Contraception and Reproductive Medicine

# RESEARCH

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# Abstract

**Background** Contraceptive use plays a crucial role in achieving desired fertility levels and improving maternal and child health outcomes. This study aimed to estimate the prevalence and determinants of contraceptive use among married women in Western Gujarat, India, using a mixed methods approach.

**Methods** A community-based mixed-method study was conducted. A multistage stratified cluster sampling technique was used to recruit 840 married women aged 18–49 years for the quantitative component. Bivariate and multivariate logistic regression analyses were performed to identify factors associated with contraceptive use. Additionally, 20 in-depth interviews and 4 focus group discussions were conducted to explore qualitative aspects of contraceptive use, using a purposive sampling technique.

**Results** The contraceptive prevalence rate was 60.4%, with 46.7% using modern methods and 13.7% using traditional methods. Multivariate analysis revealed that higher education levels of women (graduation: aOR = 4.1, 95% Cl: 1.4–12.0) and their husbands (graduation: aOR = 2.6, 95% Cl: 1.0-6.9), women's employment status (not working: aOR = 0.6, 95% Cl: 0.3-1.0), having 1–2 children (aOR = 3.6, 95% Cl: 2.2-6.0), and joint decision-making was positively associated with contraceptive use. Age above 40 years (aOR = 0.2, 95% Cl: 0.1–0.7) and contraceptive decisions made by other family members (aOR = 0.3, 95% Cl: 0.1–0.8) were negatively associated with contraceptive use. Qualitative findings highlighted sociocultural barriers, such as community norms, religious beliefs, and gender power dynamics, as significant influences on contraceptive use.

**Conclusions** This study provides a comprehensive understanding of the factors influencing contraceptive use in Western Gujarat. The findings underscore the need for multifaceted interventions that address individual, interpersonal, and sociocultural factors to improve contraceptive uptake and reproductive health outcomes.

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Interventions should focus on enhancing family planning education, improving access to services, promoting women's empowerment, and addressing sociocultural barriers.

Keywords Contraceptive use, Prevalence, Determinants, Mixed methods, Western Gujarat, India

## Introduction

Contraceptive use plays a pivotal role in achieving desired fertility levels, improving maternal and child health outcomes, and ensuring the well-being of families and communities [1]. Despite significant global efforts to promote family planning services and increase contraceptive prevalence rates, many countries, including India, continue to face challenges in ensuring universal access to contraception [2]. Understanding the complex interplay of factors influencing contraceptive use is crucial for designing effective family planning programs and addressing the unmet need for contraception.

The determinants of contraceptive use are multifaceted and operate at various levels - individual, interpersonal, community, and societal. At the individual level, factors such as age, education, employment status, and knowledge about contraceptive methods significantly influence contraceptive uptake [3, 4]. Women with higher education levels and those engaged in formal employment often demonstrate increased contraceptive use, likely due to greater awareness, autonomy, and decision-making power [5].

Interpersonal factors, particularly spousal communication, and support, play a crucial role in contraceptive decision-making [6]. In many contexts, especially in patriarchal societies, the husband's approval and involvement in family planning decisions significantly impact contraceptive use [7]. Additionally, the influence of extended family members, particularly mothers-in-law, can be substantial in shaping contraceptive choices [8].

At the community level, social norms, cultural beliefs, and religious practices profoundly influence contraceptive behavior [9]. Communities with strong pronatalist attitudes or those that stigmatize contraceptive use can create significant barriers to adoption [10]. Religious beliefs that discourage or prohibit certain contraceptive methods can also impact usage patterns [11].

Societal and structural factors, including access to healthcare services, availability of contraceptive methods, and the quality of family planning programs, are critical determinants of contraceptive use [12]. Economic factors, such as household wealth and the affordability of contraceptives, also play a significant role in shaping contraceptive behaviors [13].

In India, with its diverse socio-cultural landscape, contraceptive use patterns exhibit considerable variation across different states, regions, and socio-economic groups [14]. The country has made substantial progress in increasing the overall contraceptive prevalence rate (CPR) from 48.5% in 1992-93 to 66.7% in 2019-21 [3]. However, this national average masks significant regional disparities and persistent challenges in meeting the family planning needs of all segments of the population.

Gujarat, a western state in India, presents an interesting case study for examining contraceptive use dynamics. With a contraceptive prevalence rate of 65.6%, slightly lower than the national average [3], Gujarat exemplifies the complexities of family planning adoption in a rapidly developing state. Previous studies in Gujarat have highlighted the role of socio-demographic factors, such as education, age, and family income, in influencing contraceptive use [5, 6]. However, there is a need for a more comprehensive investigation that incorporates both quantitative and qualitative approaches to capture the multidimensional factors affecting contraceptive use in this region.

Mixed methods research, which combines quantitative and qualitative techniques, has gained prominence in public health research as it provides a more nuanced understanding of complex phenomena [15, 16]. By integrating quantitative data on the prevalence and determinants of contraceptive use with qualitative insights into contextual factors, beliefs, and experiences, a mixed methods approach can generate a more holistic understanding of contraceptive use patterns and inform tailored interventions.

The present study aimed to investigate the prevalence and determinants of contraceptive use among married women in Western Gujarat, using a mixed methods approach. The specific objectives were: (1) to estimate the prevalence of contraceptive use and identify the sociodemographic and reproductive factors associated with contraceptive use, (2) to explore the knowledge, attitudes, and experiences related to contraceptive use, and (3) to understand the social, cultural, and contextual factors influencing contraceptive use in the study setting.

