## Major Activities of the Centre - July to December, 2024

**Participation in Seminar / Workshop / Training**

Dr. Jyoti S. Hallad attended Institutional Ethical Committee meetings at SDM College of Medical Sciences and Hospital, Dharwad on 16th, 23rd April, 21st May, 18th June, 12th July, 10th September, 3rd December, 2024 and 11th March, 2025 as an IEC member.

Dr. Shriprasad H., Associate Professor attended as a Resource person in a National webinar on Population and Health Status in India on the occasion of World Population Day organised by Department of Economics SDM college Ujire on 11th July 2024.

Dr. Jyoti S. Hallad presented a paper on "Data for Women from Women" at the Gender Conclave organized by National Council of Applied Economic Research, New Delhi during 25-26 September, 2024.

Dr. Praveen Chokhandre attended E-workshop on Sample size calculation essentials from theory to practice, organized by MED STAT INDIA from 22-23 July 2024.

Dr. Praveen Chokhandre and Mr. K. G. Kallihal attended One Week Online Workshop on Qualitative & Quantitative Data Analysis organized by the IQAC, Mata Sundri College for Women Delhi in collaboration with the Resilient Foundation for Academic Innovation & Scientific Research from 21st –27th September 2024.

Dr. Praveen Chokhandre and Dr. Nutan Kumari attended Five days online national-level faculty development workshop on "Qualitative Research and Data Analysis in Public Health and Social Sciences for Research and Impact Evaluations" (Hands-on with Software, including AI-Powered Software, ATLAS.ti), conducted by the school of public health, SRM Institute of Science and Technology, Tamilnadu during September 30 to October 5, 2024.

Mr K G Kallihal attended One day E-workshop on unlocking the secrets of successful scientific paper and poster presentations using AI tools on 8/10/2024 organised by MED STAT India

Dr. Nutan Kumari Presented a paper titled "Changes in female marriage age in India: the role of consanguinity" at 45th annual conference organised by the Indian Association for the Study of Population (IASP), in collaboration with the CSRD, Jawaharlal Nehru University (JNU), New Delhi during 12-14 December, 2024.

Dr. Nutan Kumari, Assistant Professor attended Field visits of 16th- Common Review Mission of National Hearth Mission (NHM) from l8th November to 23rd November 2024 in Delhi and Karnataka.

Centre organized a one-day workshop on KoboToolbox for fieldwork researchers. The event was jointly hosted by the Population Research Centre, JSS Institute of Economic Research, Dharwad, and the Department of Studies in Anthropology, Karnatak University, Dharwad. The workshop was inaugurated by the Director PRC, Dharwad on December 5, 2024. Mr. B. I. Pundappanavar and Dr. P. K. Chokhandre were the resource persons.

**Publications**

Jyoti S. Hallad, B I Pundappanavar and Sajini B. Nair (2024), "Supplementary nutrition provided to the children through ICDS scheme during prepandemic and pandemic period in India: Perspectives of mothers", *International Journal of Home Science*, 10(3): 448-459, DOI: https://doi.org/10.22271/ 23957476. 2024.v10.i3g.1736

Jyoti S. Hallad, Usha Ram, B. I Pundappanavar (2024) "Utilization of contraceptive services during the first wave of Covid-19 Pandemic in India: An assessment through a Multi centric study" In an edited book *Challenges to Health care and wellbeing during the Covid -19 Pandemic* by Kumool Abbi, Sukhabir Singh and Manmohan Singh SLM publishers, ISBN 978-93-91083-59-57 pp72-91

Shriprasad H (2024) "Enablers and Barriers of Tele-Consultation in India during COVID-19 Pandemic: Disease Specific Experience Exploration and Way Forward" in an edited book Kumool Abbi, Sukhbir Singh, Manmohan Singh – *Challenges to Health Care and Wellbeing during the COVID-19 Pandemic*, SLM Publishers, ISBN: 978-93-91083-59-5, pp 130-148.

Shriprasad H (2024) "The coverage of health insurance among households of Karnataka: An exploration using National Family Health Survey-5 (NFHS 5) Date *"Shodha*, Volume 14 Nov 1, July - December 2024. ISSN 2249-0396

Javeed A Golandaj and Jyoti S Hallad, (2024), "Impact of Covid-19 on TB notifications in India" In an edited book *Challenges to Health care and wellbeing during the Covid -19 Pandemic* by Kumool Abbi, Sukhabir Singh and Manmohan Singh SLM publishers, ISBN 978-93-91083-59-5, pp 97-113

Golandaj JA. Kampli MS. Kumar M. and Hallad JS. (2024). "Complications and implications of Caesarean delivery: Facts and perceptions", *Clinical Epidemiology and Global Health*, Vol. 29, No. 101770, https://doi.org/10.1016/j.cegh.2024.101770.

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# IER JOURNAL OF HEALTH AND DEMOGRAPHY

## RESEARCH ARTICLES



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# IER JOURNAL OF HEALTH AND DEMOGRAPHY



## Padma Vibhushan, Dr. D. Veerendra Heggade Chair for Studies on Health and Demography, JSS Institute of Economic Research (IER), Dharwad.

Institute of Economic Research (IER) is one of the institutions of Janata Shikshana Samiti (JSS) was established in 1957. Population Research Centre, fully funded by the Ministry of Health and Family Welfare (MoHFW), Government of India was attached to IER during 1961. The primary aim of the centre is to undertake the research activities on Health and Demography.

Sri. Vishwaprasanna Theertha Swamiji, Pejavar Matt, Udupi is the President of JSS. The visionary Padma Vibhushana Dr. D. Veerendra Heggade, Dharmadhikari of Shri Kshetra Dharmasthala is the Chairman. The activities of the Samiti are being led by Dr. Ajith Prasad, Secretary.

Padma Vibushana Dr. D. Veerendra Heggade, is a well known visionary of our times. Ever since he assumed the responsibility as a Head of Shri Manjunatha Swamy Temple Dharmasthala, (South India's renowned religious landmark located in Karnataka) he is successfully implementing multi disciplinary programs for social and economic well being of the society. He is the President of SDM Education Society and SDM Medical Trust that runs several institutions. His Self-employment training Institute made millions of youths as self-reliant. By various rural development programmes, he has organized thousands of Self-Help Groups in Karnataka and Kerala to empower rural women, to create health awareness and to enable health insurance for millions of poor. Dr. Heggade is the recipient of several National and International awards for his contributions in the field of education, health and rural development.

To support his novel health programmes, Dr. N Vajrakumar former Secretary of JSS intended to install an Endowment Chair in the name of Dr. D. Veerendra Heggade for facilitating the programmes on Health and Demography in the JSS IER,Vidyagiri, Dharwad. This plan was announced during 75th Birthday of Dr. N. Vajrakumar.

**Vision of the Chair:**

To facilitate research work on Health and Demography



## About the Journal

The ***IER Journal of Health and Demography*** is a Bi-annual, mono language (English) journal published by DVH chair for studies on Health and Demography, JSS Institute of Economic Research (IER), Dharwad, Karnataka. **This is a peer refereed journal which publishes the quality research work on Health, Demography and the related issues.** The journal publishes with ISSN 2454-9207.

Papers shall be submitted to ierjournaldwd@gmail.com should be original contribution and should not be under consideration for publication elsewhere at the same time. ***Submissions that do not conform to journal's style may be returned to the respective authors for necessary revision before publication.*** Last submission date for January issue is December 31, and for July issue is June 30.

Please prepare your manuscript before submission, using the following guidelines:

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e.g., Calabrese, F.A. (2005), "The early pathways: theory to practice - a continuum", in Stankosky, M. (Ed.), *Creating the Discipline of Knowledge Management*, Elsevier, New York, NY, pp. 15-20.

**For journals** : Surname, Initials (year), "Title of article", *Journal Name (in Italic)*, volume issue, pages.
e.g., Capizzi, M.T. and Ferguson, R. (2005), "Loyalty trends for the twenty-first century", *Journal of Consumer Marketing*, Vol. 22 No. 2, pp. 72-80.

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e.g., Castle, B. (2005), "Introduction to web services for remote portlets", available at: http://www-128.ibm.com/developerworks/library/ws-wsrp/ (accessed 12 November 2007).


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# IER Journal of Health and Demography

## ARTICLES

# Family Planning Practices: Examining the link between use and knowledge of contraction among the tribal women

**Akram Khan[1] and Baldev Singh Kulaste[2]**

**Abstract**

*Background: Family planning is crucial for improving maternal and child health outcomes, yet tribal women in India face significant barriers in accessing and utilizing contraception. Traditional practices, cultural beliefs, and a lack of healthcare services limit their ability to make informed decisions regarding family planning. This study aims to explore the relationship between contraceptive knowledge and usage among tribal women and identify the factors influencing these practices. Data and Method: This study utilizes data from the National Family Health Survey (NFHS-5) conducted in 2019-2021. Descriptive and inferential statistics were applied to examine the association between contraceptive knowledge and use. Result: The findings of the study reveals that the use of any contraceptive method among the tribal women is 64.8%, which accounts 55.1% and 9.3% of any modern and traditional method, respectively. Discussion: The results highlight the disparity between contraceptive knowledge and actual use, emphasizing the need for targeted interventions that address both education and healthcare access.*

**Keywords:** Family Planning, Contraception, NFHS, Tribal women

## Introduction

Family planning is a cornerstone of public health and very critical aspect of women's reproductive health, particularly in underserved communities such as tribal populations. Unfortunately, many tribal women in developing regions continue to have limited access to information and resources related to modern contraceptive methods (Apanga & Adam, 2015; Buscaglia et al. 2025). Tribal communities in India face unique challenges when it comes to family planning and reproductive health. Factors such as geographic isolation, cultural norms, and socioeconomic status often hinder access to family planning services and information

1.Research Investigator & 2. Research Scholar, Gokhale Institute of Politics and Economics Pune – 411004

(Ghule et al. 2015; Narain, 2019). Previous research has highlighted the need to better understand the factors that influence contraceptive use among tribal women, as this population has historically exhibited lower rates of modern family planning adoption compared to the general population (Mog et al. 2020; Sreedevi et al., 2022).

A study by Mog et al. (2024) indicated that cultural resistance to modern contraceptive methods remains a significant barrier among tribal women, who often rely on traditional methods of birth control. Similarly, Sharma et al. (2020) found that tribal women are less likely to be aware of modern contraceptive options compared to their non-tribal counterparts, largely due to lower education levels and restricted access to healthcare services. These studies highlight the need for a targeted approach that addresses the unique challenges faced by tribal women in accessing and utilizing contraception (Sahoo et al. 2024; Toqi et al., 2019).

While existing literature provides valuable insights into the factors influencing family planning practices among tribal women, most studies have focused primarily on either knowledge or usage, without examining the relationship between the two (Sharma, 2015). This study seeks to fill this gap by analyzing the connection between contraceptive knowledge and its use among tribal women. Additionally, the role of socio-cultural factors, education, and healthcare access in shaping family planning behaviors among tribal populations remains underexplored (Iyer, 2002; Sharma & Pasha, 2019).

**Methodology**

This study uses data from the National Family Health Survey (NFHS-5), conducted between 2019 and 2021 (IIPS, 2021). NFHS-5 is one of the most comprehensive sources of information on health and family welfare in India, providing detailed data on a wide range of indicators, including contraceptive knowledge and use. The survey sample included 47,852 tribal women from various regions across India, representing different socio-economic backgrounds and cultural contexts.

**Statistical Analysis**

The data were analyzed using descriptive and inferential statistics to assess the association between contraceptive knowledge and use. Descriptive statistics provided an overview of the demographic characteristics of the participants, while inferential statistics

were employed to explore the relationship between knowledge and use of contraception, controlling for factors such as education, healthcare access, and cultural beliefs.

## Results

### Sociodemographic characteristics of participants

The socio-demographic characteristics of the study population in India from 2019-2021 is presented in Table 1. It depicts that, a total of 47,852 tribal women were participated with an average age of 32.8 years (± 8.5). Age distribution of the reveals that the majority of the tribal women are between 20-39 years, with 35.6% of aged 20-29 and 34.7% of aged 30-39. The younger women (15-19 years) represent only 3.8%, while older adults (40-49 years) make up 25.9%. Educationally, a significant portion of the tribal women, i.e. 41.9%, has no formal education, and 37.5% have completed secondary education. only a small fraction, 5.5%, has achieved higher education or above. Employment status shows a fairly even split, with 51.9% not working and 48.1% employed. The age at first childbirth shows that 44.5% of respondents had their first child between ages 15-19, and 53.2% between ages 20-29. Fertility patterns indicate that 10.1% of women had no children, 47.9% had 1-2 children, and 42.1% had three or more.

The majority of households are male-headed (88.6%), and household size trends show that 58.5% have more than four members. Regarding religion, 87.0% are Hindu, with Muslims at 2.0% and other religions at 10.9%. In terms of wealth, 44.0% fall into the poorest category, followed by 25.3% poorer, 15.8% middle, 9.3% richer, and 5.7% richest. Most participants (86.7%) reside in urban areas, while 13.3% are rural residents. Regionally, 24.4% are from the East, 22.3% from the Central region, 21.1% from the West, 12.4% from the South, 10.5% from the North, and 9.5% from the Northeast.

**Table 1: Socio-Demographic Characteristics of the Study Population in India, 2019 - 21**

| Socio-Demographic Characteristics | Percent | Sample |
|---|---|---|
| **Individual Characteristic** | | |
| **Age** | | |
| **Mean ± SD** | **32.8 ± 8.5** | |
| 15 - 19 | 3.80 | 1,830 |
| 20 - 29 | 35.6 | 17,040 |
| 30 - 39 | 34.7 | 16,612 |
| 40 - 49 | 25.9 | 12,371 |

| | | |
|---|---|---|
| **Education Status** | | |
| No education | 41.9 | 20,027 |
| Primary | 15.2 | 7,293 |
| Secondary | 37.5 | 17,925 |
| Higher and Above | 5.50 | 2,607 |
| **Occupation** | | |
| Not working | 51.9 | 3,695 |
| Working | 48.1 | 3,420 |
| **Age at birth of 1st Child** | | |
| 15 - 19 | 44.5 | 18,523 |
| 20 - 29 | 53.2 | 22,138 |
| 30 - 39 | 2.30 | 960 |
| 40 - 49 | 0.00 | 18 |
| **Child Ever Born** | | |
| No birth | 10.1 | 4,816 |
| 1 - 2 | 47.9 | 22,896 |
| 3+ | 42.1 | 20,139 |
| **Household Characteristics** | | |
| **Head of Household** | | |
| Male | 88.6 | 42,384 |
| Female | 11.4 | 5,468 |
| **Number of family members in HH** | | |
| Less than or equal to 4 | 41.5 | 19,843 |
| More than 4 | 58.5 | 28,009 |
| **Religion** | | |
| Hindu | 87.0 | 41,645 |
| Muslims | 2.00 | 976 |
| Others | 10.9 | 5,232 |
| **Wealth Index** | | |
| Poorest | 44.0 | 21,032 |
| Poorer | 25.3 | 12,092 |
| Middle | 15.8 | 7,562 |
| Richer | 9.30 | 4,461 |
| Richest | 5.70 | 2,705 |
| **Community Characteristic** | | |
| **Place of Residence** | | |
| Rural | 13.3 | 6,345 |
| Urban | 86.7 | 41,507 |
| **Region** | | |
| North | 10.5 | 5,002 |
| Central | 22.3 | 10,658 |

| | | |
|---|---|---|
| East | 24.4 | 11,675 |
| Northeast | 9.50 | 4,521 |
| West | 21.1 | 10,071 |
| South | 12.4 | 5,925 |
| **Total** | **100.0** | **47,852** |

**Knowledge of Family Planning Methods among the Tribal Women**

Figure 1 and Table 2 shows the knowledge of any family planning methods among the tribal women. Figure 1 depict that a vast majority with 99.3% of tribal women were aware about the modern methods of family planning, followed by traditional method with only 0.1%, indicating high awareness across the study population. Further, the knowledge of family planning methods was significantly high across all age groups, with a slightly lower percentage among the youngest age group (15-19) at 97.9%, compared to 99.7% for those aged 30-39. Similarly, higher education, wealth, certain regions, and rural residence are associated with slightly higher knowledge levels. The table also reveals, significant association of education, children ever born, religion, wealth index, and region with the knowledge of family planning methods, indicating that these factors may influence FP knowledge among tribal women in India.

