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Life, decisions, and losses: Examining the relationship between contraceptive use and pregnancy loss among Indian Women: A case study of Uttar Pradesh multivariate by binary logistic regression

Riti Deshmukh

Junior Research Fellow, Department of Geography, Banaras Hindu University, Varanasi, 221005

Email: riti1999@bhu.ac.in

Sakshi

Junior Research Fellow, Department of Geography, Banaras Hindu University, Varanasi, 221005

Email: sakshii.201997@gmail.com

Dr. Sabina Bano

Assistant Professor, Department of Geography, MMV, Banaras Hindu University, Varanasi, 221005

Email: sabina.dhn@gmail.com

Abstract--The study explores the relationship between contraceptive prevalence and the demographic characteristics of women of reproductive age in Uttar Pradesh, India, particularly focusing on their experiences with pregnancy loss. The research utilizes data from NFHS-5(2019- 2021). A cross-sectional sample comprising 6,485 women aged 15-49 has been chosen for this study. Bivariate descriptive statistics and Multivariate Binary Logistic regression are employed to evaluate the prevalence of contraceptive usage and its correlation with pregnancy loss, alongside identifying the determining

factors. The findings reveal that 41.22% of reproductive women abstain from contraceptive use, with 31.24% opting for short-term modern methods, 20.30% relying on traditional methods, 5.59% choosing permanent methods, 1.66% preferring long-acting reversible methods, and 0.08% utilizing other modern methods. A significant correlation is observed between pregnancy outcomes and contraceptive utilization, indicating a 1.64 times higher likelihood (OR: 1.64, 95% CI, 1.44-1.86) of contraceptive use among those who have experienced abortion compared to miscarriage. Besides that, an intimate association has been found between age, family size, residential and regional status. So, the choice of contraceptive methods among women of reproductive age is influenced by their past experiences of pregnancy loss as well as socio-demographic factors. Limited awareness, particularly among rural women, regarding modern contraceptive methods, whether long-term/permanent or short-term, contributes to their inability to utilize any method.

Keywords---Contraceptive use, Pregnancy loss, NFHS-5, Uttar Pradesh.

Introduction

Healthcare needs may differ for men and women, but both have equal rights to healthy lifestyles. However, for a significant percentage of women and girls, mobility restrictions and a lack of financial resources are among the factors that cause gender discrimination to systematically impede their access to health care. This is exacerbated by additional burdens posed by gender disparities limiting their ability to stay healthy. These involve endless hours spent performing household chores, hazardous workplaces, and gender-based violence, for which there are frequently insufficient preventative and protective measures. Risks associated with pregnancy and childbirth are distinct. Globally, 830 women lose their lives to preventable pregnancy- and birth-related fatalities every day, which adds up to approximately 303,000 women per year (**UN Women**). Maternal health is explicitly recognized within the United Nations' Sustainable Development Goals (SDGs), specifically in Goal 3 (Good Health and Well-being) and Goal 5 (Gender Equality). Achieving universal access to reproductive healthcare services, reducing maternal mortality ratios, and ensuring universal access to sexual and reproductive health and rights are integral components of the SDG framework. SDG 3 targets to reduce the global maternal mortality ratio to less than 70 per 100,000 live births and ensure universal access to sexual and reproductive healthcare services, including family planning, information and education, and the integration of reproductive health into national strategies and programs by 2030 (**World Health Organization n.d.**). Improved maternal well-being and pregnancy outcomes are an integral healthcare priority. Maternal health is an essential facet of development as it demonstrates a country's commitment to ensuring the well-being of its citizens, especially its women and children. Miscarriage, stillbirth, and abortion are all adverse pregnancy outcomes that reflect poor maternal health caused as a result of unplanned pregnancies and inefficient family planning. An unintended pregnancy is a significant public health

concern in both low and high-income countries. All women, regardless of their geography, per capita income, or other demographic characteristics, have encountered unintended pregnancy at a certain point in their lives (**Sharma and Singh, 2023**). Pregnancy terminations are a common response to the burden of an unintended pregnancy, which can have a detrimental impact on a woman's family, the health care system, and society at large. Worldwide, in 2000, approximately 90% of abortion-related morbidity and mortality, 20% of pregnancy-related morbidity and mortality, and 32% of maternal deaths could be prevented through the use of effective contraception (**Cleland et al., 2006**). Based on research performed in India, there were 70 unintended pregnancies for every 1000 women aged 15 to 49 years, accounting for almost 50% of India's 48.1 million pregnancies in 2015 (**Singh et al., 2018**). Each year, these unwanted pregnancies result in about 47,000 maternal deaths and 25 million unsafe abortions (**Perappadan, 2019**). In addition to national surveys, state-level surveys also provide comparable data. The 2015 state-level survey "Unintended Pregnancy and Abortion in India" (UPAI), conducted in six Indian states, offers estimates of abortion and unintended pregnancies in both facility and outpatient settings. In states such as Assam, Uttar Pradesh, Bihar, Gujarat, and Madhya Pradesh, the survey indicates that about 43-55% of pregnancies were unintended. Uttar Pradesh had the highest percentage of unintended pregnancies (**Singh et al., 2018**). The costs associated with an unintended pregnancy on a personal, social, medical, and economic level have been overlooked in these statistics. Even though Contraceptive failure and failure to use contraception contribute to a significant number of unplanned pregnancies; however, inadequate availability of affordable, accessible contraception services, a lack of awareness of reliable contraception, and sexual inequalities in numerous traditions can all impact a woman's ability to control her own fertility (**Klima, 1998**). Worldwide, roughly 257 million women who prefer to prevent pregnancy do not use reliable and safe, modern contraceptive methods, and wherever statistics are available, almost a quarter of all women lack the ability to say no to sex (**Mureithi, 2022**). A variety of more significant variables contribute to unintended pregnancies, including a lack of sexual and reproductive health care and information, contraceptive methods unsuitable for the bodies or situations of women, harmful norms and prejudice around women governing their individual fertility and bodies, sexual harassment and reproductive coercion, stigmatization or judgmental attitudes in the health services, poverty, stalled economic growth, and gender inequality (**Mureithi, 2022**). For family planning and reproductive health, individuals and couples in India use a wide range of contraceptive methods. According to the National Family Health Survey (NFHS-4) conducted in 2015-16, female sterilization, condoms, and oral contraceptive pills (OCPs) were the most popular contraceptive methods among currently married women aged 15-49 years. Female sterilization, also known as tubectomy, was identified as the most popular method, with approximately 36.2% of women choosing this long-term form of contraception. Condoms, both male and female, were used by approximately 5.6% of women, offering dual protection against pregnancy and sexually transmitted infections. Oral contraceptive pills were used by approximately 4.1% of women, providing a convenient and reversible hormonal contraceptive method (**Agrawal et al., 2023**). In addition to hormonal Intrauterine contraceptive device IUDs and copper-T IUDs, which offer long-term contraceptive protection, intrauterine devices (IUDs) are another widely used method in India. Healthcare providers administer

injectable contraceptives such as Depo-Provera (medroxyprogesterone acetate), which are an effective hormonal contraceptive. Some couples use natural methods such as the calendar method (which involves tracking menstrual cycles) and withdrawal (coitus interruptus). In line with population statistics, an overall contraceptive usage rate of 67% in NFHS-5, compared to 54% in NFHS-4 at all India levels has been achieved. As a result, the prevalence of modern contraception has increased from 48% to 56%, with female sterilization remaining the most popular method (38%). Furthermore, the public sector's use of modern contraceptives remains consistent between NFHS-4 (69%) and NFHS-5 (68%). The demand for family planning among married women aged 15 to 49 years has increased by 10%, from 66% (NFHS-4) to 76% (NFHS-5). All of this has helped reduce the unmet need for family planning from 13% to 9%, as reported in NFHS-4 (**Ministry of Health and Family Welfare, 2021**). On the other hand, discontinuation also increased. The reason includes fertility reasons consisting of infrequent sex/husband away, difficulty getting pregnant/menopausal, marital dissolution/separation, side effects or health concerns, desire to become pregnant, wanting a more effective method, failure of existing methods or other reasons including lack of access/too far, costs too much, and inconvenient to use (**Ministry of Health and Family Welfare, 2021; Tripathi et al., 2023**). Contraceptive utilization and continuation are influenced by various factors, including individuals' prior experiences, pregnancy outcomes, regional accessibility to reproductive health services, and levels of awareness, rumours, and misconceptions. Moreover, these determinants are closely tied to the socioeconomic development status of the respective regions (**Takyi et al., 2023**). For instance, regions with higher levels of economic development often exhibit greater accessibility to contraceptive resources and more comprehensive awareness programs, thereby positively impacting contraceptive use and continuation rates (**Troutman et al., 2020**). Consequently, the interplay between regional development and contraceptive behaviours underscores the multifaceted nature of reproductive health dynamics (**Muhoza et al., 2021**). With over 220 million people, Uttar Pradesh (UP) is India's most populous state, accounting for 16.0% of the country's total population where 75% of households are predominantly rural (**Ministry of Health and Family Welfare, 2021; Takyi et al., 2023**).