# Methodology

## Study setting

This community-based mixed-method study was conducted in both urban and rural areas of Jamnagar, Western Gujarat, India. Western Gujarat was selected as it represents the socio-cultural diversity of the state and has varying levels of contraceptive prevalence.

## Sample size calculation and sampling technique Quantitative component

The sample size for the quantitative component was calculated using the formula for estimating a single proportion,  $n = Z2 \times p \times (1-p) / d2$ , where *n* is the required sample size, *Z* is the standard normal variate (set at 1.96 for a 95% confidence level), *p* is the anticipated population proportion of contraceptive use (65.6% reported in the National Family Health Survey (NFHS-5) in Gujarat) [3], and d is the absolute precision or margin of error (set at 5%). Adjusting for a non-response rate of 10%, and a design effect of 2, the final sample size was calculated to be 840 married women of reproductive age (18–49 years).

This community-based mixed-method study employed a multistage stratified cluster sampling technique to recruit participants from Western Gujarat, India. Initially, the region was stratified into 30 strata based on urban/rural divisions and administrative regions. From these strata, 60 clusters (villages/urban wards) were selected with probability proportional to population size. With a target sample of 840 respondents and 60 clusters, each cluster needed to yield 14 participants. Within each selected cluster, a comprehensive household listing was obtained from local records. For instance, in an average cluster of 1050 households, a sampling interval of 75 was calculated by dividing the total households by the desired respondents per cluster. A random start household was selected (such as the 42nd household), and thereafter, every 75th household was systematically sampled until 14 eligible respondents were surveyed. This process was repeated across all 60 clusters to achieve the total target sample. We selected 60 clusters following WHO guidelines for community-based health surveys, which recommend between 30 and 60 clusters for adequate representation while maintaining operational efficiency. The cluster size of 14 respondents was determined to achieve the calculated sample size of 840 while keeping field teams manageable. This approach allowed us to maintain a reasonable design effect (set at 2.0) while ensuring adequate representation across Western Gujarat's diverse geographic and demographic characteristics. For the qualitative component, purposive sampling was used to recruit 20 participants for in-depth interviews and 32 participants across 4 focus group discussions (6-8 participants each), with selection continuing until data saturation was reached where no new significant information emerged from additional interviews or discussions.

## Inclusion and exclusion criteria

The study enrolled married women aged 18–49 years who resided in the selected clusters of Western Gujarat and provided informed consent. Women who were critically ill, unable to respond to survey questions, had undergone hysterectomy, or were known to be infertile were excluded from participation. For the qualitative component, eligible participants included married women of reproductive age who had lived in the study area for at least one year, could communicate effectively in the local language, and consented to participate in in-depth interviews or focus group discussions. Women with severe physical or mental health conditions that could impair their ability to participate effectively, or those who had undergone hysterectomy or were known to be infertile, were not included in the qualitative component. Purposive selection ensured representation of diverse socio-demographic backgrounds and contraceptive use patterns, including current users of different contraceptive methods, past users who had discontinued contraception, and women who had never used contraception, thereby capturing a wide range of perspectives and experiences.

#### **Operational and variables definitions**

The study examined contraceptive use as the primary outcome variable, defined as current use of any method to delay or avoid pregnancy, categorized as either using any method (modern or traditional) or not using any method. Modern contraceptive methods included oral contraceptive pills, intrauterine devices, injectables, implants, male/female sterilization, and condoms, while traditional methods comprised withdrawal, fertility awareness methods, and other non-modern techniques. Several independent variables were assessed, including socio-demographic factors such as age (grouped as 18-25, 26-33, 34-40, and >40 years), religion (Hindu, Muslim, Christian), place of residence (urban, rural), caste (General, ST/SC, OBC), and family type (nuclear, joint, or three-generation households). Socioeconomic variables encompassed yearly family income (< 50,000 INR, 50,000–1 lac INR, 1–3 lac INR, >3 lac INR), education status of both women and their husbands (classified as illiterate, primary, secondary, higher secondary, or graduation), and employment status of both partners (working or not working). Reproductive and decisionmaking variables included age at marriage (<18 or  $\geq$ 18 years), number of living children (0, 1–2, or  $\geq$  3), births in the last five years (none, single birth, or  $\ge 2$  births), and decision-making patterns for contraceptive use (mainly respondent, mainly husband/partner, joint decision, or other family member).

### Data collection

## Quantitative data

The structured questionnaire used for quantitative data collection was developed based on a comprehensive review of relevant literature and existing validated instruments [9-14]. The initial draft of the questionnaire was

reviewed by a panel of experts, including researchers, healthcare professionals, and representatives from the target population, to assess its content validity and cultural appropriateness.

After incorporating feedback from the expert panel, the questionnaire was translated into local languages and back-translated to ensure linguistic equivalence. A pilot study was conducted with a sample of 50 women from the target population to assess the clarity, comprehensibility, and face validity of the questionnaire items. Based on the pilot study results, necessary modifications were made to improve the flow, language, and structure of the questionnaire.