**Figure 1: Knowledge of FP methods among the tribal women**

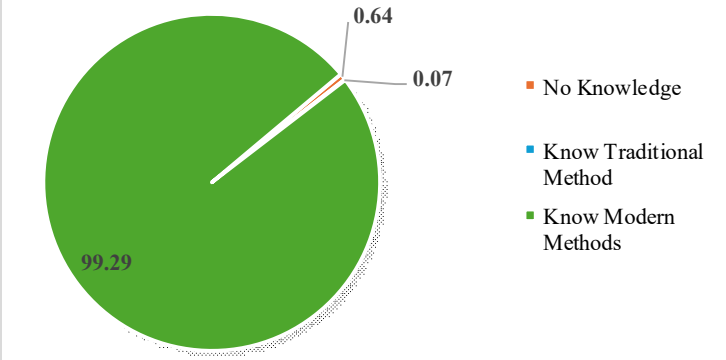



**Table 2: Knowledge of family planning methods among the tribal women by socio-demographic characteristics, 2019 – 21**

| Individual Characteristic | Knowledge FP | Chi-Square | Sample |
|---|---|---|---|
| **Age** | | | |
| 15 - 19 | 97.9 | 46.94*** | 1,830 |
| 20 - 29 | 99.4 | | 17,040 |
| 30 - 39 | 99.7 | | 16,612 |
| 40 - 49 | 99.2 | | 12,371 |
| **Education Status** | | | |
| No education | 99.2 | 79.93*** | 20,027 |

| | | | |
|---|---|---|---|
| Primary | 99.2 | | 7,293 |
| Secondary | 99.5 | | 17,925 |
| Higher and Above | 100.0 | | 2,607 |
| **Occupation** | | | |
| Not working | 99.0 | 2.9 | 3,695 |
| Working | 99.6 | | 3,420 |
| **Age at birth of 1st Child** | | | |
| 15 - 19 | 99.4 | | 18,523 |
| 20 - 29 | 99.6 | 12.82** | 22,138 |
| 30 - 39 | 98.5 | | 960 |
| 40 - 49 | 99.6 | | 18 |
| **Child Ever Born** | | | |
| No birth | 98.6 | | 4,816 |
| 1 - 2 | 99.5 | 61.98*** | 22,896 |
| 3+ | 99.4 | | 20,139 |
| **Household Characteristics** | | | |
| **Head of Household** | | | |
| Male | 99.4 | 6.84** | 42,384 |
| Female | 99.2 | | 5,468 |
| **Number of family members in HH** | | | |
| Less than or equal to 4 | 99.5 | 1.9 | 19,843 |
| More than 4 | 99.3 | | 28,009 |
| **Religion** | | | |
| Hindu | 99.4 | | 41,645 |
| Muslims | 99.3 | 61.9*** | 976 |
| Others | 99.1 | | 5,232 |
| **Wealth Index** | | | |
| Poorest | 99.1 | | 21,032 |
| Poorer | 99.3 | | 12,092 |
| Middle | 99.7 | 90.6*** | 7,562 |
| Richer | 99.7 | | 4,461 |
| Richest | 99.9 | | 2,705 |
| **Community Characteristic** | | | |
| **Place of Residence** | | | |
| Rural | 99.9 | 28.9*** | 6,345 |
| Urban | 99.3 | | 41,507 |
| **Region** | | | |
| North | 100.0 | | 5,002 |
| Central | 99.7 | | 10,658 |
| East | 99.5 | 103.6*** | 11,675 |
| Northeast | 99.1 | | 4,521 |
| West | 99.0 | | 10,071 |
| South | 99.0 | | 5,925 |
| **Total** | **99.4** | | **47,852** |

Note: *p<0.05 **p<0.001 ***p<0.0001

**Prevalence of Family Planning Users and Non-Users**

The findings of the study reveal that 64.8% of tribal women reported using any form of contraception (Figure 2). Among them, 55.4% relied on modern contraceptive methods, such as sterilization, oral contraceptives, or intrauterine devices (IUDs), while 9.4% used traditional methods, including withdrawal and periodic abstinence (Figure 3). Additionally, figure 2 indicate that the prevalence of family planning (FP) users among tribal women varies slightly between rural and urban settings. Rural areas have a slightly higher proportion of FP users (65.7%) compared to urban areas (64.7%), which may suggest that family planning knowledge and practices are relatively similar across different places of residence among tribal populations.

**Figure 2: Prevalence of Users and Non-users among the tribal women by place of residence**

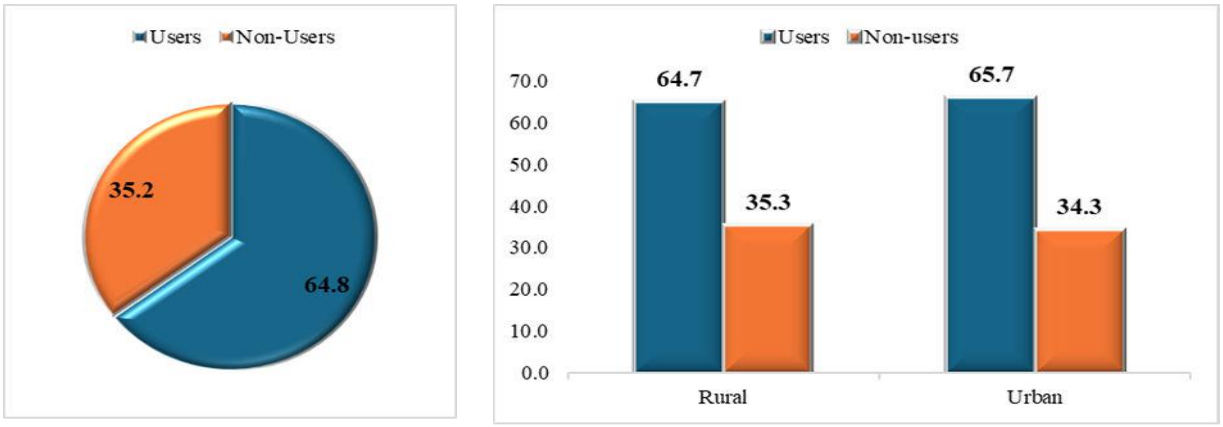
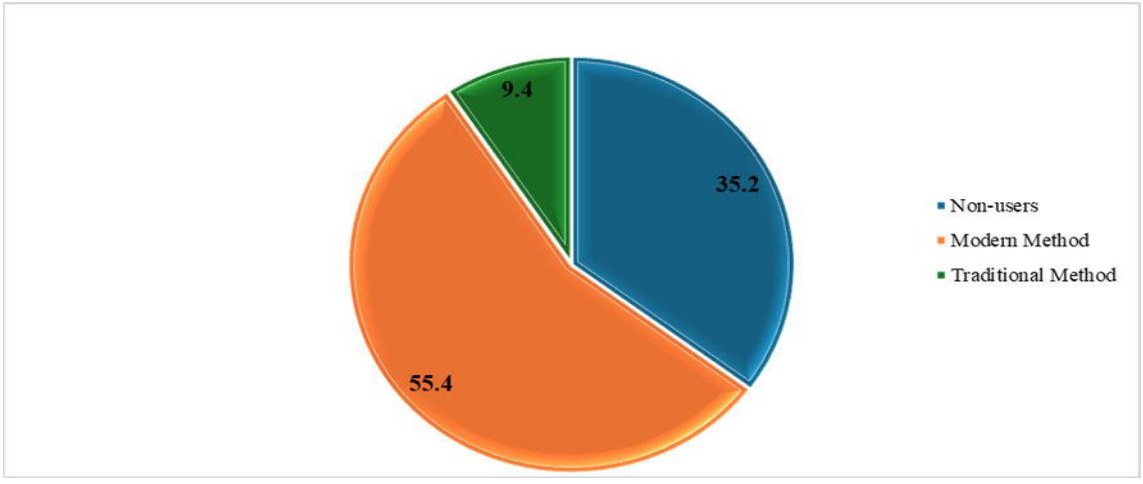



**Figure 3: Users by Methods among the tribal women**



Further, table 3 revels that the use of family planning methods increases with increase in the age of tribal women, reaching 74.7% and 75% among women aged 30-39 and 40-49, respectively. Similarly, the use of family planning methods was high among the tribal women, who were women (71.7%), had first child before 19 years of age (73.8%), had more than 3 children (76.5%), women from male-headed (66.2%), and larger (66.1%) households, followers of Hindu religion (66.3%) and belongs to poorer wealth quintile (66.4%) and northern region (70.0%) as compared to their counterpart tribal women. The table 3 also reveals strong and significant association of family planning methods with age, education, occupation, children ever born, religion, and region, reflecting significant disparities across different demographic groups.

**Table 3: Prevalence of user of family planning methods among the tribal women by socio-demographic characteristics, 2019 – 21**

| Individual Characteristic | Users | Chi-Square | Sample |
|---|---|---|---|
| **Age** | | | |
| 15 - 19 | 25.6 | | 1,791 |
| 20 - 29 | 51.9 | 4000*** | 16,930 |
| 30 - 39 | 74.7 | | 16,556 |
| 40 - 49 | 75.0 | | 12,271 |
| **Education Status** | | | |
| No education | 70.6 | | 19,864 |
| Primary | 67.3 | 903.8*** | 7,237 |
| Secondary | 59.3 | | 17,840 |
| Higher and Above | 51.7 | | 2,607 |
| **Occupation** | | | |
| Not working | 61.7 | 71.6*** | 3,657 |
| Working | 71.7 | | 3,405 |
| **Age at birth of 1st Child** | | | 0 |
| 15 - 19 | 73.8 | | 18,419 |
| 20 - 29 | 67.5 | 449.4*** | 22,038 |
| 30 - 39 | 58.8 | | 945 |
| 40 - 49 | 30.2 | | 18 |
| **Child Ever Born** | | | |
| No birth | 15.8 | | 4,749 |
| 1 - 2 | 64.8 | 8200*** | 22,785 |
| 3+ | 76.5 | | 20,013 |

| | | | |
|---|---|---|---|
| **Household Characteristics** | | | |
| **Head of Household** | | | |
| Male | 66.2 | 772.7*** | 42,122 |
| Female | 53.9 | | 5,425 |
| **Number of family members in HH** | | | |
| Less than or equal to 4 | 63.0 | 133*** | 19,737 |
| More than 4 | 66.1 | | 27,811 |
| **Religion** | | | |
| Hindu | 66.3 | | 41,396 |
| Muslims | 55.0 | 2000*** | 968 |
| Others | 54.5 | | 5,183 |
| **Wealth Index** | | | |
| Poorest | 63.6 | | 20,842 |
| Poorer | 66.4 | | 12,013 |
| Middle | 65.2 | 44.2*** | 7,541 |
| Richer | 66.2 | | 4,449 |
| Richest | 63.7 | | 2,703 |
| **Community Characteristic** | | | |
| **Place of Residence** | | | |
| Rural | 65.7 | 62.3*** | 6,339 |
| Urban | 64.7 | | 41,209 |
| **Region** | | | |
| North | 70.0 | | 5,000 |
| Central | 66.5 | | 10,626 |
| East | 63.1 | 1700*** | 11,613 |
| Northeast | 53.8 | | 4,479 |
| West | 67.5 | | 9,967 |
| South | 64.5 | | 5,863 |
| **Total** | **64.8** | | **47,547** |

Note: *p<0.05 **p<0.001 ***p<0.0001

**Factor Associated with use of family planning methods from Multivariate Analysis**

Table 4 shows the crude and adjusted odds ratios (AOR) for various factors associated with the use of FP methods among tribal women in India. The odds of using family planning methods are significantly higher among the tribal women of aged 20 – 29, 30 – 39 and 40 – 49, with adjusted odds ratios of 1.80, 3.80, and 3.14, respectively as compared to those aged 15-19. Similarly, working women are more likely to use family planning methods compared to non-working women, with a significant increase in odds (AOR=1.15). However, the

education level shows mixed results, with those having primary and secondary education having slightly higher odds of using family planning methods, while women with higher education have lower odds (AOR=0.91).

The age at the birth of the first child also influences family planning use, with women who gave birth at 20-29 or 30-39 years having lower odds of using family planning methods than those who gave birth between 15-19 years, with AOR of 0.83 and 0.55, respectively. Women with 3 or more children have significantly higher odds of using family planning methods (AOR=1.31).

The household characteristics reveals that women living in female-headed households are less likely to use family planning methods than those in male-headed households (AOR=0.61). Larger households, with more than four members, also have slightly lower odds of using family planning methods (AOR=0.91). Religious affiliation plays a significant role, with Muslim tribal women and women from other religions having much lower odds of using family planning methods compared to Hindu tribal women, with AOR of 0.35 and 0.61, respectively. Wealthier tribal women are more likely to use family planning methods, with those in the poorer, middle, and richest wealth indices having higher odds (AOR=1.27, 1.33, and 1.34, respectively), while the richest category shows a marginally significant result.

Further, the community characteristics such as place of residence show no significant difference between urban and rural areas (AOR=1.02), but the region of residence significantly affects family planning use. Tribal women in central, east, northeast, west, and south regions have lower odds of using family planning methods compared to those in the north, with AOR ranging from 0.44 to 0.78, indicating regional disparities in the use of family planning methods.

**Table 4: Binary Logistic Regression (Univariate and Multivariable), 2019 – 21.**

| Individual Characteristic | Crude OR | 95% CI | Adjusted OR | 95% CI |
|---|---|---|---|---|
| **Age** | | | | |
| 15 – 19 | | | | |
| 20 – 29 | 2.64*** | [2.41 - 2.89] | 1.80** | [1.28 - 2.54] |
| 30 – 39 | 5.76*** | [5.26 - 6.31] | 3.80*** | [2.68 - 5.39] |
| 40 – 49 | 5.46*** | [4.98 - 5.98] | 3.14*** | [2.20 - 4.49] |

| | | | | |
|---|---|---|---|---|
| **Education Status** | | | | |
| No education | | | | |
| Primary | 0.85*** | [0.82 - 0.88] | 1.12 | [1.00 - 1.27] |
| Secondary | 0.68*** | [0.66 - 0.70] | 1.10 | [1.00 - 1.22] |
| Higher and Above | 0.53*** | [0.50 - 0.56] | 0.91 | [0.75 - 1.12] |
| **Occupation** | | | | |
| Not working | | | | |
| Working | 1.35*** | [1.26 - 1.44] | 1.15*** | [1.07 - 1.25] |
| **Age at birth of 1st Child** | | | | |
| 15 - 19 | | | | |
| 20 - 29 | 0.79*** | [0.77 - 0.82] | 0.83*** | [0.77 - 0.91] |
| 30 - 39 | 0.52*** | [0.48 - 0.56] | 0.55*** | [0.45 - 0.68] |
| 40 - 49 | 0.29*** | [0.18 - 0.48] | 0.36 | [0.11 - 1.15] |
| **Child Ever Born** | | | | |
| No birth | | | | |
| 1 - 2 | 7.40*** | [6.97 - 7.86] | - | - |
| 3+ | 11.37*** | [10.7 - 12.08] | 1.31*** | [1.18 - 1.44] |
| **Household Characteristics** | | | | |
| **Head of Household** | | | | |
| Male | | | | |
| Female | 0.57*** | [0.55 - 0.59] | 0.61*** | [0.55 - 0.68] |
| **Number of family members in HH** | | | | |
| Less than or equal to 4 | | | | |
| More than 4 | 1.17*** | [1.14 - 1.20] | 0.91* | [0.83 - 0.99] |
| **Religion** | | | | |
| Hindu | | | | |
| Muslims | 0.56*** | [0.52 - 0.60] | 0.35*** | [0.27 - 0.44] |
| Others | 0.54*** | [0.52 - 0.55] | 0.61*** | [0.54 - 0.68] |
| **Wealth Index** | | | | |
| Poorest | | | | |
| Poorer | 1.09*** | [1.06 - 1.13] | 1.27*** | [1.15 - 1.40] |
| Middle | 1.05* | [1.01 - 1.09] | 1.33*** | [1.18 - 1.51] |
| Richer | 0.97 | [0.93 - 1.02] | 1.14 | [0.97 - 1.33] |
| Richest | 0.94 | [0.88 - 1.01] | 1.34* | [1.06 - 1.70] |
| **Community Characteristic** | | | | |
| **Place of Residence** | | | | |
| Rural | | | | |
| Urban | 1.16*** | [1.12 - 1.21] | 1.02 | [0.89 - 1.16] |
| **Region** | | | | |
| North | | | | |
| Central | 0.86*** | [0.81 - 0.91] | 0.63*** | [0.53 - 0.75] |

| | | | | |
|---|---|---|---|---|
| East | 0.78*** | [0.74 - 0.83] | 0.62*** | [0.52 - 0.74] |
| Northeast | 0.52*** | [0.49 - 0.55] | 0.44*** | [0.37 - 0.53] |
| West | 1.15*** | [1.08 - 1.22] | 0.78* | [0.64 - 0.96] |
| South | 0.78*** | [0.73 - 0.84] | 0.70** | [0.57 - 0.87] |

Note: ®reference category, *p<0.05, **p<0.01, ***p<0.001

**Discussion**

The family planning is a critical aspect of reproductive health, particularly for marginalized groups such as tribal women in India. Effective family planning enables tribal women to make informed decisions about the timing and spacing of their children, which has profound implications for their health, social status, and overall quality of life.

The current study reveals a significantly high level of awareness of modern family planning methods (99.3%) among the tribal women in India. The studies by Kumar et al. (2021) and Vohra (2014) also reported high awareness of modern contraception methods among rural and tribal women, however, this awareness does not translate into high-level use of family planning methods. Factors such as age, education, and wealth were strongly and positively associated with knowledge of family planning methods, similar findings were reported by Mudi and Pradhan (2023), which indicate that wealth and education improve access and knowledge of family planning services among tribal populations (Seshadri et al., 2020).

Regarding family planning use, the study found that 64.8% of tribal women use any method of family planning, with modern methods being preferred by 55.4%. These results are comparable to the study conducted by Sharma et al. (2009), who observed a preference for sterilization and other modern contraceptive methods among tribal women. Furthermore, the association between family planning use and sociodemographic factors such as age, education, and wealth in this study corroborates the findings of Panda et al. (2023), who found that older, educated, and wealthier tribal women are more likely to use contraception (Singh et al. 2020; Mog et al., 2020).

The multivariate analysis revealing higher odds of family planning use among the working tribal women, those belongs to higher wealth quintiles, and larger families, similar trends observed in Jain et al. (2021) study, which highlighted the association of economic autonomy and higher socioeconomic status with more likelihood of contraceptive use (Kumar

et al., 2020). Additionally, the analysis reveals lower odds of using family planning methods among the Muslim tribal, which indicates the cultural and religious factors as potential barriers to contraceptive use among certain religious groups in India (Iyer, 2002; Rasheed, et al., 2015; Sharma & Pasha, 2019).

The study's findings on regional disparities in family planning use, with lower odds in regions such as the Central and Eastern parts of India, align with the work of Sahoo et al. (2024) and Toqi et al. (2019), which attributed regional variations to differences in health infrastructure and social norms. These disparities emphasize the importance of region-specific interventions to improve family planning access and utilization among tribal women across India (Lakew et al. 2013; Halli et al. 2024).