In Uttar Pradesh, India, the dynamics of family size significantly impact contraceptive use and pregnancy loss rates, reflecting broader social and economic development patterns. Research has shown that larger family sizes often correlate with lower contraceptive use, potentially due to limited resources, education gaps, or cultural norms. This is particularly relevant in Uttar Pradesh, where the Total Fertility Rate (TFR) remains relatively high at around 2.4 children per woman as of recent NFHS-5 data, which is higher than the replacement fertility level making its way in the list of 5 states having fertility rates above the replacement level of 2.1 which includes Uttar Pradesh, Bihar, Jharkhand, Meghalaya, and Manipur (**Ministry of Health and Family Welfare, 2021**). The total fertility rate in urban areas of U.P is 1.9 children per woman, which is less than the replacement level, whereas in the rural U.P, it is 2.5 children per woman, which is more than the replacement level (**Ministry of Health and Family Welfare, 2021**). Unplanned pregnancies are quite common in Uttar Pradesh. If all women had only the number of children they desired, the total

fertility rate would have been 1.8 children per woman, rather than the current level of 2.4. 88% of the last pregnancies in the five years preceding the survey resulted in a live birth, with the remaining 13% resulting in foetal wastage (abortion, miscarriage, or stillbirth). Miscarriage is the most common type of foetal wastage, accounting for 8% of all pregnancies, while abortions accounted for 4% (**Ministry of Health and Family Welfare, 2021**). Women reported three main reasons for seeking abortion: unplanned pregnancy (61%), pregnancy complications, and health concerns (6% each) (**Ministry of Health and Family Welfare, 2021**). With larger families, women may face increased challenges accessing and utilizing contraceptives effectively, contributing to higher rates of unintended pregnancies and subsequent pregnancy loss. However, the scenario begins to shift as development indicators improve—such as increased literacy rates, better healthcare infrastructure, and economic opportunities. The preference for sons is very strong in Uttar Pradesh. 23% of women and 22% of men want more sons than daughters, while only 2-3% of women and men want more daughters. However, 87% of women and 83% of men would like to have at least one son, while 85% of women and 8% of men want at least one girl. Women's desire to have more children is strongly influenced by their current number of sons. For example, 85% of women with two sons want no more children, while 44% of women with two daughters do (**Ministry of Health and Family Welfare, 2021**). Contraception is almost universally understood in Uttar Pradesh. In contrast, a few options are still relatively unknown. Half of currently married women are aware of the lactational amenorrhoea method (LAM), while 18% are aware of female condoms. Only 42% of women are aware of emergency contraception. The contraceptive prevalence rate among currently married women aged 15 to 49 is 62%, up from 46% in NFHS-4 (2015-16). The adoption of modern family planning methods (45%) has also risen since NFHS-4 (32%) (**Ministry of Health and Family Welfare, 2021**). The effectiveness of contraceptives is based on several factors, including user adherence and continuation, individual fecundability, coital frequency, and drug or device efficacy (**Teal and Edelman, 2021; Trussell and Wynn, 2008**). Under ideal adherence, all commonly used contraception methods, such as withdrawal and periodic abstinence, face little or moderate failure rates (**Trussell and Wynn, 2008**). However, in real life, the rate of failure is higher for methods that require memory, skill, and discipline, such as oral contraceptives, condoms, periodic abstinence, and withdrawal (**Cleland, 2020**). Using data from 15 high-quality Demographic and Health Surveys (DHSs), it was projected that 19% of periodic abstinence users, 17% of withdrawal users, 9% of condom users, and 6% of pill users would become pregnant by month 12 of use (**Takyi et al., 2023**). Implants and IUDs have much higher continuation rates (around 90%) than other methods (50-60%), so the term 'Long-Acting Reversible Contraception (LARCs)' methods are frequently used to describe them. Their low failure rate, combined with high continuation, demonstrates LARCs' superiority in pregnancy prevention. It is worth noting that, while injectables have a low failure rate, they also have a low continuation rate. A randomized control trial in the United States confirms observational evidence that LARCs are superior. Compared to women assigned to other methods, women randomly assigned to a LARC had lower pregnancy rates and higher continuation rates (**Hubacher et al., 2017**). Contraceptive practice prevalence and method types will have a significant impact on the contribution of contraceptive failure to the total number of unintended pregnancies in a population and vice versa (**Polis et al.,**

2016). According to previous studies, there is evidence of a positive correlation between contraceptive failure and pregnancy termination (**Sánchez-Páez and Ortega, 2019**), particularly induced abortion (**Marston and Cleland, 2004**). In developing countries, it has been reported that 74% of the 89 million unintended pregnancies in 2017 were caused by the non-use of any contraceptive method, 16% by contraceptive failure of a modern method, and 10% by failure of a traditional method (**Guttmacher Institute, 2017**). India's vast and diverse terrain, combined with comprehensive norms, provides a unique setting for evaluating the multifaceted factors that contribute to unintended pregnancies and, as a result, pregnancy loss. The percentage of people who use modern methods of contraception for family planning has climbed from 47.8% to 56.5% in the five years between NFHS-4 (2015–16) and NFHS-5 (2019–20). At the same time, live births fell by 1.3 percentage points (90.2% vs. 88.9%), with nearly half of Indian states/UTs (n = 17/36) reporting lower live birth rates than the national average (88.9%) in 2019–21. Pregnancy loss was found to be higher across both urban (6.4% vs 8.5%) as well as rural areas (5.3% vs 6.9%), with stillbirths increasing by 28.6% (0.7% vs 0.9%). The proportion of Indian women having abortions fell (3.4%vs2.9%) (**Kuppusamy et al., 2023**).

Understanding the relationship between contraceptive use and pregnancy loss in India holds profound significance for public health and reproductive care initiatives. By comprehensively studying how contraceptive practices are affected by pregnancy outcomes, especially in terms of reducing unintended pregnancies and associated losses, policymakers and healthcare providers can tailor interventions to better serve diverse populations. This knowledge can help create and administer family planning programmes that effectively address the behavioural, socioeconomic, and cultural aspects that influence the use of contraceptives. Furthermore, understanding this relationship can help guide the development of evidence-based policies that prioritise reproductive health services and support systems for women, resulting in better maternal health outcomes and overall well-being in communities. With this background, the objective of the study is to examine the prevalence of contraceptive use among reproductive women with special emphasis on pregnancy loss and its association with their socio-demographic background and regional disparities providing valuable insights for policymakers, healthcare professionals, and researchers working to improve reproductive health strategies in Uttar Pradesh's context which is one of the most populous state of India.