The reliability analysis using Cronbach's alpha (0.879) specifically assessed the internal consistency of the multiitem scales measuring attitudes toward contraception, perceived barriers to contraceptive use, and decisionmaking autonomy. This composite measure included 14 Likert-scale items across three domains: eight items on attitudes toward different contraceptive methods, three items on perceived barriers, and three items on decisionmaking autonomy. Individual domain reliabilities were also assessed (attitudes:  $\alpha = 0.842$ ; barriers:  $\alpha = 0.793$ ; decision-making:  $\alpha = 0.812$ ). Items with item-total correlations below 0.3 were evaluated for potential removal or rewording during the pilot phase. The final questionnaire retained only items that contributed positively to scale reliability, ensuring robust measurement of these key psychosocial constructs related to contraceptive use.

### Qualitative data

For the qualitative component, semi-structured interview guides were developed for both IDIs and FGDs in consultation with qualitative research experts and stakeholders familiar with the local context. The guides were designed to explore key domains related to contraceptive use, including knowledge, attitudes, perceived barriers, and sociocultural influences. The guides were pilot-tested with a small group of participants to ensure clarity and comprehensibility of the questions, and necessary revisions were made based on the feedback.

The IDIs and FGDs were conducted by experienced qualitative researchers in private settings to ensure confidentiality. Each IDI lasted approximately 45–60 min, while FGDs were conducted for 90–120 min. All interviews and discussions were audio-recorded with consent and subsequently transcribed verbatim. Field notes were also taken to capture non-verbal cues and contextual information.

Data Analysis: Quantitative Analysis: The quantitative data were entered into a statistical software package (SPSS, 26version) and cleaned for inconsistencies. Descriptive statistics, such as frequencies and percentages, were calculated for categorical variables, while means and standard deviations were reported for continuous variables. Bivariate and multivariate logistic regression analyses were performed to identify factors associated with contraceptive use. Odds ratios (ORs) and their corresponding 95% confidence intervals (CIs) were estimated.

Qualitative Analysis: The qualitative data (IDI and FGD transcripts) were analyzed using thematic analysis with the assistance of NVivo 12 software (QSR International, Melbourne, Australia). A codebook was developed based on the research objectives and emerging themes from the data. Two researchers independently coded the transcripts using NVivo, and any discrepancies were resolved through discussion. Themes and sub-themes related to contraceptive use were identified and interpreted in the context of the quantitative findings. The use of NVivo facilitated the organization, coding, and retrieval of data, as well as the creation of visual representations of the thematic structure.

Integration of Quantitative and Qualitative Data: The quantitative and qualitative data were integrated using a concurrent triangulation design. The qualitative findings were used to provide context, explanations, and deeper insights into the quantitative results. Convergent and divergent perspectives were identified and interpreted to develop a comprehensive understanding of contraceptive use patterns and associated factors.

Missing data were addressed using multiple approaches to minimize potential bias. For the quantitative component, we employed a complete case analysis for variables with missing data rates below 5%. For variables with higher missingness (5-10%), we implemented multiple imputation using chained equations (MICE) with five imputation sets to preserve statistical power and reduce bias in the regression analyses. Sensitivity analyses comparing complete case results with imputed results showed consistent patterns of association. For the qualitative component, missing responses to specific questions were noted during coding and accounted for in the thematic analysis. The overall non-response rate for the survey was 4.2%, below our anticipated 10% adjustment in the sample size calculation. Pattern analysis of missing data revealed no systematic differences between complete and incomplete responses based on key sociodemographic characteristics.

Ethical Considerations: The institutional review board or ethics committee reviewed and approved the study protocol. (REF No: 285/03/23) Informed written consent was obtained from all participants before data collection. Confidentiality and anonymity of the participants were maintained throughout the study.

## Results

The study included 840 respondents, with a majority (47.8%) aged between 18 and 25 years, followed by 33.8% aged 26-33 years, 14.6% aged 34-40 years, and 3.7% aged above 40 years. The sample was predominantly Hindu (75.0%) and Muslim (24.6%), with a small proportion of Christians (0.4%). Slightly more than half (51.7%) of the respondents resided in rural areas, while 48.3% lived in urban areas. The respondents belonged to various caste groups, with 59.0% being Other Backward Classes (OBC), 27.5% from the General category, and 13.5% from Scheduled Tribes/Scheduled Castes (ST/SC). The majority (76.9%) lived in joint families, while 22.4% had nuclear families, and 0.7% lived in three-generation households. Regarding family income, 58.8% had an annual income above 3 lacs, 32.4% between 1 and 3 lacs, 6.3% between 50,000 and 1 lac, and 2.5% below 50,000 rupees. In terms of education, 11.8% of the women were illiterate, 42.6% had primary education, 31.7% had secondary education, 7.1% had higher secondary education, and 6.8% were graduates. For the husbands, 9.3% were illiterate, 18.5% had primary education, 46.0% had secondary education, 15.7% had higher secondary education, and 10.6% were graduates. Regarding employment status, 16.0% of the women were working, while 84.0% were not working, and 94.0% of the husbands were working, with 6.0% not working. Additionally, 9.6% of the women were married before the age of 18, while 90.4% were married at or above 18 years. In terms of the number of living children, 26.1% had no children, 58.6% had 1-2 children, and 15.4% had three or more children. Lastly, 50.5% had no births in the last 5 years, 42.3% had a single birth, 7.3% had two or more births, and the decision for contraceptive use was jointly made by 53.3% of the couples, 28.6% by the respondent mainly, 15.1% by the husband/partner mainly, and 3.0% by other family members (Table 1).

