareness of the schemes, improving the skills, and handholding in different aspects of entrepreneurship with the least requirement of initial investment by women.
- Access to quality education must be provided to SC /ST girls and women to enhance their participation in employment. Furthermore, a comprehensive hiring practice, strong non-discriminatory measures, and individualised career counselling and mentorship initiatives are needed to ease socio-economic constraints.

- NGOs and panchayats should organise training programs to impart digital skills, financial literacy, and improve communication and vocational skills to empower women, especially those belonging to disadvantaged groups, so that they are encouraged and motivated to take up the jobs. It is also the responsibility of the family members, including spouses, in-laws, and others, to encourage and provide the required support to enable women to participate in the labour market.

iii) Improving the Health Status of Women

- Improved access to quality healthcare services by the state government through increased awareness about various healthcare schemes and services available such as Deen Dayal Swasthya Seva Yojana, Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana, etc., to ensure equal health benefits for all individuals.
- Programs targeted at improving health and nutrition, literacy, better living conditions and social welfare schemes from local government and NGOs are needed. Women's reproductive health and related issues, along with nutrition, need to be discussed in rural areas and educational institutions. Mobile healthcare services need to be deployed to reach the backward and tribal areas.
- Women should prioritise their personal health, including regular checkups, seeking medical care on time, having better nutrition and lifestyle. Family members should also provide the required resources and support to women to improve their health.

iv) Enhancing Husband's Health Status and Children's Nutritional Status

- Policies should be targeted towards enhancing access to healthcare services, and couple-based preventive healthcare measures should be encouraged.
- Health check-up and awareness camps should be organised by panchayats and municipalities to ensure increased awareness and better utilisation of healthcare facilities.
- Easily accessible fitness facilities to encourage physical activity and incentives to maintain a healthy weight should be provided by the local bodies.
- Anthropometric measurements of children should be undertaken regularly in Anganwadi centres /educational institutions to identify undernourished, malnourished, and overweight /obese children so that appropriate measures can be taken on time. Childcare

leave to mothers to take adequate care of their infants and below 5 year old children would be useful in bringing down the number of undernourished children to zero.

- Specific measure targeted toward addressing lifestyle and dietary patterns in school-going children is also needed. Nutrition education is also required to be imparted to parents focusing on health improvement by promoting balanced diets and reducing the intake of calorie-dense and unhealthy foods. In addition, there is a need to promote regular physical activity, and monitor the availability of unhealthy food items and growth patterns among older children in the educational institutions.
- Targeted interventions toward preventing excessive screen time, a sedentary lifestyle, and minimising parental academic pressure can also help in prevention of obesity among older children.
- Regular physical education classes should be implemented not only in schools but also in higher educational institutions. Healthy food options should be made available in canteens and restrict the sale of fast foods, sugary drinks, and salty snacks to curb obesity and related health issues.
- An integrated approach involving parents, educational and community institutions is required to ensure that the benefits of a mother's education leads to healthy growth among children of various age groups. Therefore, investing in women's education and empowerment is important for their better health outcomes, as well as their spouses and children.

v) Minimising the Incidence of NCDs and Improving Lifestyle Patterns

- Integrated health services including routine checkup, counselling on NCDs, nutrition, and screening should be provided.
- Frequent screenings to detect anaemia, high blood pressure, high blood sugar, BMI should be undertaken by local bodies, health centres along with NGOs especially for individuals aged 30 years and above.
- The prevalence of NCDs can be reduced by promoting healthy home environments through a balanced diet and reduced sedentary behaviour.
- Apart from improving women's access to higher education, health literacy addressing lifestyle and NCDs should be incorporated in the school and college curriculum, which can aid in NCD reduction and prevention.

- Joint activities such as sports, yoga workshops, etc. should be organised on regular basis by NGOs and local bodies for reducing NCDs and related risk factors. Healthy food items including fruits, vegetables, etc. should be subsidized or provided at reasonable prices in local outlets so as to encourage them to include these items in their regular diet.

From the study, it can be concluded that Goa can be a model state if there is full and proper utilisation of the various existing schemes and initiatives of the Government, local bodies, NGOs, and educational institutions in the state. It would help to improve the access to quality education, better employability, self-care of health with healthy lifestyle, proper attention to health issues. Proactive participation on the part of the individuals, family and society is essential for the socio-economic betterment.