Material and Methods

Data source

NFHS is a cross-sectional, multistage household survey which is carried out periodically in India. The study is based on the most recent demographic and health survey in India, the National Family Health Survey (NFHS-5) dataset, which was conducted in 2019–21. The NFHS-5 is a nationally representative large-scale sample survey that included 6,36,699 households, of which 7,24,115 were women and 1,01,839 were men, with a respondent response rate of 97.5%, 96.9%, and 91.6%, respectively (**Ministry of Health and Family Welfare, 2021**). The households were interviewed in 18 local languages using the Computer Assisted Personal Interviewing (CAPI) technique. The data is collected using four

survey questionnaires that cater to Household, Woman, Man, and Biomarker categories. A total of 30,459 primary sampling units were selected from 707 districts. Fact sheets related to each state, union territory, and district have been made available separately.

Study design and sample size

This study used a cross-sectional design and the most recent data from the National Family Health Survey-5. Uttar Pradesh was chosen from the district fact sheet comprising women aged between 15 to 49 years. The survey tracks information on household characteristics, reproductive and child healthcare utilisation, fertility, mortality, family planning methods, attitudes and behaviours towards HIV/AIDS, women's empowerment, and health outcomes. The NFHS-5 collected calendar data on the incidences of pregnancy, childbirth, contraceptive use, and discontinuation over the previous five years. We used individual-level data from the Uttar Pradesh women's file from NHFS-5. It provides current statistics about women in terms of demographics, maternal care service utilisation, women's status and empowerment, nutritional status and anaemia, and domestic violence (**Ministry of Health and Family Welfare, 2021**).

The National Family Health Survey (NFHS-5) conducted interviews with 7,24,115 ever-married women aged 15-49 years across India. Within this cohort, a subset of women residing in Uttar Pradesh constituted the focus of our study. Among this subgroup, a total of 1,20,696 women were identified. Out of this population, 52,062 women reported current use of contraception. Subsequently, we conducted sample selection procedures to isolate cases where women in Uttar Pradesh were currently using contraception, with a specific emphasis on instances of pregnancy loss, including miscarriage and abortion, as defined by NFHS-5 criteria. This refinement yielded a final sample size of 7,151 women. To enhance the precision of our analysis, we excluded instances of stillbirth due to their negligible occurrence and low response rate. This decision aligns with existing literature, which demonstrates a significant association between miscarriage, abortion, and contraceptive choices and practices. Consequently, our focus was directed exclusively towards women in Uttar Pradesh who were using contraception and had experienced pregnancy loss in the form of abortion or miscarriage. This approach resulted in a final sample size of 6,485 women for analysis.

Outcome variables

The dependent variable (DV) of this study is related to the fertility and family planning section of NFHS-5 i.e. "Contraceptive Use". Contraception is defined as the deliberate prevention of conception using a variety of devices, sexual practices, chemicals, drugs, or surgical procedures. Thus, any device or act designed to keep a woman from becoming pregnant can be considered a contraceptive. It combines traditional, modern, and surgical methods (Jain & Muralidhar, 2011). Contraceptive use is divided into two sections- Using and Not using. Further, Use is divided into three sections namely - **Permanent and Long Active Reversible (LAR) modern methods, Short-term modern and emergency methods and Traditional methods.**

Permanent and Long Active Reversible (LAR) modern methods include female sterilization, male sterilization and intrauterine devices (IUDs).

Short-term modern and emergency methods include male condoms, female condoms, Pills, foam or jelly, lactational amenorrhea (LAM), injections, diaphragm, emergency contraception and other modern methods.

Traditional methods include periodic abstinence, withdrawal, standard days method, and other traditional methods.

To facilitate empirical analysis, the variable — "Contraceptive use"—was transformed into binary variables, with "0" denoting 'No' and "1" denoting 'Yes'.

Predictor variables

Pregnancy outcome resulting in pregnancy loss is the key predictor in this study. A pregnancy outcome is the end result of a fertilisation event. Pregnancy outcomes can be classified as live birth (full-term or preterm), stillbirth, abortion and miscarriage ([Kuppusamy et al., 2023](#)). Abortion and miscarriage rates among women were evaluated using the pregnancy outcome indicators resulting in pregnancy loss. A live birth occurs when a child is born alive. Pregnancy loss is defined as a pregnancy that does not result in a live birth due to miscarriage, stillbirth, or abortion. A miscarriage is an early and involuntary termination of a pregnancy. Spontaneous abortion, also known as miscarriage, occurs when a foetus dies in the womb before 20 weeks gestation. Stillbirth is defined as the birth of a child with no signs of life or foetal death at 28 weeks of gestation or later. Abortion is defined as the voluntary termination of pregnancy ([Kuppusamy et al., 2023](#)).

Confounding variables

This study also considered several other socio-demographic variables to be confounding factors in addition to pregnancy loss. These variables comprise women's age (<25, 25–35, 35–45 and over 45 years), educational attainment (no education, incomplete primary, incomplete secondary, complete secondary, higher), religion (Hindu, Muslim, others), wealth index (Poorest, Poorer, Middle, Richer, Richest), body mass index (Too Thin, Normal, Over Weight, Obese), Number of children (No child, Single Child, More than 1, Number of Households Member, Less than 3, 3-5, More than 5) and Place of Residence (Urban, Rural), Region (Paschim Pradesh, Purvanchal, Bundelkhand, Awadh Pradesh). The household wealth quintile was estimated and divided into five quintiles, ranging from 1 (poorest), 2 (poorer), 3 (middle), 4 (richer), and 5 (richest), based on the ownership of household assets, housing characteristics, and access to housing and sanitation amenities. To investigate regional variations in maternal healthcare utilization, Uttar Pradesh state was divided into four regions based on geographical surroundings and shared cultural backgrounds.

Statistical analyses

Descriptive statistics were used to determine the distribution of samples by key predictors, covariates, and outcome variables. The independent variables were used to estimate a bivariate percentage distribution of the contraceptive use and different methods and the differences were then tested using Pearson's chi-squared statistic. The sample weight was used to estimate the percentage distribution. Finally, multivariate binary logistic regression models were used to investigate the crude and adjusted relationship between pregnancy loss and the use of contraceptives. The regression results were presented as an estimated odds ratio (OR) with a 95% confidence interval (CI). All statistical analyses were carried

out using STATA version 16.0 (StataCorp, 2019). In the multivariate binary analysis, Model 1 demonstrates the overall prevalence of contraceptive use with a binary response (yes or no). Subsequently, we did not exclude any methods. Model 2 illustrates the prevalence of permanent methods, including long-term IUD use. Model 3 depicts the prevalence of short-term modern methods and emergency contraception. Finally, Model 4 represents the prevalence of traditional methods.

Result

Descriptive analysis

Univariate analysis

Table 1 illustrates the comprehensive distribution of contraception usage among women of reproductive age group (15-49) in Uttar Pradesh. It reveals that 41.22% do not utilize any method, while 31.24% opt for short-term modern methods, 20.30% rely on traditional methods, 5.59% choose permanent methods, 1.66% prefer long-acting reversible methods, and 0.08% use other modern methods. The percentage of women who were pregnant and outcomes with miscarriage and abortions was 73.47 and 26.53% respectively. The largest demographic (54.87%) falls within the 25-35 age bracket, with only 0.81% being over 45. The findings indicate that approximately 43.17% of women have attained secondary education, and Hinduism represents 85.63% of religious affiliation. Wealth distribution reveals that 22.96% of women were from poorer families, followed by 20.68% from the richest, 19.59% from the middle, 18.61% from the poorest, and 18.17% from richer families. Most women (62.04%) fall within the normal BMI range, and the results dictate that 37.99% of women have a single child. We have seen that the majority (54.79%) of women from larger households with over 5 members. Rural residents constitute 73.15%, while urban dwellers make up 26.85%. Geographically, 47.91% of respondents were from Paschim Pradesh, while only 3.39% were from Awadh Pradesh. (Table 1)

Table 1: Distribution of contraceptive use among reproductive-aged (15–49 years) women by background characteristics

Variables	Frequency	Percentage
Contraceptive use		
Not user	2,666	41.12
Permanent Methods user	363	5.59
Long-Acting Reversible methods user (LAR)	108	1.66
Short Term User	2,026	31.24
Traditional User	1,317	20.30
Other modern Methods of user	5	0.08
Pregnancy outcome		
Miscarriage	4,764	73.47
Abortion	1,721	26.53
Current age		
Below 25	2,209	34.07
25-35	3,558	54.87
35-45	665	10.25