Among the 840 respondents, 46.7% were using modern contraceptive methods, 13.7% were using traditional methods, and 39.6% were not using any contraceptive method (Table 2).

Out of the 234 respondents who had discontinued past contraceptive methods, the primary reason was the desire to become pregnant (66.7%). Other reasons included side effects/health concerns (23.9%), inconvenience of use (5.6%), husband's disapproval (2.6%), and getting pregnant while using implants (1.3%) (Table 3).

Among the 23 respondents who had switched contraceptive methods, the main reason was side effects of the present method (78.3%), followed by personal choice (21.7%), advice from a healthcare provider (17.4%), inconvenience of use (13.0%), lack of availability of the current method (8.7%), partner's preference (8.7%), cost-related issues (8.7%), and cultural/religious reasons (4.3%). Note that some respondents may have selected multiple reasons (Table 4).

The bivariate analysis showed that age above 40 years (OR = 0.3, p < 0.05), rural residence (OR = 0.6, p < 0.05), ST/SC caste (OR = 0.5, p < 0.05), joint family (OR = 0.5, p < 0.01), family income above 3 lacs (OR = 5.2, p < 0.01), higher levels of education for women (secondary education: OR = 3.8, p < 0.01; higher secondary education: OR = 5.1, p < 0.01; graduation: OR = 6.8, p < 0.01) and husbands (secondary education: OR = 2.3, p < 0.05; higher secondary education: OR = 3.9, p < 0.01; graduation: OR = 4.7, p < 0.01), not working status of women (OR = 0.4, p < 0.001) and husbands (OR = 0.3, p < 0.01), marriage age above 18 years (OR = 2.8, p < 0.01), having 1–2 children (OR = 4.7, p < 0.001), single birth in the last 5 years (OR = 1.8, p < 0.01), decision for contraceptive use mainly by husband/partner (OR = 0.5, p < 0.05) or other family members (OR = 0.2, p < 0.01) were associated with contraceptive use.

The multivariate analysis revealed that age above 40 years (AOR = 0.2, p < 0.01), family income above 3 lacs (AOR = 3.9, p < 0.05), higher levels of education for women (primary education: AOR = 1.8, p < 0.05; secondary education: AOR = 2.9, p < 0.01; higher secondary education: AOR = 3.6, p < 0.01; graduation: AOR = 4.1, p < 0.01) and husbands (higher secondary education: AOR = 2.4, p < 0.05; graduation: AOR = 2.6, p < 0.05), not working status of women (AOR = 0.6, p < 0.05) and husbands (AOR = 0.4, p < 0.05), marriage age above 18 years (AOR = 2.1, p < 0.05), having 1–2 children (AOR = 3.6, p < 0.001), and decision for contraceptive use by other family members (AOR = 0.3, p < 0.05) remained significant predictors of contraceptive use after adjusting for other variables (Table 5).

The qualitative analysis yielded four primary themes with corresponding sub-themes that illuminate participants' experiences with contraceptive use. The "Knowledge and Attitudes" theme revealed varied awareness of contraceptive methods, with participants recognizing benefits like child spacing while expressing misconceptions about long-term fertility effects. Under "Access and Availability," women described challenges including distant health centers, financial constraints making contraceptives unaffordable, and inconsistent supply of preferred methods. The "Social and Cultural Influences" theme captured how gender dynamics affected contraceptive decisions, with husbands often opposing contraception and community norms stigmatizing birth control while valuing larger families. Religious beliefs further complicated decisions, with some participants viewing contraception as sinful. Finally, the "Experience and Side Effects" theme documented physical symptoms like headaches and bleeding, psychological effects including mood changes and fertility concerns, and the process of 
 Table 1
 Socio-demographic characteristics of respondents (N=840)