6.5 Limitations of the Study

The following limitations came on the way to have the universal application of the study.

- The primary data required for the present study were gathered from only two talukas of Goa, i.e., the Tiswadi taluka of the North Goa district and the Ponda taluka of the South Goa district, due to time and money constraints.
- Another limitation of the study is the reliability of the information provided by the respondents, as the primary data are based on the responses of women, who may not always be able to provide accurate information. Additionally, all the data relating to health status obtained from women respondents are self-reported; therefore, there is a possibility of biasness in reporting, which may have led to underestimation or overestimation of results. The height and weight of the women, their husbands, and their children were self-reported and not based on the anthropometric measurements.
- Only two major NCDs, i.e., Diabetes and high Blood Pressure were considered in this study.
- The present study considers education, income, and employment as the three main socio-economic indicators, where the economic status of the family didn't consider the wealth index of the respondents.
- Last but not the least, the secondary data analysis was confined only to 10 or more years of schooling without grouping each level of schooling /education separately due to non-availability of category-wise data.

6.6 Scope for Further Research

This study attempted to explore the impact of women's education on their socio-economic and health status in Goa.

- There is a lot of scope for further research with respect to analysing the contribution of female education toward the socio-economic status and the health of the family by conducting a comparative study to include Goa with other states of India or any other region of the country.
- This study considered only the physical well-being of the family where mental health was not considered; hence, future study can be extended to include mental health status.
- The assessment of family health included the health of the woman, her husband, and their children. However, future research can be extended to study the impact of female education on the health status of other family members.
- Reliable anthropometric measurements and medical reports could be used to assess the health status in future research. The association between mother's educational level and overweight/obesity among children aged 5 years or below can be tested by collecting a larger sample of children in this age group.
- The future study can investigate the quantity of healthy and unhealthy food consumed by the households and the number of hours spent in physical activity.
- The association between overweight /obesity among children and their lifestyle patterns, as per mother's education and employment status, can be investigated in future studies.

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ANNEXES

ANNEXURE-I

QUESTIONNAIRE

A study on "Impact of Female Education on Family Health and Socio-economic Status"

This is a part of the research work related to the Ph.D. degree of Ms. Manisha Phadte (Assistant Professor, Department of Economics, Govt. College of Arts, Science & Commerce, Khandola-Goa), Research Scholar, under the guidance of Dr. Seema P. Rath, Professor, Cluster Research Centre in Economics, Govt. College, Sanquelim, Goa. (Goa University)

Note: The undersigned is participating in research on the topic mentioned above which is expected to lead to her Ph.D. degree. Information provided will be used solely for research and academic purposes only. I assure you that your personal information and identity will be kept confidential. This questionnaire is to be filled on a voluntary basis. Thank you in anticipation for your time, cooperation, and valuable input.

Manisha Phadte
Research Scholar

Section A

General Information

1. Name of the village/ town:
2. Name of the respondent:
3. Place of residence: Urban/ Rural
4. Religion: Hindu / Christian / Muslim / others (please specify)
5. Category: SC / ST / OBC / General
6. Type of Ration Card held: APL / BPL / None

7. Type of family: Joint / Nucleate
8. Monthly family income:
9. No. of family members:
10. Details of family members:

Sr. No.	Age	Relation with the respondent	Gender	Education	Marital status	Age at marriage	Employment Status	Nature of Employment
1.		Self						
2.		Husband						
3.		Child 1						
4.		Child 2						
5.		Child 3						

Codes used: **Gender**: Male-1, Female-2

Level of education (Illiterate- 0, Below Primary- 1, Primary- 2, Below S.S.C- 3, S.S.C- 4, Below H.S.S.C- 5, H.S.S.C- 6, Under Graduate-7, Graduate- 8, Post Graduate- 9, Ph.D- 10, Others- 11)

Marital status: Married-1, Divorced/separated -2, Widowed - 3

Employment Status: Unemployed-1, self-employed-2, regular employed- 3, retired and earning -4, retired and not earning- 5, daily wages-6

