Shiv Shakti International Journal of Multidisciplinary and Academic Research
ISSN: 2278-5973 (Online) | Vol. 14, No. 2, (March 2026)
https://doi.org/10.5281/zenodo.20795192

Testing The Association Between Socio-Demographic Factors and Caesarean Section Among 332 Deliveries in District Udham Singh Nagar, Uttarakhand

Bushra Naz[1] and Dr. Amit Kumar Vats[2]
[1] Research Scholar, Department of Management, Shri Venkateshwara University, Gajraula, India
[2]Guide, Department of Management, Shri Venkateshwara University, Gajraula, India

Abstract

Background: Caesarean Section (C-section) is a life-saving obstetric intervention when medically indicated; however, rising rates have raised concerns about over-medicalization. The World Health Organization recommends population-level C-section rates between 10–15%. In India, C-section rates have increased significantly around 21.5% according to the NFHS-5, 2019–21 report. The higher prevalence were noticed among urban and socio-economically strong women. This study tested whether education, income, and urban residence are positively associated with Caesarean Section.

Methods: A cross-sectional analytical study was conducted among 332 women who delivered in District Udham Singh Nagar, Uttarakhand from April 2023-March 2024. Mode of delivery (the dependent variable was C-section vs. Normal Delivery. Independent variables included education, monthly household income, and place of residence. Descriptive statistics estimated prevalence, and Chi-square tests assessed associations. Statistical significance was set at $p < 0.05$.

Results: The C-section prevalence was 31.76% (105/332). Higher proportions were observed among women with graduate-level education (36%), higher income (50% in ≥₹50,000 group), and urban residence. However, these associations were not statistically significant ($p > 0.05$).

Conclusion: Although socio-demographic gradients were observed, they were not statistically significant. Institutional factors may exert a stronger influence on delivery mode in this setting.

Keywords: Caesarean Section; Socio-Demographic Factors; Education; Income; Urban Residence; Maternal Health; India

Introduction

Caesarean Section (C-section) is a critical obstetric intervention that significantly reduces maternal and neonatal mortality when medically indicated. However, the steady rise in C-section rates worldwide has raised concerns regarding the over-medicalization of childbirth. The World Health Organization recommends that C-section rates at the population level should ideally range between 10–15%, as rates beyond this threshold do not correspond to further reductions in maternal or neonatal mortality. In India, C-section rates have increased markedly over the past two decades. According to the International Institute for Population Sciences (NFHS-5, 2019–21), the national average C-section rate is 21.5%, with substantially higher rates reported among urban, wealthier, and more educated women. These patterns suggest the presence of socio-demographic gradients in obstetric interventions. The present study examines 332 deliveries in District Udham Singh Nagar, Uttarakhand, to empirically test the following hypothesis:

Corresponding Author: Bushra Naz, bushranaz2010@gmail.com

H_1 (Research Hypothesis): Socio-demographic factors such as education, income, and urban residence are positively associated with a higher likelihood of Caesarean Section.

H_0 (Null Hypothesis): There is no association between socio-demographic factors and the likelihood of Caesarean Section.

Methodology

Study Design and Setting

A cross-sectional analytical study was conducted among 332 women who delivered in District Udham Singh Nagar, Uttarakhand.

Ethical Considerations

Ethical approval for the study was obtained from Shri Venkateshwara University (SVU), Gajraula, Uttar Pradesh. The study was conducted in accordance with established ethical principles for research involving human participants. Informed consent was obtained from all participants prior to the data collection. They were informed about the purpose of the study, and confidentiality and anonymity of the information collected were ensured throughout the research process.

Variables

Dependent Variable

- Mode of delivery (C-section = 1; Normal Delivery = 0)

Independent Variables (Socio-Demographic)

- Education level (Primary, Secondary, Graduate and above)
- Monthly household income (≤₹10,000; ₹10,001–20,000; ₹20,001–50,000; ≥₹50,000)
- Place of residence (Urban/Rural)

Statistical Analysis

- Descriptive statistics were used to estimate prevalence.
- Chi-square tests were applied to examine associations between socio-demographic variables and mode of delivery.
- Statistical significance was set at $p < 0.05$.
- Hypothesis testing was conducted using bivariate analysis.

Results

Prevalence of Caesarean Section

Out of 332 deliveries:

- 105 were Caesarean Sections
- 227 were Normal Deliveries

The overall C-section prevalence was 31.76%, which is more than double the upper limit recommended by the WHO.

Hypothesis Testing

Table 1. Education and Likelihood of C-Section

Education Level	CS n (%)	Normal Delivery n (%)	Total
Primary	18 (26%)	51 (74%)	69
Secondary	47 (32%)	101 (68%)	148
Graduate+	40 (36%)	75 (64%)	115

$\chi^2$2.278
$p > 0.05$

Interpretation: A positive gradient is observed across education levels (26% → 32% → 36%). However, the association between education and C-section was not statistically significant at the 5% level.
Decision: Fail to reject H_0 for education.

Table 2. Monthly Income and Likelihood of C-Section

Monthly Income (₹)	C-Section n (%)	Normal Delivery n (%)	Total
≤10,000	22 (24%)	69 (76%)	91
10,001–20,000	38 (36%)	67 (64%)	105
20,001–50,000	35 (33%)	72 (67%)	107
≥50,000	10 (50%)	10 (50%)	20

χ^2 = 8.397
$p > 0.05$

Interpretation: Higher-income groups demonstrated higher proportions of C-sections, particularly the ≥₹50,000 category (50%). Nevertheless, the association did not achieve statistical significance.

Decision: Fail to reject H_0 for income.