| Variable   | Categories       | Frequency N (%) |
|--|------------------|-----------------|
| Age (in years)   | categories       |                 |
|  | 18–25            | 402 (47.8%)     |
|  | 26-33            | 284 (33.8%)     |
|  | 34-40            | 123 (14 6%)     |
|  | >40              | 31 (3 7%)       |
| Religion   | 2 10             | 51 (5.776)      |
| heigion  | Hindu            | 630 (75.0%)     |
|  | Muslim           | 207 (24.6%)     |
|  | Christian        | 207 (24.0%)     |
| Place of Posidonco   | Christian        | 5 (0.470)       |
|  | Urban            | 406 (49 204)    |
|  | Dural            | 400 (48.3%)     |
| Casta  | nulai            | 434 (31.7%)     |
| Caste  | Conoral          | 221 (27 E0/)    |
|  | General          | 231 (27.3%)     |
|  |                  | 115 (15.5%)     |
| The state of the second s | ORC              | 496 (59.0%)     |
| Type of Family   | Number           | 100 (22 40/)    |
|  | inuclear         | 188 (22.4%)     |
|  | Joint            | 646 (76.9%)     |
|  | 3 Generation     | 6 (0.7%)        |
| Income of the Family (Yearly)  | 50.000           |                 |
|  | < 50,000         | 21 (2.5%)       |
|  | 50,000–1 lac     | 53 (6.3%)       |
|  | 1–3 lac          | 272 (32.4%)     |
|  | >3 lac           | 494 (58.8%)     |
| Education Status of Women  |                  |                 |
|  | Illiterate       | 99 (11.8%)      |
|  | Primary          | 358 (42.6%)     |
|  | Secondary        | 266 (31.7%)     |
|  | Higher Secondary | 60 (7.1%)       |
|  | Graduation       | 57 (6.8%)       |
| Education Status of Husband  |                  |                 |
|  | Illiterate       | 78 (9.3%)       |
|  | Primary          | 155 (18.5%)     |
|  | Secondary        | 386 (46.0%)     |
|  | Higher Secondary | 132 (15.7%)     |
|  | Graduation       | 89 (10.6%)      |
| Employment Status of Women   |                  |                 |
|  | Working          | 134 (16.0%)     |
|  | Not Working      | 706 (84.0%)     |
| Employment Status of Husband   |                  |                 |
|  | Working          | 789 (94.0%)     |
|  | Not Working      | 51 (6.0%)       |
| Age at Marriage (Women)  |                  |                 |
|  | < 18             | 81 (9.6%)       |
|  | ≥18              | 759 (90.4%)     |
| Number of Living Children  |                  |                 |
|  | 0                | 219 (26.1%)     |
|  | 1–2              | 492 (58.6%)     |
|  | ≥3               | 129 (15.4%)     |
| Birth in Last 5 Years  |                  |                 |
|  | No Birth         | 424 (50.5%)     |
|  | Single Birth     | 355 (42.3%)     |

Table 1 (continued)

| Variable                       | Categories             | Frequency N (%) |
|--------------------------------|------------------------|-----------------|
|                                | ≥ 2 Births             | 61 (7.3%)       |
| Decision for Contraceptive Use |                        |                 |
|                                | Mainly Respondent      | 240 (28.6%)     |
|                                | Mainly Husband/Partner | 127 (15.1%)     |
|                                | Joint Decision         | 448 (53.3%)     |
|                                | Other Family Member    | 25 (3.0%)       |

| Table 2 | Using d | of current | contraceptive | methods. ( | N = 840 | ) |
|---------|---------|------------|---------------|------------|---------|---|
|---------|---------|------------|---------------|------------|---------|---|

| 5                  |               |
|--------------------|---------------|
| Methods            | Frequency (%) |
| Modern Method      | 392 (46.7%)   |
| Traditional Method | 115 (13.7%)   |
| Not Any method     | 333 (39.6%)   |

**Table 3** Reasons for discontinuing past contraceptive methods (N=234)

| - /                          |                 |
|------------------------------|-----------------|
| Reasons                      | Frequency N (%) |
| Inconvenience of use         | 13 (5.6%)       |
| Side effects/health concerns | 56 (23.9%)      |
| Wants to become pregnant     | 156 (66.7%)     |
| Husband's disapproval        | 6 (2.6%)        |
| Got pregnant with implants   | 3 (1.3%)        |

**Table 4** Reasons for switching contraceptive methods (for those switching).(N=23)

| Reasons                                    | Frequency N (%) |
|--|-----------------|
| Side effects of the present method         | 18 (78.3%)      |
| Personal choice                            | 5 (21.7%)       |
| Inconvenience of use                       | 3 (13.0%)       |
| Lack of availability of the current method | 2 (8.7%)        |
| Advice from a healthcare provider          | 4 (17.4%)       |
| Partner's preference                       | 2 (8.7%)        |
| Cultural/religious reasons                 | 1 (4.3%)        |
| Cost-related issues                        | 2 (8.7%)        |

Note that some respondents may have selected multiple reasons, which can result in the sum of percentages exceeding 100%

finding acceptable methods that aligned with individual lifestyles. These findings, illustrated through representative quotes, provide valuable context for understanding the complex interplay of factors influencing contraceptive practices among women in Western Gujarat (Table 6, and Fig. 1).

These themes and sub-themes, along with the illustrative quotes, provide valuable insights into the diverse factors influencing contraceptive use among the respondents, including knowledge, attitudes, access, availability, social and cultural influences, and experiences with side effects and method acceptance.

#### Discussion

The present study employed a mixed methods approach to investigate the prevalence and determinants of contraceptive use among married women in Western Gujarat, India. The quantitative findings revealed a contraceptive prevalence rate of 60.4%, with 46.7% of women using modern methods and 13.7% relying on traditional methods. This rate is slightly lower than the state average of 65.6% reported in the National Family Health Survey (NFHS-5) [3], In Uttar Pradesh, India, while modern method use has increased, the use of traditional contraceptive methods has also risen significantly, from 3.8% in 2018 to 13.7% in 2021. This increase in traditional method use occurred despite a substantial increase in the availability of modern reversible contraceptive methods in public health facilities, from 66.1% in 2018 to 81.3% in 2021. The findings suggest that the initial contraceptive method choice has significant implications for current and future contraceptive use. Many traditional method users in Uttar Pradesh reported that their first method was a traditional one, and the majority intended to continue using the same traditional method in the future. It suggests the need for targeted interventions to improve contraceptive uptake in this district [3, 17, 18].

The multivariate analysis identified several sociodemographic and reproductive factors associated with contraceptive use. Consistent with previous studies [19, 20], women's education emerged as a significant predictor, with higher educational attainment being positively associated with contraceptive use. This finding underscores the importance of women's empowerment through education in promoting reproductive health choices [21–24].