Variables	Frequency	Percentage
Over 45	53	0.81
Educational Attainment		
No education	1,499	23.12
Incomplete Primary	906	13.97
Incomplete Secondary	2,799	43.17
Complete secondary	48	0.74
Higher	1,232	19.00
Religion		
Hindu	5,553	85.63
Muslim	909	14.02
Christian	9	0.14
Others	14	0.21
Wealth Index		
Poorest	1,206	18.61
Poorer	1,489	22.96
Middle	1,270	19.59
Richer	1,178	18.17
Richest	1,341	20.68
Body Mass Index		
Too Thin	783	12.57
Normal	3,864	62.04
Over Weight	1,234	19.81
Obese	348	5.58
Number of children		
No child	1,982	30.56
Single Child	2,464	37.99
More than 1	2,039	31.44
Number of Households Member		
Less than 3	157	2.41
3-5	2,775	42.79
More than 5	3,553	54.79
Place of Residence		
Urban	1,741	26.85
Rural	4,744	73.15
Region		
Paschim Pradesh	3,107	47.91
Purbanchal	1,679	25.89
Bundelkhand	1,479	22.81
Awadh Pradesh	220	3.39

*All the percentages used here are weighted percentages

Bi-Variate Analysis

Table 2 outlines the percentage distribution of contraception usage among the reproductive age group women in Uttar Pradesh. It reveals that the highest proportion of women, approximately 41.13%, do not utilize any form of contraception, followed by 31.32% who opt for short-term modern and emergency methods, 20.3% who rely on traditional methods, and only 7.25% who utilize long-acting reversible (LAR) and permanent methods. Notably, a significant correlation exists between pregnancy outcomes (miscarriage and abortion) and

contraceptive use. The percentage of women not using contraception is high among those women who have miscarriages which is about 45.36% and that is 29.36% in the case of aborted women. Contraceptive usage tends to increase with age, with women below 25 predominantly using short-term modern and emergency contraception (27.12%), a trend which remains high among women aged 25-35 and 35-45. However, permanent and long-acting reversible methods are most prevalent among women over 45, constituting 11.48% of this age group. Educational attainment also plays a significant role, with less educated women (24.55%) showing an inclination towards opting for traditional methods over highly educated women. Additionally, results indicate that short-term contraceptive methods are mostly similar within all categories of women's educational groups. Hindu and Muslim women predominantly rely on short-term and traditional methods rather than permanent methods.

There is a positive correlation between wealth and contraception usage, with the wealthiest households (37.16%) utilizing short-term modern and emergency contraception the most. As women's weight increases, there is a consistent rise in the utilization of short-term modern methods and a decrease in traditional methods.

The number of children also influences contraception utilization, with 51% of women with no children utilizing any contraception, compared to 63% of those with more than one child. Among nuclear families, approximately 17% of respondents with fewer than three members do not actively use contraception, while joint families show higher utilization rates. Among the users of nuclear families most cases women mostly utilize short-term modern and emergency methods that are about 10.34 %. In the joint family, approximately 60% of women utilize any of the contraception methods while traditional and short-term including emergency methods are mostly useable the has been found. **(Table 2)**

Table 2: Results of Bivariate analysis showing the Association between Determinants with contraceptive prevalence of reproductive women in Uttar Pradesh

Background characteristics	Not user (%)	Permanent and LAR modern methods (%)	Short-term modern and emergency methods (%)	Traditional methods (%)	Total sample (N)	Chi-square value	P value
Overall	41.13	7.25	31.32	20.3	6,485		
Pregnancy Outcome							
Miscarriage	45.36	5.96	29.12	19.56	4,764	2,4000	<0.001
Abortion	29.36	10.86	37.41	22.37	1,721		
Current age							
Below 25	53.03	3.46	27.82	15.69	2,209	226.93	<0.000
25-35	36.18	8.82	32.99	22.01	3,558		
35-45	28.62	11.21	35.37	24.8	665		

Background characteristics	Not user (%)	Permanent and LAR modern methods (%)	Short-term modern and emergency methods (%)	Traditional methods (%)	Total sample (N)	Chi-square value	P value
Over 45	32.14	11.48	14.6	41.78	53		
Educational Attainment							
No education	38.53	7.89	29.04	24.55	1,499		
Incomplete Primary	40.45	9.11	32.3	18.13	906	48.06	<0.001
Incomplete Secondary	41.77	7.33	31.24	19.96	2,847		
Complete Secondary	58.96	4.64	34.83	1.56	48		
Higher	43.26	5.05	33.44	18.25	1,232		
Religion							
Hindu	39.81	7.65	31.74	20.81	5,553		
Muslim	48.88	4.81	28.88	17.43	909	37.57	<0.001
Christian	100	0	0	0	9		
Others	15.1	18.13	47.56	19.21	14		
Wealth Index							
Poorest	45.63	8.11	24.13	22.13	1,206		
Poorer	43.59	8.82	28.45	19.13	1,489	81.47	<0.001
Middle	39.47	6.09	33.17	21.26	1,270		
Richer	42	6.24	33.68	18.08	1,178		
Richest	35.09	6.74	37.16	21.01	1,341		
Body Mass Index							
Too Thin	41.7	7.76	25.95	24.59	783	17.22	0.3
Normal	42.23	7.17	31.51	19.09	3,864		
Over Weight	36.82	7.8	34.47	20.9	1,234		
Obese	38.66	7.85	32.66	20.82	348		
Number of children							
No child	48.7	6.06	26.24	19	1,982	56.29	<0.001
Single Child	38.6	7.29	33.51	20.59	2,464		
More than 1	36.79	8.38	33.6	21.22	2,039		
Number of Households Member							
Less than 3	83.71	0.33	10.34	5.62	157	91.99	<0.001
3-5	40.21	6.08	33.04	20.67	2,775		
More than 5	39.95	8.48	30.9	20.67	3,553		
Place of Residence							
Urban	35.48	7.22	39.14	18.15	1,741	60.19	<0.001
Rural	43.19	7.27	28.44	21.1	4,744		

Background characteristics	Not user (%)	Permanent and LAR modern methods (%)	Short-term modern and emergency methods (%)	Traditional methods (%)	Total sample (N)	Chi-square value	P value
Region							
Paschim Pradesh	34.5	6.66	34.67	24.18	3,107	199.68	<0.001
Purbanchal	50.86	9.46	21.48	18.19	1,679		
Bundelkhand	43.13	5.47	35.3	16.1	1,479		
Awadh Pradesh	46.79	10.79	32.42	9.99	220		

*All the percentages used here are weighted percentages

The percentage of women with permanent methods user of contraception is almost similar for urban and rural women, approximately 7.22% for urban, and 7.27% for rural. Women in urban areas tend to utilize short-term and emergency methods more (39.14%) compared to rural women (28.44%), while traditional methods are more prevalent in rural areas (21.1% compared to urban areas (18.15%). **(Figure 1)**