**Limitation**

This study, while providing valuable insights into the link between contraceptive knowledge and use among tribal women, is not without its limitations.

Firstly, the data used for the analysis comes from the National Family Health Survey (NFHS-5), which, while comprehensive, may not fully capture the diverse and context-specific experiences of all tribal groups across different regions of India. The tribal population in India is heterogeneous, with various sub-groups having distinct cultural practices, which may not be uniformly reflected in the survey data. This limits the generalizability of the findings to all tribal communities.

Another limitation is that the study focuses primarily on quantitative data, and does not explore in-depth the qualitative aspects of cultural beliefs, social norms, and personal experiences that influence contraceptive use. These qualitative factors could provide a richer understanding of the barriers and facilitators of family planning practices in tribal communities.

Lastly, the limited scope of socio-economic indicators, such as household income and occupation specifics, may not fully capture the economic determinants of family planning use, potentially impacting the findings related to wealth and employment status. Future research would benefit from a longitudinal approach and a more granular analysis of healthcare access, partner influence, and cultural factors to provide a more nuanced understanding of family planning behaviors among tribal women in India.

**Conclusion:**

This study has provided a comprehensive analysis of the relationship between contraceptive knowledge and use among tribal women, revealing a significant gap between awareness and practice. Despite relatively high levels of knowledge about modern contraceptive methods, many tribal women continue to face barriers that prevent them from utilizing this knowledge. These barriers include low education levels, limited healthcare access, and cultural resistance to modern contraceptives. To address these challenges, targeted interventions are needed that focus on improving education, healthcare access, and community engagement. Educational programs should be tailored to the specific needs and beliefs of tribal communities, while healthcare services must be made more accessible to ensure that all women have the resources they need to make informed decisions about contraception. By addressing these barriers, we can help close the gap between knowledge and use of contraception, ultimately improving family planning outcomes for tribal women and contributing to better maternal and child health in India's tribal communities.

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# Changing Trends in Female Age at Marriage in India: A Focus on Consanguineous Unions

**Rajan Ram[1] and Nutan Kumari[2]**

**Abstract**

*Early marriage, which appears to be a paradox, is essentially a union between a boy and a girl before they reach the legal age of marriage (UNICEF). Early marriage is widely recognized as a violation of health and human rights. The primary aim of the present study was to determine the extent to which female age at marriage has changed in India during the last generation. In addition, to assess whether there is an association between consanguinity and age at marriage. The data for the study were collected from married women aged 15-49 years as part of National Fertility and Health Surveys (NFHS)-1, 4 and5, conducted across India in 1992-93, 2015-16, and 2019-2021. Findings indicate a significant increase in the age of marriage among consanguineous unions, although early marriage remains prevalent in these contexts. The incidence of early marriage has decreased from 69.6% to 40.1% among women aged 15-49, yet 44.2 of women in consanguineous marriages still experience child marriage, higher particularly among first-cousin and uncle-niece pairings. The study also highlights the impact of socio-economic factors on early marriage within consanguineous communities. The government and NGOs need to raise awareness at the community level to reduce early marriage rates, especially among consanguineous couples; a more targeted approach is necessary.*

**Keywords**: Consanguinity, Female age at marriage, NFHS, India

## Introduction

As is the case in many predominantly rural populations, India has a strong cultural tradition of young females' age at marriage (Allendorf & Pandian, 2016). In recognition of the adverse health consequences often associated with such marriages, the Child Marriage

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Restraint Act was introduced by the colonial authorities in 1929. With the exception of Jammu and Kashmir, the Act became law in 1930 with a minimum age of 14 years stipulated for females and 18 years for males (Kumar 2020). The legislation was amended by the Government of India in 1949 and 1978, and under the terms of the 1978 Act, the minimum age of marriage was raised to 18 years for females and 21 years for males (Kumar 2020).Although the Child Marriage Restraint Act was subsequently replaced by the Prohibition of Child Marriage Act (PCMA) in 2006, with no further changes have been made to the prescribed minimum ages at marriage of females or males, with under-age marriage treated as valid but voidable, i.e., not legal or legally binding (Kumar 2020).

Due to the unmated need for contraception before first childbirth, shorter birth intervals, and multiple unwanted pregnancies, the high fertility rates associated with young female's age at marriage have been identified as a major barrier to female social and economic development in India (Raj et al. 2009; Heidari & Dastgiri, 2020; Hussain & Bittles,1999).For this reason, strenuous governmental efforts have been made to significantly reduce the incidence of child marriage and, at the 72nd Independence Day celebrations in 2021,Prime Minister Narendra Modi indicated that an increase in the minimum female age at marriage in India from 18 to 21 years. Indian Union Minister for Women and Child Development has introduced the Prohibition of Child Marriage (Amendment) Bill, 2021, which proposes amendments to the 2006 law was sent to a Parliamentary Standing Committee for further discussion and it was under active consideration (*The Indian Express*).

Consanguineous marriage, usually defined as marital unions between couples related as second cousins or closer (equivalent to a coefficient of inbreeding $F \geq 0.0156$) (Hussain, Bittles, Sullivan, 2001; Hamamy et al. 2011), is customarily precluded by a large majority of the Hindu population of North India (Kumari et al. 2020). However, in the Dravidian Hindu populations of South India, cross-cousin marriage ($F = 0.0625$) was legally recognized in the Hindu Marriage Act of 1955, and the legality of uncle-niece marriages ($F = 0.125$) was confirmed in the Hindu Code Bill of 1984. At the national level, first and second-cousin marriages ($F \geq 0.0156$) are also contracted within the minority Muslim, Christian, and Buddhist communities (Kumari et al., 2020; Kalam et al., 2020). In addition to young females' age at marriage, consanguineous unions have been shown to significantly influence

offspring's health. The focus of the present study was to determine whether there has been a decline in the prevalence of young females at marriage age in India and, if so, whether these changes have been paralleled by changes in parental consanguinity profiles. The primary aim of the present study was to determine the extent to which female age at marriage has changed in India during the last generation. In addition, to assess whether there is a causative association between consanguinity and age at marriage.

## Methodology

### Data

This study utilized cross-sectional data from the first, fourth, and fifth rounds of the National Family Health Survey (NFHS-1, NFHS-4, and NFHS-5), conducted in 1992-93, 2015-16, and 2019-21, respectively. The NFHS is a large-scale, cross-sectional, nationally representative survey conducted under the Ministry of Health and Family Welfare (MoHFW), Government of India. It provides self-reported data on various aspects, including demographic, socio-economic, material, marital status, and type of marriage, among others. The NFHS employs a multistage stratified random sampling method for data collection. For further details on the sampling methodology, please refer to the NFHS report.

Following established convention (Bittles 2001; Hamamy *et al.* 2011), spousal consanguinity was defined as marriages between second cousins or closer ($F \geq 0.0156$) with five consanguinity categories identified from the information collected: uncle-niece ($F = 0.125$), first cousin ($F = 0.0625$, second cousin ($F = 0.0156$) 'other blood relative' ($F < 0.0156$) and non-consanguineous ($F = 0$), with the latter including couples related as 'brother-in-law' and 'other non-blood relative'.

### Dependent Variable

The dependent variable in the study is early marriage or child marriage in 15-49-year-old women. A dichotomous variable is constructed, where "1" indicates the woman married/cohabited before the age of 18 years and "0" otherwise.

### Independent Variables

After the reviewing literature, explanatory variables were finally such as education (No education, primary, secondary, and higher); Religion (Hindu, Muslim, Other); Caste (SC "Scheduled Caste", ST "Scheduled Tribes", OBC "Other backward class", Other), Wealth

index (Poorest, Poorer, Middle, Richer, Richest); Place of residence (Rural, Urban), Region of India (North, Central, East, Northeast, West, South).

**Statistical Analysis**

Cross-tabulation and bivariate logistic regression have been used in the present study. The results of the logistic regression are presented through odds ratios and tested the significance at 95% confidence interval. The whole analysis of the study was carried out using the STATA 14 version.

**Results**

At the national level, the mean prevalence of consanguineous marriage ($F \geq 0.0156$) decreased from 9.3% in NFHS-1 to 7.5% in NFHS-4 and slightly increased to 7.6% in NFHS-5. Correspondingly, the mean coefficients of inbreeding declined from $\alpha = 0.0058$ to $\alpha = 0.0051$ (Table 1). Minor changes were observed in the specific types of consanguineous marriages. Comparing NFHS-1 to NFHS-5, the prevalence of uncle-niece unions decreased from 0.6% to 0.4%, first-cousin marriages from 7.9% to 6.7%, and second-cousin marriages from 0.8% to 0.5%. This represents a 7.0% reduction in the overall degree of consanguinity, as measured by the mean inbreeding coefficient (α), from NFHS-1 to NFHS-5.

**Table 1: Consanguineous marriage (%) in married women, all India 1992-93, 2015-16 & 2019-2021**

| Marriage type | F-Value | 1992-93 | 2015-16 | 2019-21 |
|---|---|---|---|---|
| Uncle-niece | 0.125 | 0.6 | 0.4 | 0.4 |
| First cousin | 0.0625 | 7.9 | 6.5 | 6.7 |
| Second cousin | 0.0156 | 0.8 | 0.6 | 0.5 |
| Other blood relative | <0.0156 | 2.1 | 1.9 | 1.8 |
| Non-consanguineous | 0.0 | 88.6 | 90.6 | 90.7 |
| Total consanguinity | ≥0.0156 | 9.3 | 7.5 | 7.6 |
| **Mean coefficient of inbreeding (a)** | | **0.0058** | **0.0047** | **0.0051** |

Frequency plots of the age at marriage for females aged ≤7 to 28+ years in 1992-93 and 2015-16 are shown in Figure 1. An evident decline over the 24-year time period is

apparent, from a median value of 17.13 years in 1992-93, 18.59 years in 2015-16, and 19.24 years in 2019-21.In 1992-93, most marriages were between the ages of 14 and 15 years, which sifted to the age of 17 to 19 years in 2019-2021. However, the marriage age is lower among consanguineous marriages compared to non-consanguineous marriages in both rounds of NFHS.

**Figure 1: Consanguineous union, age at marriage of currently married women (age 15-49) in India, 1992-93 (NFHS-1), 2015-16 (NFHS-4) and 2019-2021 (NFHS-5)**


The percentage distribution of child marriage was disaggregated by consanguinity category is listed in Table 2. In 1992-93, around 70 percent of marriages were before legal age, which has declined to about 36 percent in 2015-16. Whereas 33.7 percent are consanguineous and 36.4 percent are non-consanguineous. There was no difference among the first three types of consanguineous marriage; it varied from 33.4 to 33.8 percent. About half of the consanguineous marriages were performed before the legal age. Within the consanguineous marriage, the prevalence of early marriage was high in the first cousin, followed by uncle-niece, other blood relative, and second cousin in both rounds of NFHS.

**Table 2: Consanguinity and percentage distribution of child marriage (<18 yrs.), All-India 1992–93 (NFHS-1) and 2015–16 (NFHS-4)**

| Marriage type | NFHS-1 | | NFHS-4 | | NFHS-5 | |
|---|---|---|---|---|---|---|
| | ≥18 yrs | <18 yrs | ≥18yrs | <18yrs | ≥18yrs | <18yrs |
| Uncle-niece | 26.7 | 73.3 | 51.3 | 48.7 | 52.2 | 42.8 |
| First cousin | 24.8 | 75.2 | 50.2 | 49.8 | 54.6 | 45.4 |
| Second cousin | 32.1 | 67.9 | 54.9 | 45.1 | 60.0 | 40.0 |
| Other blood relative | 29.9 | 70.1 | 54.7 | 45.3 | 59.5 | 40.5 |
| Consanguineous | 25.5 | 74.5 | 50.6 | 49.4 | 55.8 | 44.2 |
| Non-consanguineous | 31.1 | 68.9 | 56.2 | 43.8 | 60.3 | 39.7 |
| Total | 30.4 | 69.6 | 55.6 | 44.4 | 59.9 | 40.1 |

* The decline rate is calculated for marriages less than 18 years from NFHS 1 to NFHS 5

Table 3 presents the percentage and bivariate analysis results to understand the relationship of early marriage with the women's background characteristics. The results revealed from NFHS-5 that women who did not have an education were more likely to get married early than women who attended school. Women belonging to ST caste groups are less likely to get married early compared to the SC caste. However, with increasing education, there is a decrease with early marriage among women. The odds of women marrying at an early age are also found to be higher in rural areas compared to urban areas. According to the region of India, the odds ratio is higher in the southern and western regions than in the northern region.

**Table 3: Percentage and logistic regression with early marriage consanguineous marriage by background characteristics of women, NFHS -5**

| Background Characteristics | Percent | Odds Ratio | P>z | [95% Conf. Interval] Lower | Upper |
|---|---|---|---|---|---|
| **Education** | | | | | |
| Higher® | 10.7 | | | | |
| Secondary | 42.9 | 5.60 | 0.000 | 5.07 | 6.19 |
| Primary | 57.1 | 9.75 | 0.000 | 8.75 | 10.86 |
| No education | 60.5 | 11.53 | 0.000 | 10.39 | 12.80 |

| | | | | | |
|---|---|---|---|---|---|
| **Religion** | | | | | |
| Hindu® | 47.0 | | | | |
| Muslim | 44.3 | 0.73 | 0.000 | 0.69 | 0.77 |
| Other | 42.1 | 0.82 | 0.000 | 0.75 | 0.90 |
| **Caste** | | | | | |
| SC® | 48.1 | | | | |
| ST | 48.0 | 0.75 | 0.000 | 0.70 | 0.80 |
| OBC | 46.1 | 1.04 | 0.127 | 0.99 | 1.10 |
| Other | 43.4 | 1.05 | 0.170 | 0.98 | 1.12 |
| **Wealth Index** | | | | | |
| Poorest® | 55.8 | | | | |
| Poorer | 53.1 | 1.05 | 0.097 | 0.99 | 1.12 |
| Middle | 49.4 | 1.02 | 0.509 | 0.96 | 1.09 |
| Richer | 44.0 | 0.96 | 0.310 | 0.90 | 1.03 |
| Richest | 29.9 | 0.80 | 0.000 | 0.74 | 0.87 |
| **Place** | | | | | |
| Rural® | 39.0 | | | | |
| Urban | 49.8 | 1.12 | 0.000 | 1.06 | 1.18 |
| **Region** | | | | | |
| North® | 34.7 | | | | |
| Central | 43.1 | 1.50 | 0.000 | 1.39 | 1.62 |
| East | 53.8 | 1.90 | 0.000 | 1.75 | 2.07 |
| Northeast | 39.8 | 1.11 | 0.115 | 0.97 | 1.27 |
| West | 43.3 | 1.70 | 0.000 | 1.57 | 1.85 |
| South | 48.2 | 2.01 | 0.000 | 1.87 | 2.16 |

**Note:** ® Reference

**Discussion**

The aim of the study is to attempt to detail the discussion on child marriage in consanguinity. With the generational shift, there has been substantial progress in reducing early marriage among both consanguineous and non-consanguineous. India's government made many acts and policies to stop early marriage. However, in 2015-16, around half of the

consanguineous marriages were child marriage, whereas, in 1992-93, around one-third of marriages were child marriage.

Overall, consanguineous marriage in India has decreased but is still highly favourable in southern India among both Hindus and Muslims, whereas in northern India mostly among Muslims. Consanguineous marriage is mostly performed through traditional rituals, and early marriage is also a part of traditional rituals, which indirectly affects the age at marriage among females and also in types of marriages in consanguinity. It is due to religious belief at the community level plays a significant role in determining consanguineous marriage, as a similar finding was found in Sahoo et al. 2022 and Krishnamoorthy & Audinarayana, 2001 study.

Within consanguineous marriage, the age at marriage also differs, such as the first Cousin and Uncle-niece, and has higher early marriage than a second cousin and other blood relatives in NFHS -5, and similar was also found in NFHS-1. There has been a decline in age at menarche among younger girls; they marry early and get pregnant early.

The present study also found that education, religion, caste, and place of residence play an important role in early marriage among women who are married within the blood relation. Women with no education are more likely to get early marriage; similar findings were also found in a study done by Raj et al., 2019; Khan et al., 2024. Therefore, according to place of residence, women living in rural areas are more likely to marry early than those in urban areas. A study done by Roy & Chouhan, 2022 found that an area-specific-targeted approach should be made among rural and poor girls to reduce the risk of child marriage.

Substantial research has indicated that child marriage causes social and medical challenges. It restricts the girl's education opportunities and subsequently limits employment opportunities, which reduces female autonomy and the overall status of females in society. There is a medical college during pregnancy of gynecologically immature child bribes, causing maternal and neo-natal materiality. Therefore, increasing the age at marriage will empower and improve women's and child health.