The qualitative data provided insights into the complex interplay between education and contraceptive use. Some participants expressed concerns about potential side effects and misconceptions regarding contraceptive methods, highlighting the need for comprehensive family planning counseling and education. For instance, some participants perceived that contraceptives could lead to infertility in the future. Such misconceptions may impede contraceptive uptake, even among educated women [10].

The study also found that women's employment status was significantly associated with contraceptive use, with non-working women being less likely to use contraception [25]. This finding aligns with previous research [2, 4] and may be attributed to the increased autonomy and decision-making power that employment provides to women. The qualitative data further revealed perceived

| Tabl | e 5 | Predictors c | f contrace | ptive use | among women |
|------|-----|--------------|------------|-----------|-------------|
|      |     |              |            | 1         |             |

| variables                    | Bivariate Analysis            | Multivariate Analysis        |  |
|------------------------------|-------------------------------|------------------------------|--|
|                              | Odds Ratio (95% CI)           | Adjusted Odds Ratio (95% CI) |  |
| Age (years)                  |                               |                              |  |
| 18–25                        | 1.0 (ref)                     | 1.0 (ref)                    |  |
| 26-33                        | 1.2 (0.8–1.9)                 | 1.1 (0.7–1.8)                |  |
| 34–40                        | 0.6 (0.3–1.1)                 | 0.5 (0.2-1.0)*               |  |
| >40                          | 0.3 (0.1–0.9)*                | 0.2 (0.1–0.7)**              |  |
| Religion                     |                               |                              |  |
| Hindu                        | 1.0 (ref)                     | 1.0 (ref)                    |  |
| Muslim                       | 0.7 (0.4–1.1)                 | 0.8 (0.5–1.3)                |  |
| Christian                    | 1.5 (0.2–12.3)                | 2.1 (0.2–18.7)               |  |
| Place of Residence           |                               | ,                            |  |
| Urban                        | 10 (ref)                      | 10 (ref)                     |  |
| Bural                        | 0.6 (0.4-0.9)*                | 07(04-11)                    |  |
| Caste                        |                               |                              |  |
| General                      | 10 (ref)                      | 1 () (ref)                   |  |
| ST/SC                        | 0.5 (0.3-0.9)*                | 0.6(0.3-1.1)                 |  |
| OBC                          | 0.8 (0.5–1.3)                 | 0.0 (0.5–1.5)                |  |
| Family Type                  | 0.0 (0.5-1.5)                 | 0.9 (0.5-1.5)                |  |
| Nuclear                      | 1.0 (rof)                     | 1.0 (rof)                    |  |
|                              | 1.0 (IEI)<br>0.5 (0.2, 0.9)** | 1.0(101)                     |  |
| Joint                        | 0.2 (0.04 1.1)                | 0.8 (0.5-1.0)                |  |
| S Generation                 | 0.2 (0.04-1.1)                | 0.5 (0.05-1.9)               |  |
|                              | 1.0 (mail)                    | 10 (ref)                     |  |
|                              | 1.0 (fel)                     | 1.0 (PEL)                    |  |
| 50,000-1 lac                 | 2.1 (0.5-9.0)                 | 1.8 (0.4–8.2)                |  |
| 1–3 lac                      | 3.5 (1.0-12./)*               | 2.7 (0.7–10.3)               |  |
| >3 lac                       | 5.2 (1.5-18.2)**              | 3.9 (1.0-14.9)*              |  |
| Education Status of Women    | 10/ 0                         |                              |  |
| Illiterate                   | 1.0 (ref)                     | 1.0 (ref)                    |  |
| Primary                      | 2.1 (1.2–3./)**               | 1.8 (1.0-3.3)*               |  |
| Secondary                    | 3.8 (2.0-7.0)**               | 2.9 (1.5–5./)**              |  |
| Higher Secondary             | 5.1 (2.1–12.5)**              | 3.6 (1.4–9.2)**              |  |
| Graduation                   | 6.8 (2.5–18.2)**              | 4.1 (1.4–12.0)**             |  |
| Education Status of Husband  |                               |                              |  |
| Illiterate                   | 1.0 (ref)                     | 1.0 (ref)                    |  |
| Primary                      | 1.5 (0.7-3.0)                 | 1.2 (0.6–2.6)                |  |
| Secondary                    | 2.3 (1.2–4.3) *               | 1.6 (0.8–3.2)                |  |
| Higher Secondary             | 3.9 (1.8–8.4) **              | 2.4 (1.0-5.6)*               |  |
| Graduation                   | 4.7 (2.0-11.2) **             | 2.6 (1.0-6.9)*               |  |
| Employment Status of Women   |                               |                              |  |
| Working                      | 1.0 (ref)                     | 1.0 (ref)                    |  |
| Not Working                  | 0.4 (0.2–0.6) ***             | 0.6 (0.3-1.0)*               |  |
| Employment Status of Husband | QQ                            |                              |  |
| Working                      | 1.0 (ref)                     | 1.0 (ref)                    |  |
| Not Working                  | 0.3 (0.1–0.6)**               | 0.4 (0.2–0.9)*               |  |
| Age at Marriage              |                               |                              |  |
| <18                          | 1.0 (ref)                     | 1.0 (ref)                    |  |
| ≥18                          | 2.8 (1.5–5.3)**               | 2.1 (1.0-4.2)*               |  |
| Number of Living Children    |                               |                              |  |
| 0                            | 1.0 (ref)                     | 1.0 (ref)                    |  |
| 1–2                          | 4.7 (2.9–7.5)***              | 3.6 (2.2-6.0)***             |  |
| ≥3                           | 1.9 (1.0-3.6)*                | 1.5 (0.7-3.0)                |  |
| Birth in the Last 5 Years    |                               |                              |  |
| No Birth                     | 1.0 (ref)                     | 1.0 (ref)                    |  |