1. **Urban Residence and Likelihood of C-Section**

Urban women exhibited higher C-section rates compared to rural women. However, this association did not reach statistical significance in bivariate analysis.
Decision: Fail to reject H_0 for urban residence.

Table 3. Summary of Hypothesis Testing

Variable	Observed Trend	Statistical Significance	Decision
Education	Positive gradient	Not significant	Fail to reject H_0
Income	Positive gradient	Not significant	Fail to reject H_0
Urban Residence	Higher urban CS	Not significant	Fail to reject H_0

Discussion

This study tested the hypothesis that socio-demographic factors like education, income, and urban residence etc. are positively associated with a higher likelihood of C-section.

Although directional trends were observed (particularly across income and education categories), these associations were not statistically significant at the 5% level. Therefore, the hypothesis was not statistically supported in this dataset.

In contrast, institutional and obstetric factors demonstrated stronger associations in the broader analysis of the dataset, particularly:

- Previous delivery mode (repeat C-section effect)
- Hospital type (private vs. government facilities)

These findings suggest that in District Udham Singh Nagar, institutional and health system factors may exert a stronger influence on delivery mode than socio-demographic characteristics alone.
It is plausible that socio-economic factors operate indirectly, primarily through access to private healthcare facilities, where C-section rates are substantially higher. The absence of statistical significance may also reflect:

- Limited statistical power for subgroup comparisons
- Potential confounding variables
- Lack of multivariable logistic regression analysis

Future studies employing multivariate modelling would be valuable to identify independent predictors.

Limitations

This study has certain limitations. The cross-sectional design limits causal inference, and small subgroup sizes may have reduced statistical power. Potential confounding factors were not controlled, and multivariable logistic regression analysis was not performed. Therefore, the independent effects of socio-demographic factors on Caesarean Section could not be fully assessed.

Conclusion

The prevalence of C-section deliveries was 31.76% among 332 deliveries in District Udham Singh Nagar, the C-section prevalence was substantially exceeding recommended thresholds.
While higher education and income groups exhibited increased proportions of C-sections, the associations were not statistically significant in bivariate analysis. Urban residence similarly did not show a significant association.
Therefore:

- The research hypothesis was not statistically supported.
- The null hypothesis cannot be rejected.

The findings indicate that institutional factors especially private hospital delivery and previous C-section are stronger determinants of Caesarean Section than socio-demographic characteristics in this district.

Key Summary Points

- The prevalence of Caesarean Section among 332 deliveries in District Udham Singh Nagar was 31.76%, exceeding the WHO recommended population-level rate of 10–15%.
- Women with higher educational attainment demonstrated a greater proportion of C-section deliveries (26% among primary education vs. 36% among graduates).
- Higher household income was associated with a greater proportion of C-sections, reaching 50% among women with monthly household income ≥₹50,000.
- Urban women showed higher C-section rates compared with rural women.

- Associations between education, income, residence, and mode of delivery were not statistically significant ($p > 0.05$).
- The findings suggest that institutional factors, particularly hospital type and previous Caesarean delivery, may have a stronger influence on delivery mode than socio-demographic characteristics.

Acknowledgements

The authors acknowledge the support of all study participants and the healthcare institutions in District Udham Singh Nagar for facilitating data collection.

References

Betrán, Ana Pilar, Ye, Jianfeng, Moller, Anne-Beth, Zhang, Jun, Gülmezoglu, A. Metin, & Torloni, Maria Regina. (2016). The increasing trend in caesarean section rates: Global, regional and national estimates: 1990–2014. PLOS ONE, 11(2), e0148343. https://doi.org/10.1371/journal.pone.0148343

Boerma, Ties, Ronsmans, Carine, Melesse, Dessalegn Y., Barros, Aluísio J. D., Barros, Fernando C., Juan, Lale Say, Moller, Anne-Beth, et al. (2018). Global epidemiology of use of and disparities in caesarean sections. The Lancet, 392(10155), 1341–1348. https://doi.org/10.1016/S0140-6736(18)31928-7

Cavallaro, Francesca L., Cresswell, Jenny A., França, Giovanny V. A., Victora, Cesar G., Barros, Aluísio J. D., & Ronsmans, Carine. (2013). Trends in caesarean delivery by country and wealth quintile: Cross-sectional surveys in southern Asia and sub-Saharan Africa. Bulletin of the World Health Organization, 91(12), 914–922D. https://doi.org/10.2471/BLT.13.117598

International Institute for Population Sciences, & Ministry of Health and Family Welfare. (2021). National Family Health Survey (NFHS-5), 2019–21: India Report. Mumbai, India: International Institute for Population Sciences.

Kambo, Ishwar, Bedi, N., Dhillon, B. S., & Saxena, N. C. (2002). A critical appraisal of caesarean section rates in India. Journal of Obstetrics and Gynecology of India, 52(4), 73–77.

Mishra, U. S., & Ramanathan, M. (2002). Delivery-related complications and determinants of caesarean section rates in India. Health Policy and Planning, 17(1), 90–98. https://doi.org/10.1093/heapol/17.1.90

National Health Systems Resource Centre. (2023). Rural Health Statistics 2022–23. New Delhi, India: Government of India.

Neuman, Michelle, Alcock, Georgia, Azad, Kishwar, Kuddus, Abul, Osrin, David, More, Nandita S., Nair, Nirmala, et al. (2014). Prevalence and determinants of caesarean section in private and public health facilities in underserved South Asian communities. BMJ Open, 4(12), e005982. https://doi.org/10.1136/bmjopen-2014-005982

United Nations Children's Fund, & World Health Organization. (2021). Monitoring maternal and newborn health through population-based surveys. New York, NY: UNICEF.

World Health Organization. (2015). WHO statement on caesarean section rates. Geneva, Switzerland: World Health Organization.