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# Health Risks of Open Dumping Sites: Findings from a Pilot Case-Comparative Study in Dharwad, India

**Javeed Golandaj[1,2*] and Renuka Asagi[3]**


## Abstract

*Rapid urbanization in India has led to the expansion of open dumping sites near residential areas, raising serious environmental and health concerns. This study investigates the health risks associated with proximity to an open dumping site in Dharwad city by comparing two communities—one located near the site and the other at a distance. A pilot study using cross-sectional case-comparison study design was conducted among 132 residents from 32 households, with 63 residents from the proximate community and 69 from the non-proximate community. Data were collected using structured interviews that assessed sociodemographic characteristics, self-reported health symptoms over the past six months, and disease prevalence. Comparative statistical analysis was used to evaluate differences between the two groups. Residents living near the dumping site reported significantly more cases of itching nose (p=0.034) and headaches (p=0.039) compared to their non-proximate counterparts. Other symptoms, such as skin rashes, sore throat, and fatigue, were also more frequent but not statistically significant. Slightly higher rates of diabetes and gastrointestinal problems were observed in the proximate group, along with isolated cases of typhoid, dengue, and asthma. Sociodemographic analysis showed that the proximate community had significantly lower education levels, lower income, and shorter residential duration. Living close to open dumping sites may pose increased health risks, especially regarding respiratory and minor gastrointestinal symptoms. These findings call for urgent interventions in solid waste management, environmental health monitoring, and policy measures to protect vulnerable urban populations. Further longitudinal studies and environmental assessments are recommended to establish causal links.*


**Keywords:** Open dumping site, Dumping waste, Proximate and Non-Proximate, Health risks, India.

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## Background

The solid waste management (SWM) is a big challenge for the authorities, especially, in developing countries; and the situations of speedy urbanization, changes in the pattern of life, and population growth are further increasing the volume and complexity of solid waste generated (Alam & Ahmade, 2013). Every year, approximately, 1.3 billion tons of solid waste is being generated in the cities across the globe, and it is estimated that this volume will increase to 2.2 billion tons by 2025 (Hoornweg & Bhada-Tata, 2012),further, increase to 3.40 billion tones by 2050(Kaza et al., 2018).

If not safely managed from generation to end point - that is separation, collection, transfer, treatment, and disposal or recycling and reuse – the MSW pose a potential threat to public health and the environment. The World Health Organization (WHO) has highlighted the risks associated with the inadequate disposal of solid waste with respect to soil, water, and air pollution and the associated health effects for populations surrounding the involved areas(WHO, 2015).The waste management practices are comparatively poor in low-income countries (Perteghella et al., 2020). Hence, the related health risks tend to be greater in low-income countries, where the most dangerous practices, such as open dumping and uncontrolled burning of solid waste, are still common (Ferronato & Torretta, 2019).

### *Municipal Solid Waste*

The quantity of MSW generation depends on a number of factors such as food habits, standard of living, degree of commercial activities and seasons. Data on quantity variation and generation are useful for collection and disposal system. Indian cities now generate eight times more MSW than they did in 1947 because of increasing urbanization and changing lifestyles(ABC Techno Labs India Private Limited, 2020).

### *Municipal Solid Waste in HDMC Area*

The residential area, slums and commercial areas are major source of generation of MSW. The approximate quantity of MSW generated is 400 TPD from a population of 9.43 lakhs distributed in 67 wards and with a floating population of 60k(ABC Techno Labs India Private Limited, 2020). According to the figure available with Hubbali-Dharwad Municipal

Corporation (HDMC) on an average every day per person 400 gm (400gm/capita/day) waste is generated. Currently, door-to-door collection of waste is implemented in the twin cities along with collection of waste from bulk generators like, hotels, chualtaries, hostels, canteens, etc. Currently there are no Solid Waste Management (SWM) facilities for the disposal of waste in the HDMC area. Therefore, whatever waste is collected from Dharwad city is being dumped at *Hosayallapura* open dumping site spread over 16 acres of land, and waste collected from Hubballi city is being disposed at *Ayodya Nagar*, spread over 17 acres(ABC Techno Labs India Private Limited, 2020).

Earlier studies recognized that the communities residing in the surrounding area of solid waste processing and disposal facilities, are exposed to environmental health risk (Vrijheid, 2000). Moreover, respiratory diseases, irritation of the skin, nose and eyes, gastrointestinal problems, Diarrhea, fatigue, headaches, psychological problems and allergies have been identified to be more common in people living near waste disposal sites(Abul, 2010; De & Debnath, 2016; Gouveia & do Prado, 2010).Hence, the present study analyses the pilot data to explore the potential health risks among communities residing in proximity to an open dumping site in Dharwad city, Karnataka.

## Methodology

### *Study Design*

This study employed a cross-sectional, case-comparison design as part of pilot research for a broader PhD investigation on environmental health risks. The aim was to compare self-reported health outcomes between communities residing proximate to and distant from an open dumping site in Dharwad city, Karnataka, India.

### *Study Area and Population*

The study was conducted in two residential communities: a proximate community located within close walking distance (within 1 km) of an active open dumping site and a non-proximate community located at least 2-3 kms away from the site and assumed to be minimally affected by its environmental impacts. Both communities are situated within the urban boundaries of the HDMC area and represent lower—to middle-income urban

populations. The HDMC is one of the largest urban local bodies in terms of population in Karnataka. As per the Census 2011, HDMC has a population of around 9.43 lakh(Registrar General and Census Commissioner of India, 2011).

***Sampling and Respondents***

A total of 32 households were purposively selected for the pilot study-15 from a proximate and 17 from a non-proximate community to an open dumping site. Within each household, the head of household or an adult member (aged ≥18 years) was interviewed face-to-face. The sample size was determined to assess the feasibility of the full-scale study, validate tools, and identify key patterns in data.

***Data Collection Tools***

Data were collected using a structured interview schedule explicitly developed for this study. The schedule included modules on: Sociodemographic information, Environmental exposure indicators, Self-reported health symptoms in the past six months, and History of chronic and infectious diseases, among other necessary information. The tool was digitised and administered using Kobo Toolbox, a mobile-based data collection platform. The data was collected mainly by the PhD scholar himself. Two other enumerators, who are also PhD scholars, helped in field data collection. Prior training was provided to ensure standardization and quality control. Field data collection was conducted in November-December 2024.

***Data Analysis***

Quantitative data were exported from Kobo Toolbox into Microsoft Excel and converted to STATA. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarise background variables. Comparative analyses between proximate and non-proximate communities were conducted using Chi-square tests for categorical variables and independent t-tests for continuous variables (e.g., age, income). Statistical significance was considered at $p < 0.05$. All data analyses were conducted using STATA version 17.0 software.

## Ethical Considerations

Prior permissions were received from the appropriate authorities, the District Health & Family Welfare Office and the Hubballi-Dharwad Municipal Corporation. Before administering the survey, verbal informed consent was obtained from all participants. Data were anonymized and stored securely.

## Results

**Table 1: Percentage distribution of residents in the proximate and non-proximate communities to the open dumping site, Dharwad, India.**

| Background Characteristics | *n* (%)/Mean (SD) | | | *P*-values |
|---|---|---|---|---|
| | Non-Proximate *n*=69 | Proximate *n*=63 | Total *n*=132 | |
| **Age (years), Mean (SD)** | 41 (19.4) | 34 (20.2) | 38 (20.0) | P=0.076 |
| **Sex** | | | | |
| Female | 37 (53.6) | 38 (60.3) | 75 (56.8) | P=0.438 |
| Male | 32 (46.4) | 25 (39.7) | 57 (43.2) | |
| **Annual income (INR), Mean (SD)** | 2,68,889 (1,65,013) | 1,65,217(1,31,788) | 2,14,697 (1,56,858) | **p<0.001** |
| **Education level** | | | | |
| No Schooling | 8 (11.6) | 14 (22.2) | 22 (16.7) | P=0.161 |
| 1-7 Years | 13 (18.8) | 15 (23.8) | 28 (21.2) | |
| 8-10 Years | 14 (20.3) | 14 (22.2) | 28 (21.2) | |
| More than 10 Years | 34 (49.3) | 20 (31.7) | 54 (40.9) | |
| **Years of education, Mean (SD)** | 10 (5.4) | 8 (5.6) | 9 (5.6) | **P=0.015** |
| **Marital status** | | | | |
| Unmarried | 17 (25.8) | 17 (31.5) | 34 (28.3) | P=0.787 |
| Married | 45 (68.2) | 34 (63.0) | 79 (65.8) | |
| Others | 4 (6.1) | 3 (5.6) | 7 (5.8) | |
| **Occupation** | | | | |
| Employed | 30 (43.5) | 25 (39.7) | 55 (41.7) | P=0.945 |
| Unemployed | 5 (7.2) | 6 (9.5) | 11 (8.3) | |
| Housewife | 20 (29.0) | 18 (28.6) | 38 (28.8) | |
| Students | 14 (20.3) | 14 (22.2) | 28 (21.2) | |
| **Chewing tobacco** | | | | |
| No | 50 (79.4) | 48 (92.3) | 98 (85.2) | P=0.052 |
| Yes | 13 (20.6) | 4 (7.7) | 17 (14.8) | |
| **Years of residence, Mean (SD)** | 20 (10.5) | 10 (5.2) | 15 (9.7) | **p<0.001** |

**Note**: Other marital status categories include divorced, separated, and widowed; **P-values** are the values of Chi-square tests for categorical variables and the independent t-tests for continuous variables. Statistical significance was considered at $p < 0.05$.

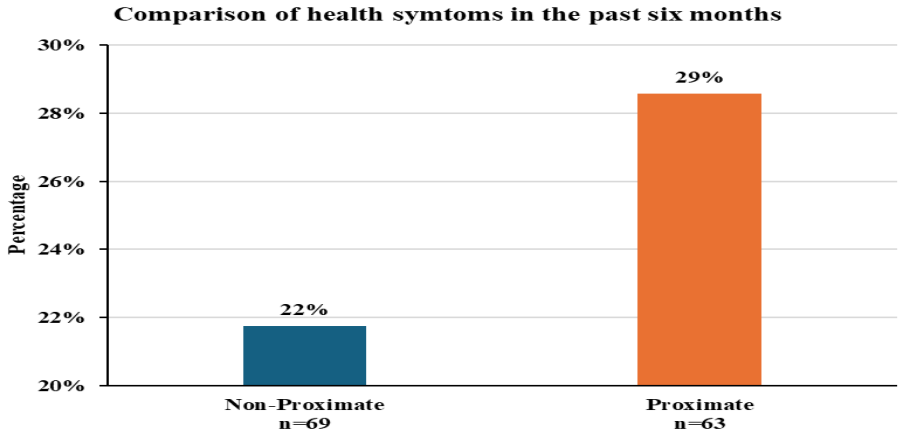
***Sociodemographic Profile of Participants***

Table 1 presents the background characteristics of the respondents from the proximate and non-proximate communities to the open dumping site in Dharwad. The two groups were generally similar in terms of sex, marital status, and employment status. However, significant differences were observed in annual income, years of education, and years of residence. Residents closer to the dumping site reported lower income levels and fewer years of schooling than those farther away ($p<0.001$ and $p=0.015$, respectively). Additionally, individuals in the proximate community had resided there for significantly fewer years (mean: 10 years) than those in the non-proximate area (mean: 20 years, $p<0.001$).

**Comparison of Self-Reported Health Symptoms**

Figure 1 and Table 2 compare self-reported health symptoms experienced in the past six months among the two groups. The proximate community residents reported a higher proportion of health symptoms compared to the non-proximate (29% vs. 22%). Although most symptoms were reported at low frequencies, several trends emerged. Itching nose (0% vs. 6%) and headache (1% vs. 10%) were significantly more common among residents in the proximate community ($p=0.034$ and $p=0.039$, respectively) than their non-proximate counterparts.

**Figure 1: Comparison of health symptoms in the past six months among residents of the proximate and non-proximate communities to the open dumping site, Dharwad, India.**




**Note**: This represents the proportion of residents reporting any health symptoms, compiled from self-reported experiences over the past six months, including respiratory, gastrointestinal, dermatological, and general symptoms such as fatigue and headache.

Symptoms like skin rashes (12% vs. 18%), sore throat (4% vs. 11%), and fatigue (0% vs. 5%) were also reported more frequently by the proximate group, though these differences did not reach statistical significance. Notably, while diarrhoea (0% vs. 5%), fatigue (0% vs. 5%), and stomach ache (1% vs. 5%) were mainly reported in the proximate community, their prevalence remained low overall (Table 2) .These findings suggest a pattern of increased respiratory and dermatological irritations potentially associated with environmental exposure near the dumping site.

**Table 2: Comparison of health symptoms in the past six months among residents of the proximate and non-proximate communities to the open dumping site, Dharwad, India.**

| Health Symptoms | Comparison of health symptoms in the past six months, *n* (%) | | | *P*-values |
|---|---|---|---|---|
| | Non-Proximate *n*=69 | Proximate *n*=63 | Total *n*=132 | |
| **Itching eyes** | | | | |
| No | 67 (97.1) | 58 (92.1) | 125 (94.7) | P=0.197 |
| Yes | 2 (2.9) | 5 (7.9) | 7 (5.3) | |
| **Skin rashes** | | | | |
| No | 61 (88.4) | 52 (82.5) | 113 (85.6) | P=0.338 |
| Yes | 8 (11.6) | 11 (17.5) | 19 (14.4) | |
| **Itching nose** | | | | |
| No | 69 (100.0) | 59 (93.7) | 128 (97.0) | **P=0.034** |
| Yes | 0 (0.0) | 4 (6.3) | 4 (3.0) | |
| **Headache** | | | | |
| No | 68 (98.6) | 57 (90.5) | 125 (94.7) | **P=0.039** |
| Yes | 1 (1.4) | 6 (9.5) | 7 (5.3) | |
| **Fatigue** | | | | |
| No | 69 (100.0) | 60 (95.2) | 129 (97.7) | P=0.067 |
| Yes | 0 (0.0) | 3 (4.8) | 3 (2.3) | |
| **Sorethroat** | | | | |
| No | 66 (95.7) | 56 (88.9) | 122 (92.4) | P=0.142 |
| Yes | 3 (4.3) | 7 (11.1) | 10 (7.6) | |
| **Diarrhea** | | | | |
| No | 69 (100.0) | 60 (95.2) | 129 (97.7) | P=0.067 |
| Yes | 0 (0.0) | 3 (4.8) | 3 (2.3) | |
| **Stomach ache** | | | | |
| No | 68 (98.6) | 60 (95.2) | 128 (97.0) | P=0.267 |
| Yes | 1 (1.4) | 3 (4.8) | 4 (3.0) | |
| **Others** | | | | |
| No | 67 (97.1) | 61 (96.8) | 128 (97.0) | P=0.926 |
| Yes | 2 (2.9) | 2 (3.2) | 4 (3.0) | |

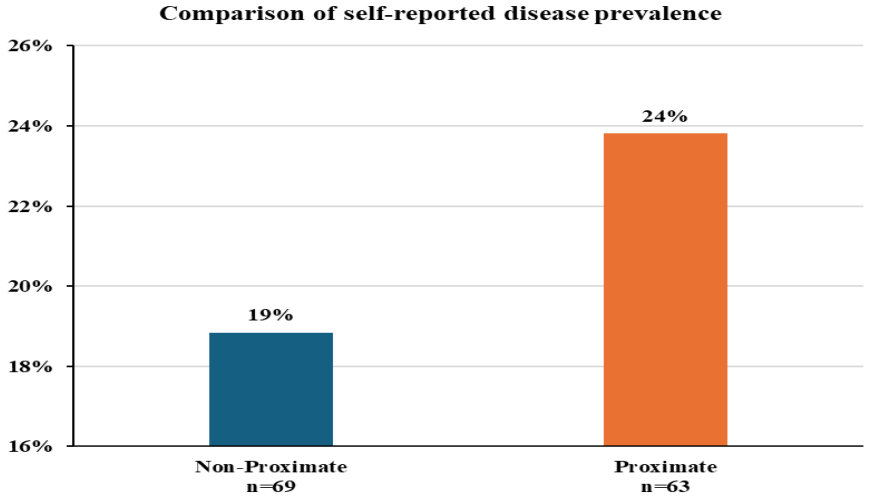
**Note:** *P*-values are the values of the Chi-square test, and the statistical significance was considered at $p < 0.05$.

### Comparison of Self-Reported Disease Prevalence

Figure 2 and Table 3 summarise the prevalence of chronic and infectious diseases as self-reported by the participants. Like health symptoms, the proximate community residents reported a higher proportion of disease prevalence than the non-proximate (24% vs. 19%).

Although no statistically significant differences were observed between the two groups in any of the diseases, a slightly higher prevalence of diabetes (15.9% vs. 10.1%) and gastrointestinal issues (4.8% vs. 2.9%) was noted among residents of the proximate community. Additionally, isolated cases of typhoid, dengue, and asthma were reported only in the proximate group, albeit in very low numbers (Table 3).

**Figure 2: Comparison of self-reported disease prevalence among residents of the proximate and non-proximate community to the open dumping site, Dharwad, India.**




**Note**: This represents the proportion of residents with any reported disease, based on self-reported diagnoses or known health conditions among household members, as provided by the respondent.

**Table 3: Comparison of self-reported disease prevalence among residents of the proximate and non-proximate community to the open dumping site, Dharwad, India.**

| Diseases | Comparison of self-reported disease prevalence, *n* (%) | | | *P*-values |
|---|---|---|---|---|
| | Non-Proximate *n*=69 | Proximate *n*=63 | Total *n*=132 | |
| **Asthma** | | | | |
| No | 68 (98.6) | 63 (100.0) | 131 (99.2) | P=0.337 |
| Yes | 1 (1.4) | 0 (0.0) | 1 (0.8) | |

| | | | | |
|---|---|---|---|---|
| **Hypertension** | | | | |
| No | 61 (88.4) | 55 (87.3) | 116 (87.9) | P=0.846 |
| Yes | 8 (11.6) | 8 (12.7) | 16 (12.1) | |
| **Diabetes** | | | | |
| No | 62 (89.9) | 53 (84.1) | 115 (87.1) | P=0.326 |
| Yes | 7 (10.1) | 10 (15.9) | 17 (12.9) | |
| **Typhoid** | | | | |
| No | 69 (100.0) | 62 (98.4) | 131 (99.2) | P=0.293 |
| Yes | 0 (0.0) | 1 (1.6) | 1 (0.8) | |
| **Dengue** | | | | |
| No | 69 (100.0) | 62 (98.4) | 131 (99.2) | P=0.293 |
| Yes | 0 (0.0) | 1 (1.6) | 1 (0.8) | |
| **Gastrointestinal** | | | | |
| No | 67 (97.1) | 60 (95.2) | 127 (96.2) | P=0.575 |
| Yes | 2 (2.9) | 3 (4.8) | 5 (3.8) | |
| **Others** | | | | |
| No | 68 (98.6) | 60 (95.2) | 128 (97.0) | P=0.267 |
| Yes | 1 (1.4) | 3 (4.8) | 4 (3.0) | |

**Note**: *P*-values are the values of the Chi-square test, and the statistical significance was considered at $p < 0.05$.