Nature of Employment: Permanent-1, Temporary-2, Contractual-3, Housewife-4, Student-5

Section B

Physical and Mental Health

	In general, how would you rate your health? Excellent-1, Very Good-2, Good-3, Fair-4, Poor-5	Self-reported Weight	Self-reported Height	Do you have good appetite? Y / N	Type of health issues, if any (Diabetes, B.P., Heart disease, etc)	Consulted Doctor (Y/N)	Do you take any medication (Y/N)	Did you Visit doctor during last month (Y/N)	Whether COVID vaccine taken (Y/N)	Do you have continued interest or pleasure in your regular activities? (Y/N)	Do you get good sleep? If not, please mention the reasons.	At what time do you sleep in the night?	At what time do you get up in the morning?	Are you able to concentrate on your work or studies? (Y/N)	How often do you complain of headaches, stomach-aches / uneasiness or sickness? 1-Always, 2-Most of the time, 3- Sometimes, 4-Rarely, 5-Never
Self															
Husband															
Child 1															
Child 2															
Child 3															

Section C

Consumption & Lifestyle Patterns

	Milk/ Curd*	Vegetables & fruits*	Fish & Egg *	Meat/ Chicken*	Fast food/ food items high in salt, sugar, and fat (soft drinks, cakes or sweets, butter/ margarine spread/ sweet spreads, Chips, French fries, etc) *	Do you have breakfast regularly? Y/N	Do you have snacks between meals? *	Does your work/ job involve physical activity? Y/N	How often do you Exercise/ perform Yoga/ play outdoor games? *	No. of hours spent to watch television or play computer or video games per day?	Smoking (Y/N)	Chewing Tobacco (Y/N)	Drinking Alcohol (Y/N)
Self													
Husband													
Child 1													
Child 2													
Child 3													

Codes *: Daily-1, Twice in a week-2, Thrice in a week-3, Five days in a week- 4, Weekly-5, Sometimes- 6, Rarely- 7, Occasionally-8, Never-9, Twice in a month-10

How much is your Total Monthly family Expenditure on Health Care services and medicines?

Thank you for your kind response!

ANNEXURE-II

Goa University

(Establishment by State Legislature by Notification No:LD/10/7/84(D) of year 1984)
Sub P.O. Goa University, Taleigao Plateau, Goa, PIN 403206

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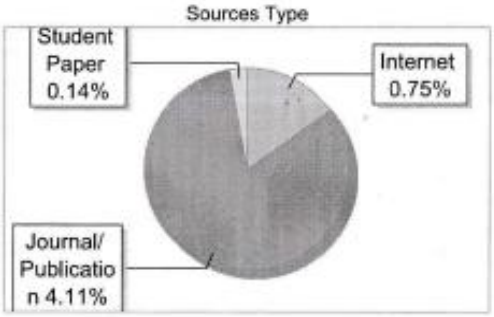
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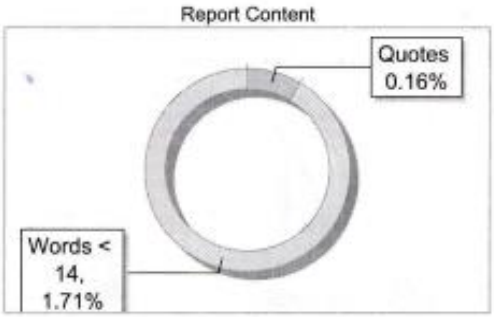
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Guide

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ANNEXURE-III

Undertaking on Ethical Practice

We hereby declare the following:

- **Ethical Considerations:** The present research adhered to due ethical considerations to ensure the integrity and credibility of the study.
- **Informed Consent:** Participants of sample study were fully informed about the research objectives, potential risks, and benefits of the research study.
- **Confidentiality and Privacy:** It is ensured that the participants' information is protected and confidentiality is maintained. It is also ensured that the collected information would be used only for academic and research purposes.
- **Conflict of Interest:** There is no conflict of interest in undertaking this study.