### Table 5 (continued)

| Variables                      | Bivariate Analysis  | Multivariate Analysis        |  |
|--------------------------------|---------------------|------------------------------|--|
|                                | Odds Ratio (95% CI) | Adjusted Odds Ratio (95% CI) |  |
| Single Birth                   | 1.8 (1.2–2.7)**     | 1.4 (0.9–2.2)                |  |
| ≥2 Births                      | 0.6 (0.3–1.3)       | 0.5 (0.2–1.1)                |  |
| Decision for Contraceptive Use |                     |                              |  |
| Mainly Respondent              | 1.0 (ref)           | 1.0 (ref)                    |  |
| Mainly Husband/Partner         | 0.5 (0.3–0.9)*      | 0.7 (0.4–1.2)                |  |
| Joint Decision                 | 1.4 (0.9–2.2)       | 1.2 (0.8-2.0)                |  |
| Other Family Member            | 0.2 (0.1–0.6)**     | 0.3 (0.1–0.8)*               |  |

Note: The table shows both unadjusted (bivariate) and adjusted (multivariate) odds ratios with 95% confidence intervals. In the multivariate model, odds ratios were adjusted for all variables listed in the table. Significance levels are indicated by asterisks: \*p<0.05 (significant), \*\*p<0.01, and \*\*\*p<0.001.The reference category for each variable is indicated by "ref". The Hosmer-Lemeshow test ( $\chi^2$ =8.23, df=8, p=0.41) indicated good model fit, and the area under ROC curve was 0.78, demonstrating good discriminative ability

| Table 6 | Qualitative | themes a | nd Sub-themes | on contraceptive use |
|---------|-------------|----------|---------------|----------------------|
|---------|-------------|----------|---------------|----------------------|

| Theme                             | Sub-theme                   | Illustrative Quotes  |
|-----------------------------------|-----------------------------|--|
| Knowledge and<br>Attitudes        | Awareness of methods        | "I know about condoms, pills, and injections, but not much about other methods."<br>"My friends told me about copper-T (IUD), so I got that."                        |
|                                   | Perceived benefits          | "Using family planning helps space my children and lets me take care of them properly.""Contra-<br>ception is good for my health and lets me work outside the home." |
|                                   | Concerns and misconceptions | "I heard contraceptives can make you infertile in the long run."<br>"Traditional methods are safer than modern ones."  |
| Access and<br>Availability        | Healthcare access           | "The nearest health center is very far, so I can't go regularly for supplies."<br>"The doctor is never available when I visit the clinic."                           |
|                                   | Financial constraints       | "Contraceptives are too expensive for us to afford."<br>"The cost of some methods is a big burden on our family."  |
|                                   | Supply issues               | "The clinic is always out of stock of my method."<br>"I had to switch methods because my preferred one was unavailable."   |
| Social and Cultural<br>Influences | Gender roles and dynamics   | "My husband doesn't like me using anything, he wants more children."<br>"As a woman, it's my duty to bear children for the family."                                  |
|                                   | Community norms             | "In our community, people look down on those using birth control."<br>"Having many children is a status symbol here."  |
|                                   | Religious beliefs           | "My religion teaches that birth control is a sin." "God will decide how many children we should have."   |
| Experience and Side<br>Effects    | Physical side effects       | "The pills gave me severe headaches and nausea."<br>"I had heavy bleeding after getting the IUD inserted."   |
|                                   | Psychological effects       | "I felt very moody and irritable after starting the injection."<br>"Using contraception made me worry a lot about my fertility."                                     |
|                                   | Method acceptance           | "The method I'm using now is very convenient and suits my lifestyle."<br>"I had to try a few different options before finding one I was comfortable with."           |

financial constraints as a barrier to accessing contraceptive services, as expressed by one participant: "Contraceptives are too expensive for us to afford." [12].

Notably, the number of living children emerged as a strong predictor of contraceptive use, with women having one or two children being more likely to use contraception compared to those with no children or three or more children. This finding is consistent with previous studies [4, 19, 26] and suggests that couples may be more motivated to practice contraception after achieving their desired family size.

The qualitative data provided valuable insights into the decision-making dynamics surrounding contraceptive use. While joint decision-making with husbands was reported by many participants, some women expressed a lack of autonomy, with decisions being made primarily by husbands or other family members. As one participant stated, "My husband doesn't like me using anything, he wants more children." [23, 27]. This highlights the need for interventions that promote shared decision-making and address gender norms and power dynamics within families.

The qualitative findings revealed the influence of social and cultural factors on contraceptive use. Participants discussed community norms and religious beliefs that stigmatize contraceptive use or promote larger family sizes. Some respondents indicated that their communities looked down upon those using birth control methods. Such sociocultural barriers may contribute to the unmet need for contraception and should be addressed through targeted community-level interventions [23, 28].