## Discussion

This study explored the health impacts of proximity to an open dumping site in Dharwad, India, by comparing two residential communities—one located near the dumping site and one located farther away. The findings suggest that individuals residing closer to the waste disposal site may be at increased risk of experiencing certain health symptoms, despite broad similarities in demographic characteristics. These findings are in line with the other studies conducted (Chowti, et al., 2018; Singh, et al., 2021).

### Socio-demographic Context and Exposure Risks

Although the two communities were generally comparable in terms of gender, marital status, and employment, residents in the proximate community had lower education levels, lower income, and shorter residential durations. These socio-economic differences may reflect broader patterns of environmental injustice, where disadvantaged populations are more likely to live in areas exposed to environmental hazards due to housing affordability and lack of political representation. Lower education levels may also contribute to reduced awareness of environmental health risks and limit the adoption of protective health behaviors.

**Health Symptoms and Environmental Exposure**

Residents near the dumping site reported a higher prevalence of itching nose, headaches, sore throat, skin rashes, and fatigue, suggesting possible exposure to airborne pollutants, foul odors, or particulate matter. Though most differences were not statistically significant, the significant increase in itching nose ($p=0.034$) and headache ($p=0.039$) is particularly concerning. Similar findings were reported in other Indian studies (Chowti, et al., 2018; Singh, et al., 2021). These symptoms may be linked to volatile organic compounds (VOCs), dust, or decomposing waste commonly associated with open dumping grounds.

The presence of gastrointestinal symptoms, such as diarrhea and stomach ache, exclusively in the proximate community—although at low levels—raises concerns about potential contamination of water sources or vector-borne diseases, which have been commonly reported near unmanaged dumping grounds in similar settings. These results align with findings from other studies in urban India and low- and middle-income countries (LMICs), which have reported similar symptom profiles among populations living near waste sites.

**Self-Reported Diseases: Emerging Patterns**

Although the prevalence of chronic illnesses such as hypertension and diabetes did not significantly differ between the groups, a slightly higher rate of gastrointestinal conditions and diabetes was noted among the proximate group, and it is in line with earlier studies (Chowti, et al., 2018; Singh, et al., 2021; Oyedele & Oyedele, 2017; Felicia, et al., 2016). The observed pattern may indicate early or subclinical effects of environmental exposure or may reflect existing health vulnerabilities exacerbated by living conditions. The presence of isolated cases of dengue, typhoid, and asthma in the proximate group—though not statistically significant—highlights potential public health concerns, especially during seasonal outbreaks or heavy rainfall, when waste leachate may spread (Mavropoulos & Newman, 2015; Vaccari, et al., 2019).

**Limitations**

This study has several limitations—first, the cross-sectional design limits causal inference. Second, reliance on self-reported symptoms and diseases may be subject to recall bias or underreporting, particularly for chronic conditions. Third, environmental exposure was not directly measured (e.g., air or water quality monitoring), which would have strengthened the association between proximity and health outcomes. Despite these limitations, the study offers valuable preliminary evidence of the health burden of living near open dumping sites. It can inform further research and policy action in similar urban contexts.

**Policy Implications**

The findings underline the urgent need for improved solid waste management systems and environmental health surveillance in urban areas. There is a pressing need for 1) Closure or containment of open dumping sites, 2) Relocation support or compensation for vulnerable households, 3) Regular health screening for residents near such sites, and 4) Community-level health education and sanitation interventions. Moreover, these findings support calls for environmental justice policies that protect low-income and marginalized communities from disproportionate exposure to urban pollution and waste.

**Conclusion**

This study highlights the potential health risks associated with living in close proximity to open dumping sites in urban India. Residents of the proximate community in Dharwad reported a higher frequency of respiratory and dermatological symptoms, particularly an itching nose and headaches, along with early signs of gastrointestinal distress and slightly elevated prevalence of chronic illnesses such as diabetes.

These findings underscore the pressing need for systematic waste management reforms, including the closure, containment, or scientific upgrading of open dumping sites, and the implementation of protective measures for affected populations. Addressing such environmental health risks is critical not only for reducing disease burden but also for promoting equity, dignity, and well-being in vulnerable urban communities.

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# Gender Disparity in Literacy and Educational Attainment: A Spatio - Temporal Study in Districts of Odisha

**Rekha Das[1] and Rakesh Behera[2]**

**Abstract**

*The literacy rate can be taken as a pivotal indicator influencing various facets of development endeavors. Governments have put in concerted efforts to establish a society that has comprehensive provisions for universal education. However, the present landscape is marred by inequalities in literacy rates and educational attainment notably evident in gender disparities. In the current era of prevailing feminism, enhancing female literacy emerges as a focal point for governmental agendas, hence achieving a perfect one-hundred percent female literacy rate remains a distant dream. While there is a plethora of determinants, the pernicious influence of social evils and entrenched taboos upon women remains the flag bearers of this divide. Hence, this paper is set out to explore the extent of gender-based disparities in literacy rates and differential education level across all districts of Odisha. Data is extracted from the Census of India and statistical abstracts of Odisha. A suite of Statistical models and methods like Sopher's disparity index, and male-female differential index have been employed in the analysis. Spatial variation among districts has visualized through bar diagrams; column diagrams, etc., and maps (using Arc GIS). The gender gap in literacy experienced a steep decline from 1951 to 1971, followed by a more gradual decline thereafter. Notably, the coastal districts of Odisha exhibit the lowest levels of gender disparity in literacy rates, while the southern districts rank higher in terms of disparity.*

**Keywords:** Literacy, Disparity, Gender, Educational level, Odisha

## Introduction

Literacy acts as both an indicator and instrument of measuring the socio-economic development of any nation. "Literacy is the sole input for human resource development which helps in overcoming the hurdles of life and education is one of the foremost necessities

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for all round development of human being and nation" (De, 2015). The magnitude of literacy and educational attainment are vital indicators of development standards for countries like India. It is one of the most crucial metrics of development and reveals the quality of life, level of awareness, and proficiency of an individual efficient literacy level and educational quality exert a positive influence on developmental parameters like health, economy, etc.

The prosperity of a nation depends on the united efforts of both men and women. When both genders are educated, they can work collaboratively towards the development of the country. The absence of education among women leaves, more than half of the population uneducated, obstructing progress. As the realization of the importance of educating girls is growing gradually, traditional notions surrounding female literacy are scattering. A mother assumes the role of the first educator for her child, the significance of female education echoes throughout generations. The 4th World Conference on Women held in Beijing in 1995 recognized that women's literacy is the key to empowering women and increasing their participation in decision-making. Millennium Development Goal (MDG) 3 (goal-3) was for women which aimed for improved education, gender equality & Women's Empowerment. Women's education is very important for any nation to develop whether it is socially or economically. Educated women act as agents of change with positive impacts on society through their contributions in the household and at workplaces. According to Mahatma Gandhi, "If you give education to a man, you teach a single person but if you educate a girl, you teach a whole generation". Neglecting women's education amounts to risking the nation's advancement, as both men and women constitute as complementary facets of the same coin, requiring equitable opportunities in the realm of education. Literacy particularly female literacy rate plays a crucial role for the improvement and advancement of the society in any area (Aradhana & Dibyajyoti, 2016).

Indian society is predominantly patriarchal. The traditional nature and taboos deprive women of various spheres of life like economic, political, educational, cultural, social, etc. They have become the deprived section of society in almost every aspect of socio-economic development and have been victimized and discriminated against in all spheres. Education as a sphere also depicts gender discrimination, victimization, deprivation, oppression, etc.

although being guaranteed as a fundamental right. In developing countries like India, this problem is serious as women are bound within the four walls of the house. Constitutionally, both men and women have equal rights, but the restrain continues even after seventy-three years of independence. In India, it has been observed that poverty compels parents to send their sons to school and as their daughters take on household duties. As a result, they live in a world of ignorance and must remain dependent on their male counterpart. This condition is more severe in the BIMAROU states of India (De, 2015). The cultural, socio-economic and infrastructural barriers restrict the girl child to enroll in elementary education (Bano, 2023). The prejudice in Indian traditional society plays a significant role in discrimination towards female literacy and traditional and religious taboos make them confined to do only domestic chores and restrict their access to education (Kumar & Dar, 2024). To improve female literacy and bring women to the mainstream making them equal with their male counterparts GOI has implemented initiatives like the National Literacy Mission, Mahila Samakhya Program, Kasturba Gandhi Balika Vidyalaya Scheme, single girl child scholarship, Mid-day Meal program, free distribution of school uniform and books. The condition of women has improved due to the structural development of society, advancement in science & technology, and awareness programs. They now participate in different community and nation-based development processes. Though their status has improved, the optimum is yet to be achieved as they still face discrimination on various grounds. To ensure equality and quality in basic education, we need massive investment with communal awareness regarding significance and ongoing obstacles in the way of education (Sharma & Kumar, 2020).

Rustagi (2004) has stated that the female literacy rate has increased over decades but there is also a certain amount of gender gap found in male & female literacy rates. She has studied the Indian states and found that Kerala, Mizoram & Goa with high literacy rates reveals a low gender gap and whereas in Bihar, Uttar Pradesh, Jharkhand, Madhya Pradesh, Odisha & Andhra Pradesh, the gender gap in literacy rate is high. The following factors are responsible for poor female literacy rates: gender-based inequality, social discrimination, and economic exploitation, the occupation of the girl child in domestic chores, the low enrolment of girls in schools, their low retention rate, and high dropout rate (Government of India, 1998). The problem of women's illiteracy is directly connected to the problem of poverty and

hence there is a serious need to pay attention to economic barriers (Dighe, 1991). Kumar et al. (2016) have stated that India is a country where the gender disparity in literacy rate is high.

Despite different plans and programs at state and national level, the gender disparity still exists in India. There is acute gender disparity associated with literacy as Low literacy rate indicates, high maternal mortality rate (MMR), decline of sex ratio, scarcity of women professionals & rise in violence against women are some of the examples of the atrocities faced by women in the society, particularly in Odisha. After thorough investigation, the decades from 1952-2011 can be considered as dismal period in the study region as there was no positive change in the literacy rate. Nevertheless, there has been a disparity between male & female literacy rates in Odisha which is proving to be a hindrance in achieving the goal of being 100 percent literate. The central focus of gender disparity in literacy rate is on Odisha since, it is an underdeveloped state. Only a reduced gender disparity in literacy and incline in overall literacy rate can advance the state economically as well as socially.

## Methodology

### Data

This study is based exclusively on the secondary data obtained from the Census of India, Statistical Abstract of Odisha & various other journals. These data have been collected form Census of India for 2011, 2001 & 1991, C-series (socio-cultural aspects). (www.censusindia.gov.in).

### Study variables and Methods of Analysis

To study the gender gap in literacy, numerous methods have been used. This study has used the measures like gender parity index (GPI), modified Sopher's index, and Male-Female Differential Index. The Gender parity index (GPI) is a socioeconomic index usually designed to measure the relative access to education of males and females. The Institute of Statistics of UNESCO also uses a more general definition of GPI for any development indicator one can define the GPI relative to this indicator by dividing its value for females by its value for males.

If $X_2$ is boy's enrolment and $X_1$ is girl's enrolment, then

GPI= $X_1/X_2$, where

$X_1$= value of indicator for female

$X_2$=value of indicator for male,

GPI equal to one refers to parity or equality between males and female, GPI greater than one indicates girls are more advantaged than boys or simply male are disadvantage, whereas GPI less than one indicates girls are more disadvantaged than boys.

Moreover, this study has used modified Sopher's disparity index given by Kundu and Rao (1986) for showing the district level gender disparity in literacy rate by using following formula.

Disparity Index (DI) = $\text{Log}(X_2/X_1) + \text{Log}\,[(Q-X_1)/(Q-X_2)]$

Where, $X_2 \geq X_1$, $X_2$= Male literacy rate, $X_1$= Female literacy rate, Q = 200

Greater the value of DI indicates the high level of disparity between male and female literacy rate. If the value is zero, then there is no disparity.

Another mathematical method i.e. Male-Female Differential Index has also been used.

$$MFDI = \frac{MLR-FLR}{TLR}$$

Where MFDI= Male-Female Differential Index, MLR= Male literacy rate, FLR= Female literacy rate and TLR= Total literacy rate.

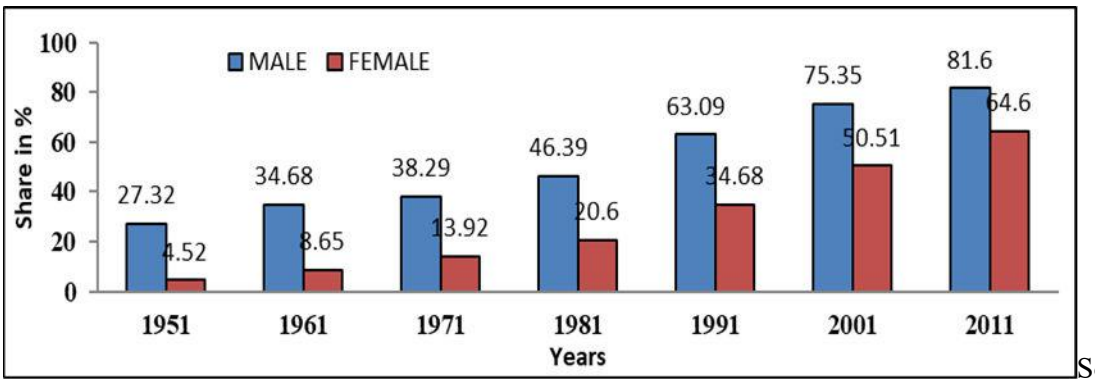
The entire analysis has been performed using MS Excell and ARC GIS software.

**Results**

**Sex differential in literacy in Odisha**

It can be interpreted from Figure-1 that the male literacy rate is always higher than the female literacy rate, in Odisha. The literacy rate of both males and females has gradually increased from 1951 to 1991 and then there is rapid growth in proportions. In comparison to the male literacy rate, growth in the female literacy rate has been higher since 1951.

**Figure 1: Sex differential in literacy in Odisha (1951-2011)**




Source: Statistical Abstract of Odisha, 2011

Over the decades from 1951 to 2001, gender disparities in literacy gradually widened only exception being in 1971 where the gap had contracted a bit from the previous decade. In 1951 the gender gap was 22.8 percent which rose over the years to 28.41 percent in 2001. Since 2001, there has been a sudden decline in the gender gap. In 2011, the gender gap was minimized to 17% as a result steep growth of 14% in the female literacy rate as compared to only 6% growth in the male literacy rate (see Table 1).

**Table 1: Trends in gender gap in literacy rate in Odisha (1951-2011)**

| Year | Male Literacy Rate (%) | Female Literacy Rate (%) | Gender Gap (%) | Disparity Index |
|---|---|---|---|---|
| 1951 | 27.32 | 4.52 | 22.8 | 0.84 |
| 1961 | 34.68 | 8.65 | 26.03 | 0.67 |
| 1971 | 38.29 | 13.92 | 24.37 | 0.50 |
| 1981 | 46.39 | 20.6 | 27.79 | 0.42 |
| 1991 | 63.09 | 34.68 | 28.41 | 0.34 |
| 2001 | 75.35 | 50.51 | 28.84 | 0.25 |
| 2011 | 81.6 | 64.6 | 17 | 0.16 |

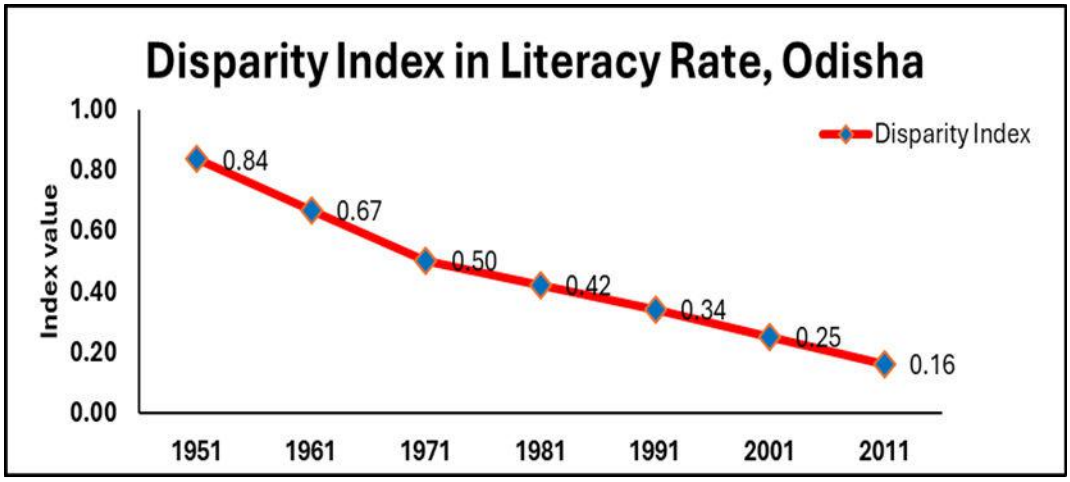
**Source:** Statistical abstract of Odisha, 2011

When analysing the gender gap in literacy, only comparing male and female literacy rates may undermine the true situation within a region, hence employing a specific

methodology is vital to accurately identify the issue. The Sopher's index method has been utilized to check gender disparity in literacy rates over time.