ANNEXURE-IV

A. Research Papers Published in Research Journals

- Published a research paper titled **"An Analysis of Educational and Health status of Scheduled Tribe Women in Goa"** in UGC care listed journal of Sanshodhak, June 2024, ISSN No. 2394-5990, Vol 25.
- Published a research paper titled **"Female Education and Risk Factors of Noncommunicable Diseases across India: An Exploration"** in Indian Journal of Pharmacy Practice, April-June 2026, Vol 19 (2), 281-287.

B. Research Paper Published in Edited Book

The research paper entitled **"Role of Female Education in Health Awareness and Prevention of Infectious Diseases with Special Reference to COVID-19 in Goa"** was published as a book chapter in a book titled Health Sector: Issues and Challenges by Right Way Publication and Distribution, Delhi, 27th October, 2025, ISBN:978-93-49894-21-1.

C. Research Papers Presented in Seminars/ Conferences

- Presented a paper titled "**Female Education and Child Health in Goa: Evidence from National Family Health Survey**" at the International Interdisciplinary Conference held Virtually organized by Federal Polytechnic Ekowe, Bayelsa State, Nigeria & Konkan Geographers' Association of India on the theme: Global Challenges and Economic Development in the 21st Century on 4th September, 2020.
- Presented a paper titled "**The Impact of COVID-19 Pandemic on Primary and High School Students in Goa**" in Inter-Disciplinary National Virtual Conference organised by PG Dept. & Research Centre in Economics, Govt. College, Sanquelim, Goa in Collaboration with Department of Economics, University of Kerala on 4th & 5th March, 2022.
- The research paper entitled "**Female Education and Noncommunicable Disease Risk Factors across India: An Analysis from NFHS-5**" was presented at the International Conference organized by Ganpat Parsekar College of Education, Harmal in

collaboration with Directorate of Higher Education, Porvorim held on 10th & 11th January, 2024.

- The research paper entitled "**Impact of Education on Health Status and Lifestyle Pattern among Rural Women in Goa**" was presented at the National Seminar organized by P.E.S. College, Ponda-Goa held on 15th February, 2025.
- The research paper entitled "**Influence of Education on the Nutritional Status of Women in Goa State, India**" was presented at the International Conference organized by K.V.S.M Government College, Nedumangad in collaboration with Government College, Sanquelim-Goa held on 17th March, 2025.

D. Participation in Capacity Building Workshops

- Participated in five days online National level workshop on SPSS Software & Research Methodology organized by South Asian Institute for Advanced Research & Development (SAIARD) in association with SPSS, South Asia from 01st to 05th September 2020.
- Attended one-month online internship in research training from 05/07/2021 to 05/08/2021 organized by MSME- Technology Development Centre (PPDC).
- Attended three days online international workshop on research methodology and doctoral colloquium organized by Department of Economics, University of Kerala from 27th to 29th January, 2022.
- Attended six days online workshop on Scholarly Writing and Publishing organized by the Knowledge Centre, Digital University Kerala from 07th to 12th February, 2022.
- Attended one day state level workshop on Questionnaire Design and Testing organized by Goa Business School, Goa University on 19th May, 2022.
- Attended three days international virtual workshop on Thesis Writing and Publication from 08/07/2022 to 10/07/2022 organized by Lavender Literary Club, Cape Comorin Trust, India, Malaysian Industrial Relations and Human Resource Association, Malaysia.
- Participated in the webinar "Designing your thesis using MS Word" organized by Gopan's Academy on 11th February, 2024.

- Participated in workshop titled "Empirical Publishing in Social Science Research: From Concept to Journal Page," held on 24th February, 2024 organized by MES Asmabi College, P. Vemballur.
- Participated in Workshops titled Handling Plagiarism and References Management using Mendeley (27th, 28th & 29th February 2024) and Statistical Data Analysis using SPSS (4th, 5th & 6th March 2024) organized by Dept. of Research & Publications, A2Z Edu Learning Hub LLP.
- Participated in Online Workshop on Qualitative Data Analysis using NVIVO from 04th July to 07th July, 2024 organized by the LekSha Research Centre, Gandhinagar, Gujarat.
- Participated in Seven-day National Level Faculty Development Programme titled "Data Analysis Using Jamovi," held from 15th -21st July, 2024 organized by Institute of Science & Management, Ranchi, Jharkhand.

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