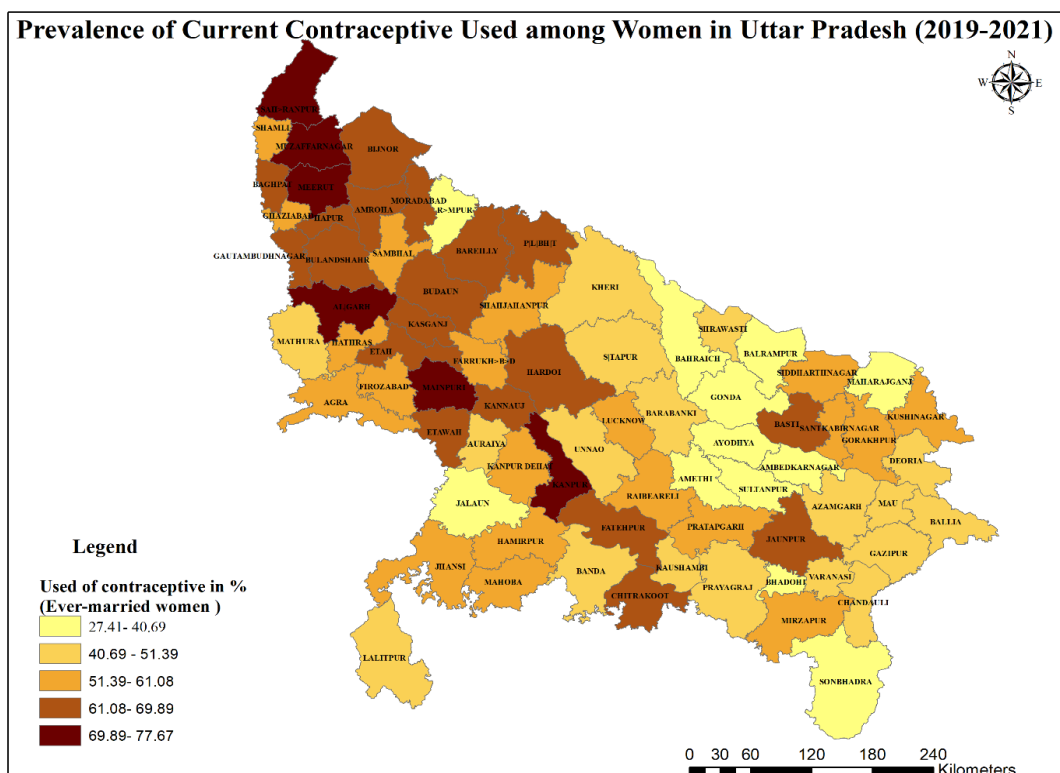


Fig.1 Geographical Region-wise Percentage of Contraceptive Use in Uttar Pradesh

Regionally, Paschim Pradesh exhibits the highest contraception utilization (65%), with a low percentage (6.66%) opting for permanent methods presented in Figure 1. Conversely, in Purbanchal, approximately 49% utilize contraception, with variations in method preferences across regions, particularly in Awadh Pradesh. In the Paschim Pradesh region highest percentage is short-term and emergency methods which is about 34.67% followed by traditional methods (24.18%). And more or less similar distributional picture of all these methods has been found in all regional divisions except Awadh Pradesh where it has been found that the highest is short-term methods that is about 32.42% followed by permanent methods (10.79%) and traditional methods (9.99%).

Results from the multivariate binary logistic regression to show the association between contraceptive methods and predictors in Uttar Pradesh

Table 3 represents the odds found from the binary logistic regression and shows the overall scenario of the contraception uses of any of the methods. In addition, Table 3 displays the findings from both unadjusted and adjusted logistic regression models examining the relationship between contraceptive method prevalence and pregnancy outcomes in the context of pregnancy loss. (**Table 3**)

Table 3: The outcomes of the multivariate binary logistic regression model analyzing contraceptive utilization, presenting the odds ratios (OR), 95% confidence intervals

Variables	Model -1					
	Unadjusted odds ratios			Adjusted odd ratios		
	Odds Ratio	95% CI	P Value	Odds Ratio	95% CI	P value
Pregnancy outcome						
Miscarriage	Ref.			Ref.		
Abortion	1.99	1.77- 2.25	0.000	1.64	1.44- 1.86	<0.001
Current age						
Below 25	Ref.			Ref.		
25-35	1.99	1.79- 2.22	0.000	1.99	1.77- 2.25	0.000
35-45	2.82	2.33- 3.39	0.000	3.18	2.57- 3.91	0.000
Over 45	2.38	1.33- 4.27	0.004	3.41	1.80- 6.47	0.000
Educational attainment						
No education	Ref.			Ref.		
Incomplete Primary	0.92	0.78- 1.09	0.348	0.94	0.78- 1.13	0.520
Incomplete Secondary	0.88	0.78- 1.00	0.061	1.02	0.87- 1.19	0.790
Complete secondary	0.44	0.24- 0.78	0.005	0.44	0.24- 0.84	0.013
Higher	0.82	0.71-	0.012	0.84	0.69-	0.077

Variables	Model -1					
	Unadjusted odds ratios			Adjusted odd ratios		
	Odds Ratio	95% CI	P Value	Odds Ratio	95% CI	P value
		0.96			1.02	
Religion						
Hindu	Ref.			Ref.		
Muslim	0.69	0.60-0.79	0.000	0.61	0.52-0.71	0.000
others	0.68	0.29-1.53	0.349	0.51	0.21-1.22	0.132
Wealth Index						
Poorest	Ref.			Ref.		
Poorer	1.08	0.93-1.27	0.288	1.07	0.91-1.27	0.412
Middle	1.29	1.09-1.51	0.002	1.26	1.05-1.51	0.013
Richer	1.16	0.98-1.36	0.074	0.93	0.76-1.14	0.490
Richest	1.55	1.32-1.82	0.000	1.14	0.91-1.43	0.258
Body Mass Index						
Too Thin	Ref.			Ref.		
Normal	0.98	0.84-1.14	0.783	0.88	0.74-1.04	0.125
Over Weight	1.23	1.02-1.47	0.029	0.95	0.78-1.16	0.631
Obese	1.13	0.87-1.47	0.338	0.78	0.59-1.03	0.080
Number of children						
No child	Ref.			Ref.		
Single Child	1.51	1.34-1.70	0.000	1.55	1.35-1.77	0.000
More than 1	1.63	1.44-1.85	0.000	1.73	1.49-1.99	0.000
Number of Households Member						
Less than 3	Ref.			Ref.		
3-5	7.64	4.96-11.75	0.000	5.15	3.19-8.30	0.000
More than 5	7.72	5.02-11.86	0.000	5.34	3.31-8.62	0.000
Place of Residence						
Urban	Ref.			Ref.		
Rural	0.72	0.65-0.81	0.000	0.77	0.67-0.89	0.000
Region						
Paschim Pradesh	Ref.			Ref.		
Purbanchal	0.51	0.45-	0.000	0.50	0.43-	0.000

Variables	Model -1					
	Unadjusted odds ratios			Adjusted odd ratios		
	Odds Ratio	95% CI	P Value	Odds Ratio	95% CI	P value
Bundelkhand	0.69	0.57-0.79	0.000	0.70	0.61-0.81	0.000
Awadh Pradesh	0.59	0.45-0.79	0.000	0.63	0.47-0.85	0.000

*Note: CI: Confidence Interval; Ref.: Reference Category.

The authors assessed the impact of pregnancy loss on contraceptive method utilization while accounting for various key socio-demographic factors such as women's age, education level, religion, socioeconomic status, body mass index, number of children, household size, urban or rural residence, and geographic region. An intimate relationship has been found between pregnancy outcomes and contraception use. The likelihood of utilizing contraceptives is 1.64 times higher (OR: 1.64, 95% CI, 1.44-1.86) experiencing abortion is compared to miscarriage.

Contraceptive utilization increases with age, with odds nearly 1.99, 3.18, and 3.41 times higher among women aged 25-35 years, 35-45 years, and over 45 years, respectively, compared to adolescent women (below 25). Surprisingly, overall contraceptive use is 39% lower (OR: 0.61, 95% CI, 0.52-0.71) among Muslim women compared to Hindu women. The number of children in a family significantly influences contraceptive use. The odds of using contraception are 55% and 73% higher among women with a single child and more than one child, respectively. Household size is also positively correlated with contraceptive use. Women from households with 3-5 members are 5.15 times more likely (OR: 5.15, 95% CI, 3.19-8.30) to use contraception, while those from households with more than 5 members are 5.34 times more likely (OR: 5.34, 95% CI, 3.31-8.62) compared with the nuclear family which had less than 3 persons. Furthermore, the odds of contraceptive use among rural women are 23% lower compared to urban women. Additionally, women from the Purbanchal region, Bundelkhand, and Awadh Pradesh have 50%, 30%, and 37% lower odds, respectively, of using contraception compared to those from the Paschim Pradesh region.