The line graph proves a prominent decline in the gender disparity index from 1951 to 1971, representing a reduction of over 30%. Subsequently, the index experienced a gradual decrease. Post-1991, the rate of decline increased, attributing to the implementation of various literacy and women's education policies and programs. Notably, gender disparity in literacy diminished by approximately 70% from 1951 to 2011, post-independence (refer to Figure 2). In the most recent data from 2011, the disparity index stands at 0.16, indicating low gender disparity in literacy. Despite this decline, women still face considerable challenges in achieving 100% education and achieving parity with their male counterparts.

**Figure 2: Disparity index in literacy in Odisha (1951-2011)**




It has been observed that the difference between male and female literacy rate is decreased in 2011 compare to 2001.

The gender gap in different educational level (see Table-2) has decreased 3.01 points for below primary,1.5 points in primary, 0.95 in middle, 3.70 in matric, 1.02 in higher secondary, 1.18 in graduation, 0.96 in post-graduation level. In Odisha, the disparity has decreased more in matric level. It means, in matric level more girls are getting their education in 2011 than 2001. Here also in graduation and post-graduation there is less disparity, which is nearly same in both 2011 and 2001. Note that the level of higher education is low overall and naturally gender gap is low.

**Table 2: Gender gaps in Odisha in different education level**

| Educational level | 2011 | 2001 |
|---|---|---|
| Literacy | 17.58 | 24.83 |
| Below primary | 1.75 | 5.28 |
| Primary | 3.10 | 4.69 |
| Middle | 4.63 | 4.44 |
| Matric | 3.57 | 13.24 |
| Higher secondary | 2.55 | 2.61 |
| Graduation | 4.26 | 5.06 |
| Post- graduation | 0.57 | 0.55 |

**Source:** Census of India, 2001 and 2011

After analyzing gender gap data in both rural and urban areas of Odisha, it can be interpreted that in Odisha the total gender gap between males and females is 17.58 which is approximately to the value of India. The gap is less in urban areas than in rural areas which is 10.30 and 25.50 respectively (see Table-3). In rural areas the gap has increases for below primary to middle class then it starts to decline with increasing education level. That means in school education the gap is found more but after metric or in higher studies the gap is found less. In urban areas, the gap increases for below the primary level to metric thereafter it starts declining and then increases rapidly, particularly at the Graduation level. Data representing up to the metric level indicate, the gap has increased class by class which might be due to high dropout among girl students or lack of parental interest to educate their daughters, etc. however, females who have completed their education up to metric level have shown more interest in pursuing higher education. The Gender Parity Index has also been calculated both for rural and urban areas and it is found that GPI higher in rural areas than urban shows less disparity in urban. Here the GPI is high at below primary level in Odisha and also in rural-urban areas.

The modified Sopher's disparity index is less in urban areas than rural areas which implies that gender disparity is lesser in urban areas than rural areas of Odisha. It has also been found that with increasing educational level, the value of Sopher's disparity index has also

increased gradually means positive relation between educational level and disparity index. And it is true for both rural and urban Odisha.

**Table 3: Gender gap in different educational level by residence, 2011**

| Educational level | Total | | | Rural | | | Urban | | |
|---|---|---|---|---|---|---|---|---|---|
| | Gap | GPI | SDI | Gap | GPI | SDI | Gap | GPI | SDI |
| Literacy | 17.58 | 0.78 | 0.40 | 25.50 | 0.68 | 0.52 | 10.30 | 0.89 | 0.38 |
| Below Primary | 1.75 | 0.90 | 0.06 | 2.34 | 0.87 | 0.07 | 0.29 | 0.97 | 0.01 |
| Primary | 3.10 | 0.87 | 0.08 | 4.07 | 0.84 | 0.10 | 0.58 | 0.97 | 0.02 |
| Middle | 4.63 | 0.75 | 0.15 | 5.17 | 0.73 | 0.16 | 2.09 | 0.87 | 0.07 |
| Matric | 3.57 | 0.72 | 0.16 | 3.79 | 0.67 | 0.19 | 2.11 | 0.88 | 0.07 |
| Secondary | 2.55 | 0.66 | 0.19 | 2.63 | 0.59 | 0.24 | 1.80 | 0.86 | 0.07 |
| Graduation | 4.26 | 0.53 | 0.30 | 3.30 | 0.44 | 0.38 | 7.78 | 0.66 | 0.22 |
| Post- Graduation | 0.57 | 0.60 | 0.23 | 0.41 | 0.42 | 0.38 | 1.15 | 0.75 | 0.13 |

**Source:** Author's Calculation

**Spatial pattern of Gender disparity in literacy**: The disparity index gives clarity for understanding the level of inequality in the district of Odisha. At the time of independence, the literacy rate for Odisha was lower at 15.8 % including 27.32 % for males and 4.52 % for females. Since then, the literacy rate has increased gradually, for males and females as well as an increase in the overall literacy rate. After analyzing districts of Odisha, it is found that the gap is higher in Nuapada district with a value of 25.50 percent which is followed by the Kalahandi, Kandhamal, Boudha, Balangir, Rayagada, Koraput, Nabarangpur, Gajapati and Mayurbhanj, etc. which are mostly Southern Districts of Odisha considered as backward region of the state. The lower gap is observed in districts like Khordha where the gender gap is about 10% which is followed by Cuttack, Jagatsinghpur, Puri, Kendrapara, Jajpur, Bhadrak, etc. (see appendix table 3). In these districts, the female literacy status is in a better position than that of other districts and are mostly coastal regions of Odisha.

District wise data of Odisha represents that in almost all districts have increased gender gap up to metric and secondary level except districts like Khordha where the gap has

declined up to some level because most of the parents are educated so they understand the importance of education for their children and secondly here accessibility to educational facilities is higher than other parts as state capital Bhubaneswar is located in this district. Every district indicates almost similar pattern in the gender gap in different educational level. Another interesting fact that is observed here is in post-graduation level, where gender gap is lower in comparison to other educational level in every district. Generally, in higher education the overall literacy rate is very low which may be one of the reasons for low gap.

The GPI value lies between 0 and 1. The closer the value to one the lesser the disparity. The highest gender parity index has been seen in Khordha which is about 0.89, which indicates the disparity in Khordha district is lesser than in any other districts. The lowest gender parity index is seen in Nabarangapur which is 0.62 i.e. in Nabarangapur the disparity is more than in any other district. Districts of Odisha that account for high disparity rates are Nuapada, Kalahandi, Rayagada, Nabarangapur, Koraput, and Malkanagiri. These are the southern and western regions of Odisha considered as the most underdeveloped region by the planning commission. Low disparity is seen in Khordha, Jagatsinghpur, and Cuttack. These are the developed districts in Odisha with high literacy rates and other developmental indicators. In all districts, the level of disparity is increasing for girls from primary to secondary levels of education (see table 4).

**Table 4: GPI in different educational level in Odisha, 2011**

| District | Overall literacy | Below Primary | Primary | Middle | Matric | Secondary | Graduation | Post-graduation |
|---|---|---|---|---|---|---|---|---|
| Baragarh | 0.78 | 0.88 | 0.87 | 0.74 | 0.74 | 0.57 | 0.40 | 0.44 |
| Jharsuguda | 0.82 | 0.94 | 0.93 | 0.75 | 0.75 | 0.75 | 0.62 | 0.85 |
| Sambalpur | 0.81 | 0.83 | 0.88 | 0.76 | 0.74 | 0.72 | 0.58 | 0.73 |
| Debagarh | 0.77 | 0.85 | 0.86 | 0.74 | 0.70 | 0.60 | 0.42 | 0.41 |
| Sundargarh | 0.81 | 0.93 | 0.88 | 0.78 | 0.75 | 0.43 | 0.71 | 0.85 |
| Kendujahr | 0.75 | 0.85 | 0.79 | 0.77 | 0.67 | 0.64 | 0.47 | 0.47 |
| Mayurbhanj | 0.71 | 0.73 | 0.78 | 0.72 | 0.57 | 0.59 | 0.44 | 0.52 |
| Baleswar | 0.83 | 0.99 | 0.92 | 0.80 | 0.78 | 0.76 | 0.51 | 0.45 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Bhadrak | 0.85 | 0.92 | 0.98 | 0.76 | 0.76 | 0.69 | 0.50 | 0.42 |
| Kendrapada | 0.86 | 0.90 | 0.97 | 0.82 | 0.76 | 0.74 | 0.51 | 0.43 |
| Jagatsinghpur | 0.87 | 0.85 | 1.00 | 0.95 | 0.78 | 0.72 | 0.55 | 0.58 |
| Cuttack | 0.87 | 0.89 | 0.99 | 0.99 | 0.82 | 0.78 | 0.61 | 0.80 |
| Jajpur | 0.84 | 0.99 | 0.96 | 0.80 | 0.81 | 0.72 | 0.52 | 0.51 |
| Dhenkanal | 0.82 | 0.90 | 0.88 | 0.82 | 0.81 | 0.72 | 0.51 | 0.53 |
| Anugul | 0.80 | 0.89 | 0.88 | 0.78 | 0.74 | 0.73 | 0.41 | 0.39 |
| Nayagarh | 0.82 | 0.86 | 0.93 | 0.83 | 0.72 | 0.59 | 0.42 | 0.49 |
| Khordha | 0.89 | 0.93 | 0.97 | 0.83 | 0.90 | 0.81 | 0.58 | 0.74 |
| Puri | 0.86 | 0.92 | 0.97 | 0.80 | 0.77 | 0.72 | 0.80 | 0.42 |
| Ganjam | 0.75 | 0.82 | 0.86 | 0.74 | 0.65 | 0.32 | 0.65 | 0.76 |
| Gajapati | 0.67 | 0.83 | 0.73 | 0.59 | 0.52 | 0.43 | 0.54 | 0.67 |
| Kandhamala | 0.68 | 0.79 | 0.69 | 0.61 | 0.56 | 0.53 | 0.45 | 0.54 |
| Baudha | 0.72 | 0.78 | 0.78 | 0.67 | 0.61 | 0.47 | 0.38 | 0.38 |
| Subarnapur | 0.76 | 0.87 | 0.83 | 0.71 | 0.74 | 0.54 | 0.40 | 0.35 |
| Balangir | 0.71 | 0.80 | 0.79 | 0.65 | 0.57 | 0.52 | 0.34 | 0.34 |
| Nuapada | 0.64 | 0.74 | 0.74 | 0.55 | 0.52 | 0.40 | 0.35 | 0.35 |
| Kalahandi | 0.65 | 0.76 | 0.21 | 0.51 | 0.51 | 0.43 | 0.42 | 0.44 |
| Rayagada | 0.64 | 0.77 | 0.67 | 0.58 | 0.36 | 0.32 | 0.37 | 0.44 |
| Nabarangapur | 0.62 | 0.70 | 0.79 | 0.59 | 0.52 | 0.49 | 0.36 | 0.35 |
| Koraput | 0.64 | 0.75 | 0.63 | 0.59 | 0.54 | 0.58 | 0.55 | 0.68 |
| Malkangiri | 0.65 | 0.79 | 0.65 | 0.56 | 0.44 | 0.41 | 0.39 | 0.39 |

**Source:** Calculated by using Census Data of 2011

It has been noticed that generally literacy rate is found more in urban areas in comparison to rural areas due to improved educational infrastructure and better standard of living. Around 83% of Odisha population is living in rural areas as per 2011 Census and their primary source of income is agriculture. Some of them employed in their own land while others worked as daily labour on the land of others. It is clearly evident that rural and urban gap in literacy is still existing though the gap is declining over period of times. The present

study tries to find out the gender disparity in literacy by taking the residence as factor. The existing patriarchal nature of the society and orthodox nature is found more in rural areas than urban. It has been observed that the female literacy rate in rural areas is comparatively lower than the urban areas. The female literacy rate in rural Odisha is 60.7% where it is 80.4% in urban areas as per 2011 census. Rural women are more likely to experience gender-based disparity in different sectors. It has been observed from the appendix table-1 that gender gap in literacy is more in rural areas of Odisha than urban areas in all districts of Odisha.

**Spatio-Temporal changes of Disparity in literacy by Modified Sopher's Index**

This study also tries to analyze the spatial-temporal changes in disparity by using modified Sopher's index for 1991 to 2011. Spatial level of Gender disparity in literacy has been shown by Choropleth maps. As per modified Sopher's method, the disparity index has been calculated and total districts are grouped into major three groups such as i) low, ii) moderate, iii) high and very high level of disparity for 1991, 2001 and 2011.

***i) High level disparity:*** From the following maps, it is evident that southern districts of Odisha experienced higher gender disparity in all three consecutive census years. This depicts that lower level of female literacy rate as well as overall literacy rate which is one reason for high gender disparity. As we know these districts are socio-economically underdeveloped regions of the state. A higher level of gender disparity is found in Kalahandi, Nabarangpur, Nuapada, Koraput, Rayagada, Kandhamal, and Gajapati. Although the rate of gender disparity in literacy in these districts has declined gradually, still the disparity index remains considerably higher than in other districts and also higher than the national average. The disparity index is highest in Nuapada in all three years. Due to its socio-economic backwardness despite special provisions is also given to some districts like the KBK region program.

A high level of disparity was found in Balangir in 1991 where the scenario changed between 2001 to 2011. Some other southern districts are included in this category. One interesting fact is that in 1991, eight districts were coming under the high disparity category where the index value was between 0.43 to 0.60 but it declined to one in 2001 census and in

2011 there were no districts that belonged to a high level of disparity category which indicates the increasing level of overall literacy rate in general and increasing female literacy status in particular. However, it does not mean that equality has been achieved between male and female literacy rates in Odisha. Only the pace of disparity has declined but still, it persists in its form.

***ii) Moderate level of disparity:*** The value between 0.26 to 0.43 is considered a moderate level and most southern and one or two northern districts lie in a moderate level of disparity. In 1991, the total number of districts where the condition is satisfactory is 18 which includes most of the northern districts and some southern districts of Odisha. The latest scenario depicts that 3 out of 30 districts where the condition is satisfactory because these districts enter into low levels of disparity due to improvement in the education system in the region. Some Districts had a high disparity value in 1991 and entered into a moderate level in 2001.

***iii) Low level disparity:*** As both male and female literacy have significance in the growth of any nation and any region, this can be better understood by the socio-economically developed part of the states. The coastal region of Odisha is developed in all socio-economic and demographic indicators and almost all districts in the coastal part and maximum northern districts exhibit low levels of literacy over time. Here the overall literacy rate is better than other parts. With time the value of disparity index in this level has declined from 1991 to 2011. The recent data from 2011 shows that 27 districts out of 30 fall under this category. Another change marked in 2011 is that the district Nuapada which possesses high disparity value in both the previous year belonged to the moderate category in 2011. It has been observed that in 2011 no single district belonged to the high disparity category, which indicates an improvement in overall literacy rate with a special focus on female education over time. The district Khordha is the single district that shares the least disparity in literacy in all three consecutive census years with a 0.09 index value in 2011, which is followed by Cuttack and Jagatsinghpur with 0.10 index value. It makes clear that the structural development of capital city Bhubaneswar, which is one of the smart cities and Cuttack city, affects the literacy level and contributes a very low share of disparity between males and females.