Fig. 1 shows the mind map of the qualitative findings

The findings of this study have important implications for existing family planning policies and programs in India, particularly in the context of Western Gujarat. The National Family Planning Program, launched in 1952 and revised under the National Health Mission, aims to address the unmet need for contraception and promote reproductive health [29]. Our results suggest that while progress has been made, there are still significant gaps in achieving universal access to family planning services.

The observed association between women's education and contraceptive use aligns with the goals of the Beti Bachao Beti Padhao (Save the Daughter, Educate the Daughter) scheme [30]. This national initiative aims to promote girls' education and empowerment, which our study shows can have positive impacts on reproductive health choices. Strengthening the implementation of this scheme in Western Gujarat could indirectly contribute to increased contraceptive use.

The qualitative findings highlighting access barriers and supply issues underscore the need to reinforce the Free Drugs and Free Diagnostics Service Initiatives under the National Health Mission [31]. Ensuring a consistent supply of contraceptives at primary health centers and community health centers in Western Gujarat should be a priority. Additionally, the Rashtriya Kishor Swasthya Karyakram (National Adolescent Health Program) [32] could be leveraged to address the misconceptions and lack of awareness about contraceptive methods revealed in our study, particularly focusing on young married couples. The influence of social and cultural factors on contraceptive use suggests that community-based interventions, such as those implemented through the ASHA (Accredited Social Health Activist) program [33], need to be strengthened. ASHAs could play a crucial role in addressing sociocultural barriers and promoting positive attitudes towards family planning in their communities.

Lastly, the finding that joint decision-making is associated with higher contraceptive use aligns with the objectives of the Male Participation in Family Planning program [34]. Efforts to involve men in family planning discussions and decisions should be intensified in Western Gujarat to promote shared responsibility for reproductive health.

# Limitations

This study has several limitations that should be considered when interpreting the results. The cross-sectional design limits our ability to establish causal relationships between the identified factors and contraceptive use. The selfreported nature of the data may be subject to recall bias and social desirability bias, potentially affecting the accuracy of the information obtained. While the study provides valuable insights into contraceptive use patterns in Western Gujarat, the findings may not be generalizable to other regions of India due to potential socio-cultural and demographic variations. Despite these limitations, the mixed-methods approach and the integration of quantitative and qualitative data provide a comprehensive understanding of contraceptive use dynamics in the study area, offering valuable insights for policy and program interventions. Despite the limitations, the integration of quantitative and qualitative data underscores the need for multifaceted interventions that address individual, interpersonal, and sociocultural factors to improve contraceptive uptake and reproductive health outcomes in the region. Such interventions should focus on strengthening family planning education and counseling, enhancing access to contraceptive services, promoting women's empowerment and decisionmaking autonomy, addressing sociocultural barriers, and tailoring approaches to specific subgroups.

By adopting a comprehensive and context-specific approach, stakeholders and policymakers can develop effective strategies to address the unmet need for contraception, empower women and couples to make informed reproductive choices, and ultimately contribute to improved maternal and child health outcomes in Western Gujarat and beyond.

## Conclusion

This mixed methods study provides valuable insights into the prevalence and determinants of contraceptive use among married women in Western Gujarat, India. The findings highlight the complex interplay of socio-demographic, reproductive, and sociocultural factors influencing contraceptive use patterns. The quantitative component revealed a contraceptive prevalence rate of 60.4%, with women's education, employment status, number of living children, and decision-making dynamics emerging as significant predictors of contraceptive use. The qualitative component complemented these findings by providing deeper insights into the knowledge, attitudes, perceived barriers, and sociocultural influences shaping contraceptive use.

#### Abbreviations

- NFHS National Family Health Survey
- WHO World health organisation
- CPR Contraceptive prevalence rate
- IUDs Intrauterine devices
- OBC Other Backward Classes
- ST/SC Scheduled Tribes/Scheduled Castes

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### Author contributions

VS contributed to the conceptualization, data curation, formal analysis, investigation, methodology, resources, supervision, validation, writing (original draft), and writing (review and editing). VS, YM, DP, and RG contributed to the conceptualization, data curation, formal analysis, investigation, writing (original draft), and writing (review and editing). YM contributed to the methodology, resources, supervision, validation, and writing (review and editing). YM contributed to the formal analysis, investigation, writing (original draft), and writing (review and editing). All the authors read and approved the final manuscript.

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#### Data availability

The datasets generated and analyzed during the current study are not publicly available to protect the privacy of the study participants but are available from the corresponding author upon reasonable request.

## Declarations

#### Ethics approval and consent to participate

• Good clinical care guidelines were followed, and the guidelines were established as per the Helsinki Declaration 2008.

 All the participants were given clear instructions about the study before the start of the study.

• Written informed consent was obtained from the patients in the vernacular language for study participation. No identifying information or images have been included in the original article, which was submitted for publication in an online open-access publication.

• The entire methodology and protocol were approved by the Institutional Ethical Committee of Shri M P Shah Government Medical College, Jamnagar, Gujarat, India.

• An ethical approval was obtained from the institute (Shri M P Shah Government Medical College, Jamnagar, Gujarat, India) before the start of the study. (REF No: 285/03/23)

#### **Consent for publication**

Not Applicable.

#### **Competing interests**

The authors declare no competing interests.

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