The impact of pregnancy outcomes on the utilization of various contraceptive methods is explored in Table 4, providing adjusted odds ratios (OR) and highlighting the association between predictors and contraceptive practices, particularly focusing on pregnancy loss. **(Table 4)**

Table 4: Results of binary logistic regression model regressing on permanent and long-term modern, short term-emergency modern and traditional contraceptive methods

Variables	Model-2			Model-3			Model-4		
	Long-term-modern & permanent methods			Short-term & emergency modern methods			Traditional methods		
	Odds ratio	95% CI	P Value	Odds ratio	95 % CI	P Value	Odds ratio	95 % CI	P Value
Pregnancy outcome									
Miscarriage	Ref.			Ref.			Ref.		
Abortion	1.43	1.15-1.77	0.001	1.03	0.89-1.19	0.676	0.81	0.69-0.94	0.008
Current age									
Below 25	Ref.			Ref.			Ref.		
25-35	2.22	1.68-2.93	0.001	0.69	0.59-0.81	0.000	1.07	0.91-1.27	0.411
35-45	2.51	1.72-3.67	0.000	0.64	0.50-0.82	0.000	1.08	0.83-1.39	0.583
Over 45	3.28	1.23-8.75	0.017	0.27	0.12-0.64	0.003	1.94	0.92-4.11	0.082
Educational attainment									
No education	Ref.			Ref.			Ref.		
Incomplete Primary	1.39	1.01-1.91	0.046	1.19	0.95-1.49	0.132	0.70	0.55-0.89	0.004
Incomplete Secondary	1.10	0.83-1.46	0.490	1.07	0.89-1.29	0.478	0.89	0.73-1.08	0.241
Complete Secondary	1.07	0.26-4.51	0.922	6.81	1.93-23.89	0.003	0.05	0.01-0.52	0.012
Higher	0.71	0.48-1.05	0.086	1.30	1.02-1.66	0.036	0.87	0.68-1.12	0.292
Religion									
Hindu	Ref.			Ref.			Ref.		
Muslim	0.81	0.57-1.14	0.226	1.27	1.02-1.58	0.027	0.84	0.67-1.06	0.142
others	2.39	0.5-10.14	0.235	0.99	0.30-3.18	0.982	0.58	0.15-2.34	0.447
Wealth Index									
Poorest	Ref.			Ref.			Ref.		
Poorer	1.22	0.89-1.65	0.209	1.24	0.99-1.55	0.054	0.72	0.58-0.91	0.005
Middle	0.74	0.52-1.45	0.090	1.42	1.13-1.79	0.003	0.78	0.62-0.99	0.046
Richer	0.79	0.53-0.16	0.231	1.51	1.16-1.96	0.002	0.72	0.55-0.94	0.016
Richest	0.83	0.54-1.28	0.412	1.38	1.04-1.83	0.027	0.78	0.58-1.04	0.095

Variables	Model-2			Model-3			Model-4		
	Long-term-modern & permanent methods			Short-term & emergency modern methods			Traditional methods		
	Odds ratio	95% CI	P Value	Odds ratio	95 % CI	P Value	Odds ratio	95 % CI	P Value
Body Mass Index									
Too Thin	Ref.			Ref.			Ref.		
Normal	0.95	0.69-1.29	0.746	1.49	1.21-1.88	0.000	0.68	0.55-0.84	0.000
Over Weight	0.90	0.67-1.19	0.472	1.44	1.12-1.85	0.005	0.71	0.55-0.92	0.010
Obese	2.31	1.40-3.79	0.001	1.28	0.90-1.80	0.170	0.79	0.55-1.13	0.201
Number of children									
No child	Ref.			Ref.			Ref.		
Single Child	1.18	0.91-1.53	0.221	1.03	0.87-1.23	0.713	0.88	0.73-1.06	0.177
More than 1	1.29	0.97-1.71	0.076	0.99	0.83-1.19	0.954	0.88	0.73-1.07	0.217
Number of Households Member									
Less than 3	Ref.			Ref.			Ref.		
3-5	3.34	0.21-53.7	0.394	0.69	0.27-1.71	0.418	1.21	0.48-3.04	0.682
More than 5	4.77	0.29-76.7	0.270	0.59	0.24-1.49	0.273	1.18	0.47-2.98	0.717
Place of Residence									
Urban	Ref.			Ref.			Ref.		
Rural	0.85	0.65-1.11	0.222	0.76	0.64-0.90	0.002	1.47	1.22-1.77	0.000
Region									
Paschim Pradesh	Ref.			Ref.			Ref.		
Purbanchal	2.19	1.70-2.82	0.000	0.81	0.67-0.97	0.023	0.82	0.68-0.99	0.039
Bundelkhand	0.90	0.68-1.19	0.629	1.60	1.34-1.91	0.000	0.61	0.51-0.74	0.000
Awadh Pradesh	2.31	1.40-3.79	0.001	1.67	1.12-2.48	0.012	0.32	0.19-0.52	0.000

*Note: CI: Confidence Interval; Ref.: Reference Category.

Effects of pregnancy outcome on utilization of permanent and long-term modern contraceptive methods:

For the utilization of permanent and long-term modern contraceptive methods, individuals who have experienced abortions have 43% higher odds compared to those who have had miscarriages. Age is positively correlated with the prevalence

of permanent contraception, with women aged 25-35, 35-45, and over 45 years having odds of 2.22, 2.51, and 3.28 times higher, respectively, compared to adolescents below 25. Additionally, obesity is associated with 2.31 (OR:2.31, 95% CI, 1.40-3.79) times higher odds of utilizing permanent long-term modern contraception compared with too-thin women. Regionally, women from Purbanchal and Awadh Pradesh show significantly twice (OR:2.19, 95% CI, 1.70-2.82) and twice-half (OR:2.31, 95% CI, 1.40-3.79) times higher odds of utilizing permanent-long term modern contraceptives compared to those from Paschim Pradesh.

Effects of pregnancy outcome on utilization of Short-term and emergency modern contraceptive methods

Regarding short-term and emergency modern contraceptive methods, age inversely affects utilization, with middle-aged women having significantly lower odds. Middle-aged women had significantly lower odds of this contraception method, with those aged over 45 years, 35-45 years and 25-35 having odds nearly 0.27, 0.64, and 0.69 times lower, respectively, compared to adolescents (below 25). Education level influences the utilization of short-term and emergency contraception, with highly educated women and those with secondary education one and a half times and nearly seventh times higher respectively being more likely to use these methods compared to non-educated women. Surprisingly, Muslim women show 27% higher odds of using short-term emergency contraception compared to Hindu women. The wealth index exhibits a positive linear trend with short-term and emergency contraception usage across all categories. The odds of utilizing contraception were 49% (OR:1.49, 95% CI, 1.21-1.88), 44% (OR:1.44, 95% CI, 1.12-1.85), and 28% (OR:1.28, 95% CI, 0.90-1.80) higher among normal, overweight and obese women respectively as compared with the too-thin women. Women from rural areas are 24% less likely to utilize these methods. Regionally, the study found region-wide variation in the context of the prevalence of short-term and emergency modern contraception. Women from the Purbanchal region were found 19% less utilized than any of the short-term and emergency modern methods, on the other hand, women from Bundelkhand and Awadh regions were 60% and 67% higher as compared to the Paschim Pradesh region.

Effects of pregnancy outcome on utilization of traditional contraceptive methods

For traditional contraceptive methods, pregnancy loss is negatively associated with utilization, with individuals who have had abortions showing 19% lower odds compared to those who have experienced miscarriages. Education level negatively influences traditional contraception usage, with educated women having lower odds compared to uneducated women. Body mass index shows a positive relationship with traditional contraception, with normal-weight women exhibiting lower odds compared to too-thin women. The results of the study show that the odds of using traditional contraception are 32% (OR:0.68, 95% CI, 0.55-0.84), 29% (OR: 0.71, 95% CI, 0.55-0.92), and 21% (OR: 0.79, 95% CI, 0.55-1.13) lower among women with normal body mass index, overweight, and obesity respectively as compared with the too-thin women. The odds of using traditional contraceptives have been found to be 1.47 times higher among women from rural residences than from urban women. Regionally, the region has been found as a

significant factor influencing the status of the prevalence of traditional contraception. Women from Awadh Pradesh, Bundelkhand, and Purbanchal were found 68% (OR: 0.32, 95% CI, 0.19-0.52), 39% (OR: 0.61, 95% CI, 0.51-0.74), and 28% (OR: 0.82, 95% CI, 0.68-0.99) lower odds respectively of using traditional contraception as compared with the women from the Paschim Pradesh region.