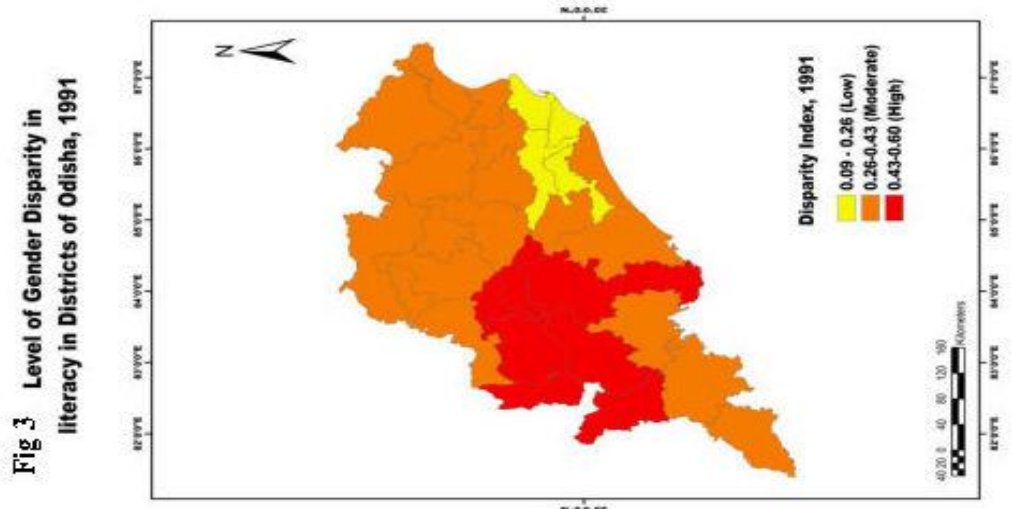



Fig 3 Level of Gender Disparity in literacy in Districts of Odisha, 1991

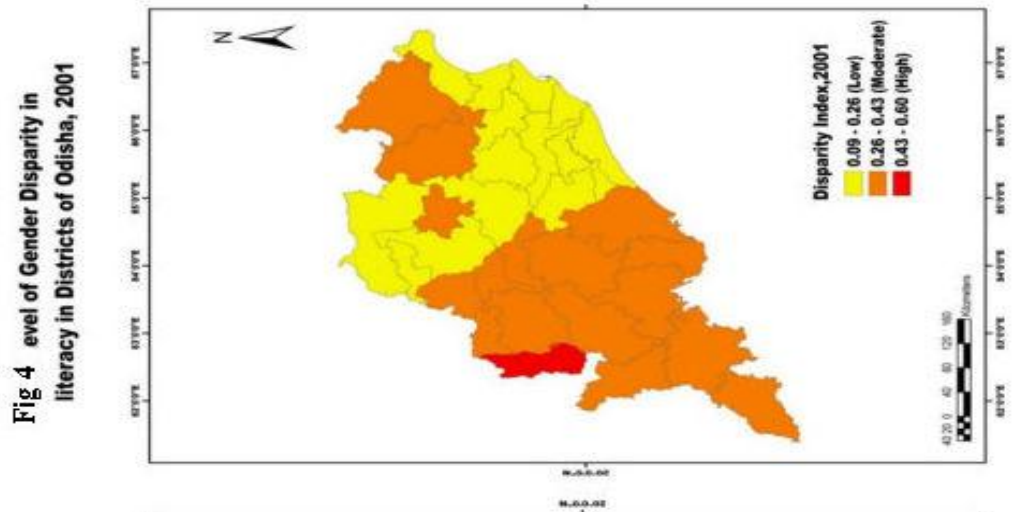



Fig 4 evel of Gender Disparity in literacy in Districts of Odisha, 2001

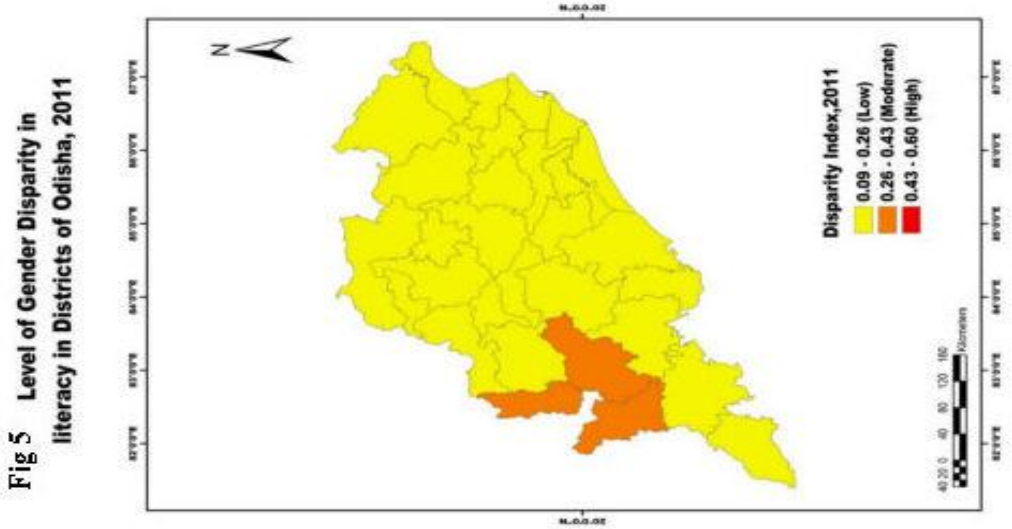
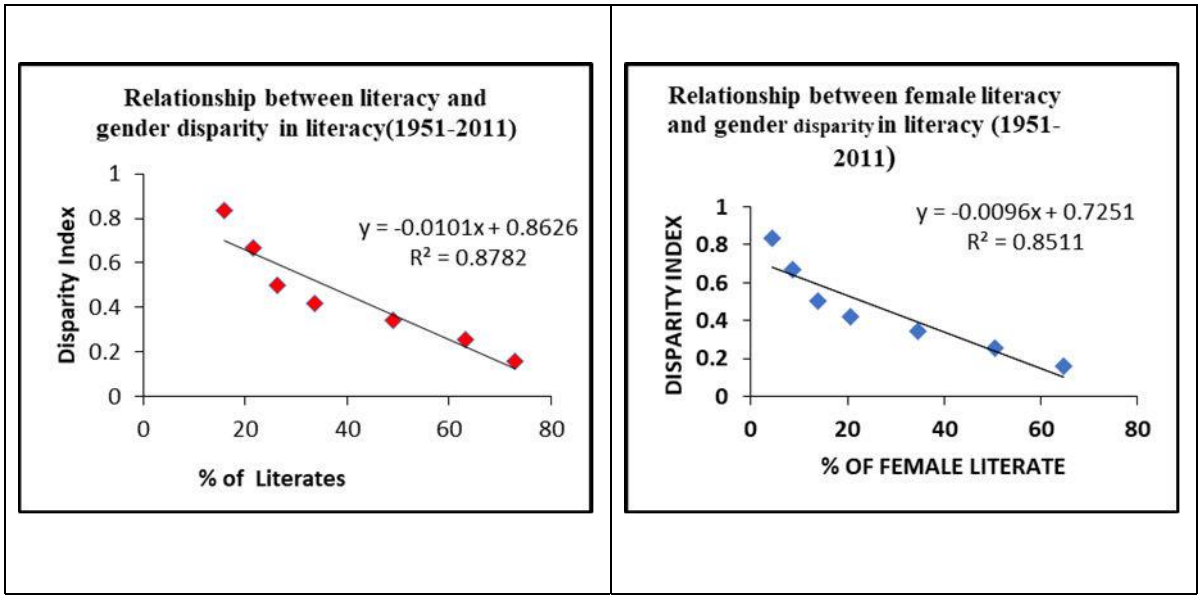



Fig 5 Level of Gender Disparity in literacy in Districts of Odisha, 2011

**Figure 6: Relationship between literacy rate and gender disparity in literacy**



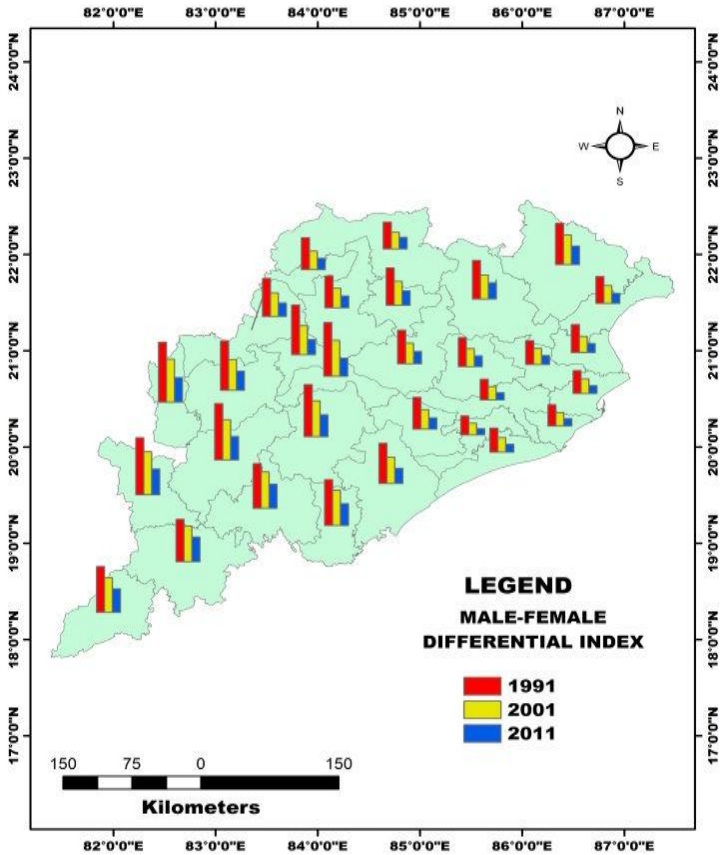

The above scatter diagram represents the relationship between literacy rate and gender disparity. Both diagrams reveal the similar results i.e. negative association between literacy rate and gender disparity also same relation between female literacy rate and gender disparity. Higher overall literacy and female literacy rate responsible for low level of gender disparity in literacy and vice-versa (see fig-6).

**Differential Index among Male and Female**

In 1991, the MFDI was maximum in Nuapada, followed by Nabarangpur which were 1.07 & 1.02 respectively. MFDI was also high in Kalahandi (0.93), Balangir (0.96 percent), and Kandhamal (0.93 percent). The minimum MFDI was recorded in Khurda and Cuttack, followed by Jagatsinghpur (0.38), Kendrapara (0.41), Puri (0.43) and Jajpur (0.43) districts. The gender gap in literacy was comparatively less in all the districts of Odisha in 2001. During this period, MFDI was lower in all the districts when compared to 1991 (Figure 7), the maximum being in Nabarangpur (0.77), & Nuapada (0.77) which were above 1 in 1991. This is followed by Kalahandi (0.72), Malakangiri, Koraput, Boudha, Kandhamal, Gajapati etc. The minimum was in Khurda (0.21), Cuttack, Ganjam, Bhadrak, Jajpur, Kendrapara and Jagatsinghpur. In 2011 gender gap in literacy decreased in almost every district of Odisha.

MFDI value dived below 0.50 for all districts. During this period, female literacy improved because of the increase in educational institutions, implementation of different school programs, scholarships provided by the government, etc. MFDI was maximum in Nabarngpur (0.46) which was 0.77 in 2001 & 1.07 in 1991 and the minimum in Khurda (0.11) which was 0.21 in 2001 & 0.34 in 1991. Almost all districts of Odisha experienced a decline in the gender gap in literacy rate from 1991 to 2011 (see Figure 10). This decline in gender disparity may be due to an increase in the economic status of families and government facilities and various attempts of Government and NGO for resolving the existing gender inequality in literacy in Odisha (Das,2018). From the data for 1991, 2001, and 2011, it is evident that gender disparity in literacy was more prominent in southern and western parts of Odisha when compared with its coastal and northern counterparts.

**Figure 7: MALE-FEMALE DIFFERENTIAL INDEX IN ODISHA**



**Discussion and conclusion**

Overall Odisha has witnessed a positive growth in the literacy rate for the period 1951-2011. Till 1981 growth rate increased slowly thereafter, a significant increase in the literacy rate was seen because of proper planning and implications of adult literacy programs, awareness campaigns, universalization of primary education, National Literacy Mission, improvement in educational and living facilities etc. After independence till 1971 there was a steep decline in the gender disparity in literacy rate but over time that decline became gradual. However, from 1991 to 2011, there has been remarkable decline in gender disparity which may be due to result of Sarva Shiksha Abhiyan (SSA, 2001).

The districts in coastal and Northeast regions of Odisha like Balesore, Bhadrak, Jagatsinghpur, Khurda, Cuttack, Puri, Jajpur, Sundergarh, Sambalpur, Anugul, Dhenkanal, Nayagarh, Keonjhar etc. marked a higher overall literacy rate while the southern region witnessed a lower literacy rate owing to backwardness, tribal dominance and uneven physiography which hampered their status in education and development.

In coastal districts, the gender disparity in literacy is low due to the high overall literacy rate which helps curb the gender gap in literacy and the rapid socio-economic development of the coastal districts, and the realization of the importance of women's education. The present capital of the state i.e. smart city Bhubaneswar and the former capital i.e. Cuttack is located in this coastal region which also somehow affects the direct or indirect literacy pattern.

The highest disparity is found in southern parts as the overall literacy rate is low which pushes up the gender gap between male and female literacy rates. It has also been found that male literacy is evenly distributed over all districts and is less variation but the same cannot be interpreted for female literacy.

Through the implication of different actions and programs in favor of female education, the gender gap has been checked to some extent but there is humongous scope for further improvement. The data for the 2001 and 2011 censuses on males and females reveal the reality of the gender gap within India as well as Odisha. Change is happening slowly but

surely yet there is still a long road ahead for gender equality to become ground reality in this predominantly traditional and conservative society. The gender disparity in the field of literacy is a serious problem for Odisha, which is in dire need of meticulous attention, impactful and sustainable solution immediately. The important problems are economic backwardness of the rural community, lack of proper social attitudes in favor of women education in rural areas.

**Suggestion and Policy recommendation**

While the gender gap in education has reduced to some extent, it still persists in many regions. Therefore, appropriate measures should be taken to address the factors contributing to this disparity, particularly in remote hilly areas that are predominantly tribal population. A special initiative should be launched to integrate these communities into the mainstream, which would positively impact overall educational outcomes. More schools with proper infrastructure should be established in these underdeveloped areas, where the education gap remains significant, making it easier for girls to enroll and understand the value of education. Various awareness programs can be conducted at the grassroots level to encourage both parents and girls to enroll in schools. Additionally, the dropout rate among girls, especially in higher education, tends to be higher than that of boys. To tackle this, a dedicated team at the Gram Panchayat and Block levels can identify and support these girls, encouraging their re-enrollment with special assistance from the government.

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# Community-Based Health Insurance and Financial Risk Protection in Karnataka: Insights from Karnataka

**Dinesha P T[1] and Ganaraj[2]**

**Abstract**

*Health is not only a critical component of human development but also serves as a fundamental pillar for the advancement of other social indicators. In India poor and marginalized communities in India secondary and tertiary healthcare services remain largely unaffordable for low-income households, frequently resulting in either untreated illnesses or financially catastrophic medical expenses—both of which contribute to the deepening cycle of poverty. Again general health insurance products are often beyond the financial reach of these groups. This gap has led to the development of community-based health insurance (CBHI) schemes designed to reduce out-of-pocket (OOP) expenditures and provide financial risk protection Among these, the Yeshasvini Cooperative Farmers Health Care Scheme stands out for its extensive geographical reach and significant budgetary commitment. The present study is designed with the objective of assessing the impact of the Yeshasvini Health Insurance Scheme on reducing out-of-pocket (OOP) health expenditures among marginalized communities. A stratified random sampling method was employed for the selection of respondents. The study was carried out in four districts of Karnataka, I,e Mysore, Tumkur, Belgaum, and Bellary. The study utilized both primary and secondary data sources. The study was conducted among a total of 160 respondents across the selected regions. The findings of this study clearly indicate that the scheme have improved the economic resilience of poor households, reduced out-of-pocket expenditures and Enhanced access to quality healthcare services. However, to ensure equity and sustainability, the coverage and depth of the schemes must be expanded to include primary, outpatient, and non-surgical inpatient care, while addressing operational inefficiencies.*

**Keywords:** Health, Public Private, Insurance, Community

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## Introduction

Health is not only a critical component of human development but also serves as a fundamental pillar for the advancement of other social indicators. In the Indian context, substantial evidence indicates that improvements in healthcare delivery and accessibility can significantly influence economic development (Acharya & Ranson, 2005; Reddy & Manjunath, 2006).

However, poor and marginalized communities in India continue to face disproportionate exposure to health-related risks. To manage these vulnerabilities, they often resort to informal coping mechanisms such as personal savings, asset liquidation, borrowing from social networks, and various forms of self or mutual insurance. While once viable, these traditional practices have become increasingly insufficient in addressing modern healthcare needs (Rangarajan, 2008). Secondary and tertiary healthcare services remain largely unaffordable for low-income households, frequently resulting in either untreated illnesses or financially catastrophic medical expenses, both of which contribute to the deepening cycle of poverty.

In response to these challenges, health insurance targeting low-income populations has emerged as a key policy tool. Unfortunately, general health insurance products are often beyond the financial reach of these groups. This gap has led to the development of government-sponsored and community-based health insurance (CBHI) schemes designed to reduce out-of-pocket (OOP) expenditures and provide financial risk protection (Gupta & Mitra, 2004; Kar, 2008). Empirical studies have underscored the positive impacts of such schemes on previously excluded households, including reduced inpatient costs, decreased dependency on high-interest loans, and strengthened community safety nets (Sabharwal et al., 2014; Schmachtenberg, 2012; Babajanian et al., 2014; Sood et al., 2014).

Karnataka has been a pioneer in adopting and implementing state-supported health insurance models. The state administers a diverse portfolio of schemes, each tailored to the needs of specific population groups (Kilaru et al., 2016). Among these, the Yeshasvini Cooperative Farmers Health Care Scheme stands out for its extensive geographical reach and significant budgetary commitment. The scheme specifically targets cooperative farmers and

other low-income beneficiaries, offering them access to essential medical services that would otherwise remain inaccessible.

**Objective**

To assess the impact of the Yeshasvini Health Insurance Scheme on reducing financial burden among marginalized communities.

**Methodology**

A stratified random sampling method was adopted to select respondents for this study. The research was conducted across four districts in Karnataka Mysore, Tumkur, Belgaum, and Bellary selected to represent a mix of socio-cultural and regional characteristics. From each district, two taluks were purposively chosen based on the presence of mixed caste populations, ensuring social diversity. Within each selected taluk, four villages were randomly chosen, resulting in a total of eight taluks and thirty-two villages being covered. The study employed both primary and secondary data sources. Primary data were collected through in-depth personal interviews using a structured interview schedule, targeting beneficiary households who had been hospitalized within the past one year and had availed services under the Yeshasvini health insurance scheme. The study used quantitative data collected from structured household interviews with few open ended questions to gather qualitative insights through interactions with key stakeholders, enabling a comprehensive assessment of the scheme's effectiveness. The study covered a total of 160 respondents across the selected regions, ensuring representation across diverse geographic, economic, and caste backgrounds.

**Data analysis**

The collected data was systematically analyzed using descriptive statistical methods. This approach facilitated the summarization and interpretation of the data by highlighting key patterns and trends. Wherever applicable, results have been expressed in terms of percentages to enable clearer understanding, easy comparison, and better representation of the distribution of responses.

## Results and Discussions

### Opinion about Public and Private Health Facility

A survey was conducted to evaluate the perceptions of beneficiaries regarding the quality of services provided in Public and Private Hospitals. The results reveal a mixed response from the participants: The data shows that 48.1% of respondents considered the quality of treatment in public hospitals to be good, taking into account various factors such as availability and attitude of doctors, condition of beds, quality of food services, and the functionality of operation theatres. Besides that 48.8% of the respondents were neutral or unable to comment, which could reflect limited exposure to or lack of recent experience with public healthcare services. And Only 3.1% rated the quality as poor, citing issues such as overcrowding, long waiting times, or lack of essential infrastructure.

These findings indicate that although a significant portion of the respondents find the services acceptable, nearly half are either unsure or not convinced about the quality of care, suggesting a general lack of confidence in public healthcare facilities.