Discussion

In developing nations like India, the primary contributor to unintended pregnancies often arises from the reliance on traditional contraceptive methods or the absence thereof, leading to unsafe induced abortions. Cultural beliefs, limited awareness regarding contraceptive options and reproductive health status, socio-demographic factors, and barriers within healthcare services are significant obstacles to the adoption of modern contraceptive practices among women of reproductive age (Najafi-Sharjabad et al., 2013).

The study delves into the prevalence of contraceptive methods and their underlying determinants, particularly focusing on pregnancy loss. The findings of the study indicate that choices of contraception methods are influenced by pregnancy outcomes and previous pregnancy experiences (Cooper & Cameron, 2024; Makins & Cameron, 2020) **Makins and Cameron, 2020**). Specifically, prior induced abortions show a stronger association with the uptake of long-term and permanent contraceptive methods as well as traditional methods when compared to other modern methods. This finding aligns with previous research by Galcier et al and others (L. Das & Shekhar, 2024; Glasier et al., 2019). Additionally, an explanation possibly lies in limited awareness about available contraception alternatives, particularly about short-term modern methods, which may contribute to this pattern (Gaur et al., 2022). So it can be said that the initial contraceptive method also plays a significant role in shaping current contraceptive choices and future preferences (Namasivayam et al., 2023). Additionally, another reason may be that previous experience of pregnancy presents a chance to provide contraception to couples seeking to prevent further pregnancies, regardless of the outcome. The majority of unintended pregnancies culminate in abortions or miscarriages. The World Health Organization has long recommended intervals of at least 6 months following a miscarriage and 1-2 years after childbirth to diminish the risk of negative pregnancy outcomes (Glasier et al., 2019). Besides that, the number of children, the age of the child, and the interval of pregnancy also present as an important factor in selecting any of the contraceptive methods for family planning regarding pregnancy outcomes.

It has been observed that as women age, the utilization of permanent and intrauterine device (IUD) methods increases, consistent with the previous findings by ((Kahraman et al., 2012). This trend may be attributed to patriarchal norms associating vasectomy with threats to masculinity and sexuality (Shafi & Mohan, 2020). Women aged 35 and above exhibit a higher inclination for permanent long-term methods, while short-term methods are more prevalent among younger age groups, particularly adolescent girls as oral contraceptive pills, vaginal rings, and transdermal patches because it is considered that long-term methods are the most cost-effective rather than the short-term methods (M. Das et al., 2022). Overall, In India, cultural norms often lead women to marry at a young age,

typically around 18, which coincides with the prime childbearing years. Consequently, between the ages of 18 and 25, a significant proportion of married women are likely to become pregnant. As a result, the use of contraceptives becomes increasingly prevalent with advancing age (Das et al., 2022; M. Das et al., 2022; Shafi & Mohan, 2020). This preference for long-term methods among older women may stem from their completed family size and desire to prevent further pregnancies (L. Das & Shekhar, 2024).

Increasing educational attainment among women is positively associated with the utilization of short-term modern contraceptive methods, echoing findings by Ewerling et al (Ewerling et al., 2021). Education enhances awareness about family planning methods and their health implications, thereby influencing contraceptive choices (Ewerling et al., 2021; Kahraman et al., 2012). Socio-economic factors, particularly household wealth status, significantly impact the utilization of short-term and emergency modern contraceptive methods, with a positive linear trend observed as wealth status increases (Fekadu et al., 2020). Accessibility, affordability, and perceived cost-effectiveness may contribute to this trend (M. Das et al., 2022). In contrast, traditional methods show less variation across different wealth index categories, warranting further investigation into this complex relationship between traditional methods and wealth status.

Contraceptive injections and long-acting reversible contraception (LARC), including IUDs and contraceptive implants, are preferred among women with higher body mass indexes (BMIs) rather than the short-term and other emergency methods, as noted in previous studies (Boyce & Neiterman, 2021). This preference may arise from considerations of suitability and efficacy, as certain contraceptive methods may be less effective or contraindicated for obese or overweight women (Simmons & Edelman, 2016).

Women with one or more living children are more likely to adopt contraception compared to those without any children, in line with previous research (L. Das et al., 2024). Women with fewer children often opt for temporary contraception or spacing methods, while those with more children tend to choose permanent methods in the study of Saudi Arabia among reproductive-age women to limit family size and control the population size of the nation (Alsaleem et al., 2018). Among Muslim women modern contraception usage tends to be lower specifically long-term modern and permanent methods rather than short-term methods compared to Hindu women in this region, although regional sub-cultural norms may influence contraceptive preferences. Similar trends were observed in studies conducted in Kenya (Abdi et al., 2024; Halli et al., 2023; Rasheed et al., 2015). Another reason can be attributed to that, over time, Muslim cultural norms have discouraged the sustained use of external devices, and there has been lesser involvement of women in making reproductive decisions (Alomair et al., 2023). Importantly, the utilization of modern contraceptives varies across residences, with rural areas in Uttar Pradesh showing a higher prevalence of traditional methods compared to other modern methods which is in line with the previous studies (Namasivayam et al., 2023). The fact is that rural women do not have complete awareness of the methods of all kinds of contraceptives. Additionally, the regional differences highlight disparities in availability, accessibility, and awareness regarding the utilization of modern contraceptive methods (Halli et al.,

2023; Najafi-Sharjabad et al., 2013; Namasivayam et al., 2023). For instance, the Purbanchal and Awadh Pradesh regions exhibit higher usage of permanent methods, while Bundelkhand and Awadh Pradesh show elevated utilization of short-term and emergency methods. Conversely, traditional methods are less prevalent in Purbanchal, Bundelkhand, and Awadh Pradesh compared to Paschim Pradesh. A similar finding has been found in the study of Uttar Pradesh (Halli et al., 2024). Where it is considered that literacy of women and awareness regarding the utilization of modern contraceptives are intimately associated with each other, additionally due to the financial incentive given for sterilization by the government, the main target of vasectomy and tubectomy were the taboos of societies, no one to do it intensely and target of the plan was mostly poor families. The Western UP population is comparatively wealthy which is why more aware of the prevalence of short-term modern contraceptives and prefer those methods rather than the remaining parts of Uttar Pradesh (Moreira et al., 2023). For an in-depth understanding of the regional anomalies of the results across different methods, further comprehensive research is needed with socio-economic as well as cultural backgrounds

Conclusion

The study findings indicate that the prevalence and selection of contraceptive methods among reproductive women are based on the previous experience of pregnancy loss in terms of miscarriage and abortions as well as on the socio-demographic norms. Among the utilization of all-contraceptive methods of reproductive women in Uttar Pradesh short-term modern methods are highly prevalent followed by traditional methods and permanent- long-term IUD methods. It has been found that those women who have faced the problem of abortions prefer long-term modern and permanent methods this is mostly those who are above 45 years old. On the other hand, the short-term term is high among adolescent girls. Among the rural women traditional methods are mostly high compared with the modern short-term and long-term methods. To understand the regional anomalies of the prevalence of contraceptive methods further in-depth research is required. For awareness of women specifically regarding the modern methods either long-term – permanent or short-term specifically among the rural area's women, governmental initiatives as well as Accredited Social Health Activist (ASHA), activities are very much required regarding family size as well as maternal health. The study on contraceptive use and its association with pregnancy loss in Uttar Pradesh underscores the intricate relationship between reproductive health, socio-demographic patterns, and economic development. By elucidating the factors influencing pregnancy loss and contraceptive practices, this research contributes to achieving several Sustainable Development Goals (SDGs), notably SDG 3 on good health and well-being and SDG 5 on gender equality. Understanding the socio-demographic dynamics at play, such as education level, income, and urban-rural divide, is crucial for designing targeted interventions to reduce pregnancy loss and improve access to family planning services. Moreover, addressing these issues aligns with broader efforts towards socio-economic development, as it empowers individuals and communities to make informed choices about their reproductive health, ultimately fostering sustainable progress and equity.

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Ethics declarations

Competing interests: The authors declare no competing interests.

Ethical approval: This article does not contain any studies with human participants performed by any of the authors.

Conflict of interest:

The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organisation or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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References

- Abdi, B., Okal, J., Serour, G., Were, V., Temmerman, M., & Gichangi, P. (2024). Pattern and determinants of contraceptive use among the muslim women in Wajir and Lamu counties in Kenya: A cross-sectional study. *BMC Women's Health*, 24(1), 53. <https://doi.org/10.1186/s12905-024-02892-9>
- Alomair, N., Alageel, S., Davies, N., & Bailey, J. V. (2023). Muslim women's views and experiences of family planning in Saudi Arabia: A qualitative study. *BMC Women's Health*, 23(1), 625. <https://doi.org/10.1186/s12905-023-02786-2>
- Alsaleem, M. A., Khalil, S. N., Siddiqui, A. F., Alzahrani, M. M., & Alsaleem, S. A. (2018). Contraceptive use as limiters and spacers among women of reproductive age in southwestern, Saudi Arabia. *Saudi Medical Journal*, 39(11), 1109–1115. <https://doi.org/10.15537/smj.2018.11.22817>
- Boyce, T. M., & Neiterman, E. (2021). Women in larger bodies' experiences with contraception: A scoping review. *Reproductive Health*, 18(1), 89. <https://doi.org/10.1186/s12978-021-01139-2>
- Cooper, M., & Cameron, S. (2024). Contraception after abortion, miscarriage, ectopic and molar pregnancy. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 92, 102428. <https://doi.org/10.1016/j.bpobgyn.2023.102428>
- Das, L., & Shekhar, C. (2024). Contraceptive behavior of women in India after induced abortion. *Reproductive Health*, 21(1), 60. <https://doi.org/10.1186/s12978-024-01802-4>
- Das, L., Shekhar, C., Sengupta, S., & Mishra, A. (2024). Adoption of contraception following a pregnancy loss in India. *International Journal of*

- Gynecology & Obstetrics*, 165(3), 1091–1103.
<https://doi.org/10.1002/ijgo.15341>
- Das, M., Anand, A., Hossain, B., & Ansari, S. (2022). Inequalities in short-acting reversible, long-acting reversible and permanent contraception use among currently married women in India. *BMC Public Health*, 22(1), 1264.
<https://doi.org/10.1186/s12889-022-13662-3>
- Ewerling, F., McDougal, L., Raj, A., Ferreira, L. Z., Blumenberg, C., Parmar, D., & Barros, A. J. D. (2021). Modern contraceptive use among women in need of family planning in India: An analysis of the inequalities related to the mix of methods used. *Reproductive Health*, 18(1), 173.
<https://doi.org/10.1186/s12978-021-01220-w>
- Fekadu, G. A., Omigbodun, A. O., Roberts, O. A., & Yalew, A. W. (2020). Correction: Determinants of change in long-acting or permanent contraceptives use in Ethiopia; A multivariate decomposition analysis of data from the Ethiopian demographic and health survey. *PLOS ONE*, 15(2), e0229349.
<https://doi.org/10.1371/journal.pone.0229349>
- Gaur, K., Shukla, A., & Acharya, R. (2022). Association between the place of abortion and post-abortion contraceptive adoption and continuation: The case of India. *Sexual and Reproductive Health Matters*, 29(2), 1966983.
<https://doi.org/10.1080/26410397.2021.1966983>
- Glasier, A., Bhattacharya, S., Evers, H., Gemzell-Danielsson, K., Hardman, S., Heikinheimo, O., La Vecchia, C., & Somigliana, E. (2019). Contraception after pregnancy. *Acta Obstetrica et Gynecologica Scandinavica*, 98(11), 1378–1385.
<https://doi.org/10.1111/aogs.13627>
- Halli, S. S., Alam, M. T., Joseph, A., Prakash, R., Isac, S., Becker, M., Anand, P., Vasanthakumar, N., Ramesh, B. M., & Blanchard, J. (2023). Declining fertility and increasing use of traditional methods of family planning: A paradox in Uttar Pradesh, India? *Journal of Biosocial Science*, 55(2), 224–237.
<https://doi.org/10.1017/S0021932022000086>
- Halli, S. S., Alam, M. T., Namasivayam, V., Prakash, R., Anand, P., Blanchard, J., & Wehrmeister, F. (2024). Geographic and socioeconomic inequalities in the coverage of contraception in Uttar Pradesh, India. *Reproductive Health*, 21(1), 50.
<https://doi.org/10.1186/s12978-024-01784-3>
- Jain, R., & Muralidhar, S. (2011). Contraceptive Methods: Needs, Options and Utilization. *The Journal of Obstetrics and Gynecology of India*, 61(6), 626–634.
<https://doi.org/10.1007/s13224-011-0107-7>
- Kahraman, K., Göç, G., Taşkın, S., Haznedar, P., Karagözlü, S., Kale, B., Kurtipek, Z., & Ozmen, B. (2012). Factors influencing the contraceptive method choice: A university hospital experience. *Journal of the Turkish German Gynecological Association*, 13(2), 102–105.
<https://doi.org/10.5152/jtgga.2012.07>
- Makins, A., & Cameron, S. (2020). Post pregnancy contraception. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 66, 41–54.
<https://doi.org/10.1016/j.bpobgyn.2020.01.004>
- Moreira, L. R., Blumenberg, C., Caicedo Velasquez, B. E., Ewerling, F., Balandrán, A., Vidaletti, L. P., Varela, A. R., Hellwig, F., Ponce de Leon, R. G., Barros, A. J. D., Silveira, M. F., & Wehrmeister, F. C. (2023). The role of gender inequality and health expenditure on the coverage of demand for family planning satisfied by modern contraceptives: A multilevel analysis of cross-

- sectional studies in 14 LAC countries. *Lancet Regional Health. Americas*, 19, 100435. <https://doi.org/10.1016/j.lana.2023.100435>
- Najafi-Sharjabad, F., Zainiyah Syed Yahya, S., Abdul Rahman, H., Hanafiah Juni, M., & Abdul Manaf, R. (2013). Barriers of modern contraceptive practices among Asian women: A mini literature review. *Global Journal of Health Science*, 5(5), 181–192. <https://doi.org/10.5539/gjhs.v5n5p181>
- Namasivayam, V., Dehury, B., Prakash, R., Becker, M., Anand, P., Mishra, A., Singhal, S., Halli, S., Blanchard, J., Spears, D., & Isac, S. (2023). Understanding the rise in traditional contraceptive methods use in Uttar Pradesh, India. *Reproductive Health*, 20(1), 8. <https://doi.org/10.1186/s12978-022-01547-y>
- Rasheed, N., Khan, Z., Khalique, N., Siddiqui, A., & Hakim, S. (2015). Family planning differentials among religious groups: A study in India. *International Journal of Medicine and Public Health*, 5(1), 98. <https://doi.org/10.4103/2230-8598.151271>
- Shafi, S., & Mohan, U. (2020). Perception of family planning and reasons for low acceptance of NSV among married males of urban slums of Lucknow city—A community based study. *Journal of Family Medicine and Primary Care*, 9(1), 303–309. https://doi.org/10.4103/jfmpe.jfmpe_779_19
- Simmons, K. B., & Edelman, A. B. (2016). Hormonal contraception and obesity. *Fertility and Sterility*, 106(6), 1282–1288. <https://doi.org/10.1016/j.fertnstert.2016.07.1094>