Furthermore, the qualitative data collected from interviews reveal that many beneficiaries still prefer private hospitals when given the choice, primarily due to perceived better care, responsiveness, and infrastructure. However, financial constraints often force them to depend on public hospitals, even when they are not fully satisfied with the services. Several respondents reported being compelled to use public hospitals because private hospital charges are unaffordable for low-income households, especially in the absence of full insurance coverage for outpatient and diagnostic services.

It is also noteworthy that Below Poverty Line (BPL) households are still compelled to use private health facilities, with this trend being even more pronounced among rural BPL households. Given this context, the quality of services available in empanelled hospitals plays a critical role in assessing the effectiveness of health insurance schemes. To explore this, respondents were asked to share their views on the quality of empanelled private hospitals. The data indicates that 89.4% of respondents rated the quality of facilities in empanelled private hospitals as good. Only 0.6%—equivalent to a single respondent reported the quality as poor. These findings clearly show that, compared to public hospitals, the quality of

services in empanelled private hospitals is perceived as significantly better. Consequently, patients tend to prefer private facilities over government hospitals for their treatment needs.

**Table 1: Opinion about Public and Private Hospitals**

| Opinion | Public Hospital | | Private Hospitals | |
|---|---|---|---|---|
| | Number | Percent | Number | Percent |
| Very Good | 0 | 0.0% | 6 | 3.8% |
| Good | 77 | 48.1% | 143 | 89.4% |
| Can't Say | 78 | 48.8% | 10 | 6.3% |
| Bad | 5 | 3.1% | 1 | 0.6% |
| | 160 | 100.0% | 160 | 100.0% |

**Surgery Facilities in the Public Hospitals**

Surgeries are a critical component of medical treatment, and the Yashaswini scheme specifically focuses on surgical procedures. To assess these further, respondents were asked about the quality of surgical facilities available in government hospitals.

The data shows that 43.1% of respondents rated the surgical facilities in public hospitals as good, while 25% rated them as poor. These findings suggest that surgical services in government hospitals are perceived as substandard when compared to those in private hospitals. As a result, many patients continue to rely on private hospitals for surgical care.

Respondents were also asked about the quality of surgical facilities in private hospitals. An overwhelming 92.5% reported that the surgical services in private hospitals are good, and notably, none rated them as poor. This clearly indicates a significantly higher level of satisfaction with surgical care in the private sector.

These insights highlight the importance of government backed health insurance schemes, such as Yashaswini, in enabling access to high-quality surgical services in private, multi-specialty hospitals. Through such programs, patients—particularly those from lower-income groups—are able to access better care that would otherwise be financially out of reach.

**Table 2: Perception about Surgery Facilities**

| Type of Hospital | Opinion | | | | Total |
|---|---|---|---|---|---|
| | Very Good | Good | Can't Say | Bad | |
| Public | 6 | 69 | 45 | 40 | 160 |
| | 3.8% | 43.1% | 28.1% | 25.0% | 100.0% |
| Private | 6 | 148 | 6 | 0 | 160 |
| | 3.8% | 92.5% | 3.8% | 0.0% | 100.0% |

**Reasons to join the Scheme**

Health insurance schemes offer a range of benefits aimed at reducing the financial burden of medical treatment. A significant majority—81.2% of respondents, reported that the availability of cashless treatment was the main reason for joining the scheme. This feature eliminates the need for upfront payments during hospitalization and offers financial relief at the point of care. 7.5% of respondents stated that they enrolled in the scheme because it did not require them to pay any premium. For low-income individuals, this is a crucial factor that enhances the scheme's accessibility. 11.2% of respondents indicated that the presence of multiple benefits—such as coverage for major illnesses, surgeries, and free or subsidized treatment—influenced their decision to join the scheme.

**Table 3: Reasons to join the Scheme**

| Reasons | | | Total |
|---|---|---|---|
| Cashless Treatment | No need to pay premium | Multiple benefits | |
| 130 | 12 | 18 | 160 |
| 81.2% | 7.5% | 11.2% | 100% |

**Difficulties Associated with the Programme**

Understanding the challenges faced by beneficiaries is crucial for evaluating the effectiveness of any health insurance programme. According to the data, 6.9% of respondents reported facing some difficulties while availing benefits under the programme, while the vast majority 93.1% stated they encountered no issues.

Among the difficulties reported, the most common problems included:

Delays in issuing identity cards or receiving in correct details caused inconvenience during hospital visits. Many respondents highlighted the absence of empanelled private hospitals near their homes or villages, especially in rural areas. Some respondents faced difficulties due to the lack of staff at hospital help desks to guide them through the process.

**Table 4:** Key **Issues Affecting the Programme**

| Barriers Faced by Beneficiaries in Availing Programme Support | | Total |
|---|---|---|
| **Yes** | **No** | |
| 11 | 149 | 160 |
| 6.9% | 93.1% | 100.0% |

**Timely Treatment by the Network Hospital**

Timely medical intervention is crucial for effective treatment and patient satisfaction. According to the data, only 51.3% of respondents reported receiving timely treatment from network hospitals. This indicates that nearly half of the beneficiaries experienced delays, which could compromise health outcomes and diminish trust in the healthcare system.

The reasons for delayed treatment varied among respondents, with several common issues emerging: Some patients reported being denied immediate admission due to unavailability of beds. In several cases, the concerned doctors were not available at the time of arrival, leading to prolonged waiting periods. Some hospitals had specialist doctors available only one or two days a week, forcing patients to wait several days—sometimes up to a week—for treatment. Despite insurance coverage, some patients were asked to pay advance or differential amounts ranging from ₹10,000 to ₹50,000 before admission. A number of respondents under the Yashaswini scheme reported that hospitals often discouraged them from availing treatment under the scheme and redirected them to other hospitals.

**Table 5: Does network hospital Provide Timely treatment**

| Yes | No | Total |
|---|---|---|
| 82 | 78 | 160 |
| 51.3% | 48.8% | 100.0% |

**Transportation Cost**

Transportation plays a significant role in accessing healthcare, especially for rural populations who often have to travel long distances to reach empaneled hospitals. According to the data, all 160 respondents (100%) reported incurring out-of pocket expenditure on transportation before reaching an empaneled private hospital.

The expenses varied depending on the mode of transport, which included cars, buses, trains, auto-rickshaws, motorbikes (fuel costs), and other locally available means. This consistent financial burden across all respondents highlights a critical gap in the health insurance scheme—non-coverage of transportation costs.

Despite being enrolled in health insurance programmes designed to reduce healthcare-related financial strain, beneficiaries still bear a significant cost just to access treatment. For individuals in remote or rural areas, these transportation expenses can be a substantial barrier, leading to delayed care or avoidance of treatment altogether.

This finding underscores the need for policymakers to consider including transportation allowances or support mechanisms within health insurance schemes, particularly for rural beneficiaries.

**Sources to Meet Out-of-Pocket Expenditure**

Out-of-pocket expenditure continues to be a major challenge for patients, even those enrolled in health insurance schemes. According to the data, all 160 respondents (100%) reported incurring out-of-pocket expenses during hospitalization, particularly when healthcare costs exceeded insurance coverage or for non-covered expenses such as transportation and medicines.

Data shows that 46.9% used their own savings or income to cover expenses. While 41.9% sought financial support from relatives or friends. Besides that, 10% were forced to borrow from money lenders, often at high interest rates. These findings reveal the financial vulnerability of many households when facing health emergencies. While health insurance schemes provide partial financial relief, the gap between actual medical expenses and coverage continues to burden low-income families

**Table 6: Sources to meet the Out of Pocket Expenditure**

| Own Sources | Money lender | Relations/Friends | Others | Total |
|---|---|---|---|---|
| 75 | 16 | 67 | 2 | 160 |
| 46.9% | 10.0% | 41.9% | 1.3% | 100.0% |

**Availability of Prescribed Medicines in Empaneled Hospitals**

One of the persistent issues faced by patients during hospitalization is the non-availability of prescribed medicines within the hospital premises. Although the quality of treatment provided in empaneled hospitals is generally regarded as good, the inconsistent availability of essential medicines remains a significant concern. According to the data, 83.8% of respondents stated that all prescribed medicines were available in the medical stores of empaneled hospitals. However, 16.3% reported that not all prescribed medicines were available, forcing them to purchase medicines from outside.

Some patients also expressed concerns that certain doctors prescribe expensive medicines, which may not be stocked by the hospital pharmacy. This not only adds to the financial burden on patients but also contradicts the principle of cashless or fully covered treatment under the health insurance schemes. Hospitals have a responsibility to provide or arrange for all necessary medicines and diagnostic tests related to the patient's treatment. When patients are required to go outside the hospital to purchase medicines, they incur out-of-pocket expenses, defeating the purpose of insurance coverage and creating additional financial stress.

**Table 7: Availability of prescribed medicines in the hospitals**

| Yes | No | Total |
|---|---|---|
| 134 | 26 | 160 |
| 83.8% | 16.3% | 100.0% |

**Availability of Diagnostic Tests in Network Hospitals**

Diagnostic tests are a crucial part of effective treatment and accurate medical decision-making. Data shows that 92.5% of respondents stated that network hospitals did not have all required diagnostic tests. Only 7.5% reported that the hospitals had comprehensive

diagnostic testing facilities. Patients explained that while some basic tests were available in the hospital, they were often referred to external diagnostic centers for specialized or advanced tests. This requirement to go outside the hospital is a major contributor to out-of-pocket expenditure, as such costs are often not covered under the insurance scheme.

This gap not only causes financial strain on the patients but also leads to inconvenience and delays in treatment, especially for those from rural areas who have limited access to transportation and external labs. To ensure the effectiveness and credibility of health insurance schemes, it is essential that empaneled hospitals are equipped with a comprehensive range of diagnostic facilities or have formal tie-ups with diagnostic centers where costs are also covered under the scheme

**Table 8: Diagnostic Tests in the Hospitals**

| All the network hospitals have all diagnostic tests | | Total |
|---|---|---|
| No | Yes | |
| 144 | 16 | 160 |
| 90.0% | 10.0% | 100.0% |

**Health Expenditure of the Family before and After the Health Insurance Programme (HIP)**

Health insurance schemes are primarily intended to reduce the financial burden of healthcare on households. The data from the study clearly indicates a positive impact of the Yashaswini Health Insurance Programme on reducing out-of-pocket (OOP) health expenditures for beneficiary families.

Before Joining the Yashaswini Scheme, 15% of respondents spent less than ₹500 per month on healthcare. And 33.1% spent ₹500–₹1000 per month. Besides that, 51.9% spent more than ₹1000 per month. After Joining the Scheme. The proportion of respondents spending less than ₹500 increased significantly to 54.8%. Those spending ₹500–₹1000 decreased to 31.0% from 50.4%. Respondents spending more than ₹1000 declined notably to 14.2%, down from 35.8%.

This clear shift demonstrates that a substantial number of households experienced a reduction in monthly health-related expenses after enrolling in the insurance programme. The

most significant improvement is seen in the decrease in the highest expenditure category (₹1000 and above) and the increase in the lowest expenditure category (less than ₹500). These findings confirm that the Yashaswini Health Insurance Programme has effectively reduced the OOP health expenditure for many low-income households, thereby making healthcare more affordable and accessible. It also highlights the role such schemes play in protecting economically vulnerable families from catastrophic health spending.

**Table 9: Health Expenditure before the HIP**

| | Health Expenditure of the family Before the HIP | | | Total |
|---|---|---|---|---|
| | Less than Rs. 500 | Rs. 500-1000 | Above Rs. 1001 | |
| Before | 24 | 53 | 83 | 160 |
| | 15.0% | 33.1% | 51.9% | 100.0% |
| After | 100 | 43 | 17 | 160 |
| | 62.5% | 26.9% | 10.6% | 100.0% |

**Reduction in Health Expenditure after Joining the Scheme**

The data further reinforces the positive financial impact of health insurance schemes on beneficiary households. After enrolling in their respective health insurance programmes, respondents reported a notable reduction in monthly health expenditures. According to the data 62.5% of respondents spent less than ₹500 per month on healthcare. While, 26.9% spent between ₹500 and ₹1000 per month. And Only 10.6% reported spending more than ₹1000 per month. This distribution clearly indicates that a majority of beneficiaries experienced a significant decline in out-of-pocket health expenses following enrollment. Compared to the pre-insurance scenario, where a larger proportion of respondents were in higher expenditure brackets, this shift demonstrates the effectiveness of the health insurance schemes in providing financial protection against medical costs.

**Expenditure on Diagnostic tests and other costs**

Although the health insurance schemes studied are designed to reduce out-of-pocket (OOP) expenditure, they do not consistently cover follow-up treatments, leading to significant financial burdens for beneficiaries. This inconsistency in coverage underscores the

urgent need for such schemes to mandatorily include follow-up treatments as part of their benefits package.

According to the data, only 1.3% of respondents incurred expenses for scanning tests and X-rays, and 1.9% spent money on various pathology tests (including blood, urine, feces, or biopsy samples). In contrast, a majority (96.3%) reported spending money on a combination of all medical tests such as scanning, blood tests, X-rays, and other pathology services including ambulance charges. This indicates that the bulk of OOP expenditure arises from diagnostic and support services, which are not covered under the current insurance framework. Many poor households are disproportionately affected, as diagnostic services in private hospitals especially scanning and certain pathology tests are often prohibitively expensive. If the patient does not require surgery, these expenses must be borne entirely out of pocket, thus negating the purpose of having insurance coverage.

Additional expenses, including doctor/surgeon fees, medicines, bed charges, attendant charges, physiotherapy, personal medical appliances, blood, and oxygen cylinders, are also typically excluded from coverage, further burdening the patient financially.

essential to ensure the schemes meet their intended objectives effectively.

**Table 10: Major Heads of Medical Expenditure in Hospitals**

| Scanning / Xray Cost | Pathology Costs | Transportation Cost | All Medical Report Cost | Total |
|---|---|---|---|---|
| 2 | 1 | 3 | 154 | 160 |
| 1.3% | 0.6% | 1.9% | 96.3% | 100.0% |

The health insurance schemes particularly those targeted at the poor, marginalized, and farming community have had a notable positive impact on beneficiaries. These schemes have significantly reduced the financial burden of medical care, making treatment more accessible and less economically disruptive for vulnerable households. Prior to enrollment in health insurance schemes, many respondents reported taking on debt to afford costly treatments. With the introduction of insurance coverage Out-of-pocket expenditure has decreased, allowing families to save money that was previously used for medical bills.

One of the respondents from Tumkur Taluk felt that "*Before joining the health insurance scheme, if any family member was hospitalized, it created serious financial strain.*

*We had to borrow money urgently—often at high interest—from local lenders. We also lost daily wages in the process. After joining the scheme, such shocks have been minimized. Now, we can use our savings for regular household expenses instead of medical costs."* This anecdote reflects a broader pattern observed in the study: insurance coverage shields families from the economic shocks of hospitalization, and improves financial resilience and quality of life

**Key Policy Directions and Suggested Reform**

Based on the findings of the study, the following recommendations are made to enhance the effectiveness, efficiency, and inclusivity of the health insurance schemes:

**Strengthening Regulation**

Standardization of costs, procedures, and services across all schemes will improve transparency, help beneficiaries make informed decisions, and ensure equity in service delivery. There is a need for a robust regulatory framework must be developed to monitor the scheme

**Establishing a Grievance Redressal System**

There is an urgent need for a user-friendly, accessible grievance redressal mechanism, particularly tailored for illiterate and economically marginalized populations. This system should allow beneficiaries to register complaints with minimal procedural barriers and ensure timely resolution to build trust and accountability in the scheme's implementation.

**Provision of Adequate Medicines**

Reports indicate frequent unavailability of prescribed medicines within empanelled hospitals. The government should: Issue strict guidelines mandating the availability of prescribed medicines and Monitor compliance via Third Party Administrators (TPAs) and also Ensure reimbursement for patients forced to purchase medicines externally

**Selection of Fully Equipped Hospitals**

Empanelment criteria should prioritize hospitals that possess In-house diagnostic and pathology services, Full-time qualified specialists and Comprehensive surgical facilities. This will reduce the need for external referrals and minimize out-of-pocket expenditure for diagnostic and pre-operative tests.

**Expansion of Primary Care Coverage**

Currently, most schemes only cover inpatient surgical procedures. However, outpatient cares (OPD) accounts for a significant portion of health expenditure. Thus, OPD coverage must be added to the benefit package to address routine care needs and reduce the progression of untreated conditions into more serious illnesses.

**Inclusion of More Diseases and Adjustment of Package Rates**

The exclusion of certain diseases and the disparity in package rates in the scheme disincentivize hospitals from participation and affect service delivery. It is recommended that there is a need to revise package rates based on current medical costs and Expand the list of covered diseases and procedures, including non-surgical hospitalizations

**Improvement in Coverage Scope**

The scope of insurance schemes should be broadened to include: Non-surgical hospitalization (e.g., for conditions like dengue, anemia, and cardiac emergencies) Medico-legal cases and Preventive and promotive healthcare services. This would enhance the comprehensive utility of the schemes and align them with the real health needs of the poor.

**Conclusion**

Publicly funded health insurance programmes serve as powerful tools for advancing inclusive development, particularly when effectively reaching marginalized populations such as Scheduled Castes, Scheduled Tribes, religious minorities, and women. The findings of this study clearly demonstrate that these schemes have strengthened the economic resilience of poor households, reduced out-of-pocket healthcare expenditures, and enhanced access to quality health services. However, to promote greater equity and long-term sustainability, it is essential to broaden the scope and depth of these programmes. This includes extending coverage to primary care, outpatient services, and non-surgical inpatient care, while simultaneously addressing existing operational inefficiencies. By adopting these reforms, publicly funded health insurance schemes can evolve into comprehensive, inclusive health protection systems, moving closer to the goal of universal health coverage particularly for the poor and socially excluded.

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