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Is empowerment the key to solve India's method-mix problem? Associational analysis of modern methods of contraception and women's empowerment using multilevel modelling of survey data

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ABSTRACT (abridged)

India's fertility has reached replacement levels largely through the use of female sterilization, masking regional and normative inequities in access to reversible contraception and raising questions about autonomy and choice. Drawing on 79,391 currently married women aged 15-49 interviewed in the 2015-16 and 2019-21 rounds of the National Family Health Survey (NFHS), this study assesses how individual and contextual empowerment influence selection of modern reversible methods versus permanent methods like sterilization. Empowerment was derived from NFHS items on attitudes to wife-beating, household decision-making and freedom of movement via factor analysis and principal-component weighting, yielding standardized individual scores and district-level means. Multilevel logistic models with district random effects show context outweighs personal autonomy: residence in medium- and high-empowerment districts more than doubled the odds of reversible use (AOR 2.26 and 2.88), while a woman's own empowerment was non-significant. Younger age, marriage at 18 + years, lower parity and counselling by frontline health workers favored reversible uptake; marginalized caste status and high parity discouraged it. Classic socioeconomic markers such as wealth and education lost significance once empowerment and service variables were included. About one-third of unexplained variance remained clustered by district (ICC ~ 0.30), signaling potent unmeasured normative and programmatic factors. The findings suggest that shifting India's method mix toward flexible, woman-centered choices will require district-tailored approaches that blend community-level norm change, structured women's groups, gender-transformative counselling and targeted behavior-change campaigns, with particular attention to parity and caste inequities.

Background

The Total Fertility Rate in India (the most populous country, as per the recent population estimates of the United Nations) reaching replacement levels and projected to fall further, does not reveal the multiple conflicting undercurrents that underlie the family planning discourse within the country. Unlike high-income countries, where fertility decline was more gradual and primarily driven by socioeconomic developments such as increased education, urbanization, and women's workforce participation, India's fertility decline has heavily relied on permanent methods.

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In the high-income countries, the use of temporary and reversible contraceptives played a more substantial role, allowing for greater individual autonomy in family planning decisions. While the prevalence of modern reversible methods has risen within India, the entrenched pattern of contraceptive use that are markedly skewed towards female sterilization reflect structural and normative barriers towards use of reversible modern methods of contraceptives, an area of research that remains significantly underexplored. Unpacking the associations between the use of specific modern contraceptive methods and women's autonomy and empowerment, therefore becomes crucial for the family planning programming in India.

This paper aims to examine the associations between the individual and district level aspects of women's empowerment, quantified through nationally representative household survey data, with their use of modern reversible contraceptive methods against the use of female sterilization method. Specifically, this association is examined for currently married women between the ages of 15-49 years, who are current users of modern methods of contraception.

Theoretical Framework

For this study, we used the definition of modern contraception proposed by Hubacher and Trussel (Hubacher and Trussell 2015), that classifies modern contraceptive methods as technological products or medical procedures that affect natural reproduction. According to this definition, the following contraceptive methods were considered as modern: male and female sterilization, contraceptive pills, condoms (male and female), intra-uterine devices (IUD), sterilization (male and female), injectables, diaphragms, spermicidal agents (foam/jelly), and emergency contraception.

A quantitative measurement of women's empowerment has been made possible by questions included in various rounds of Demographic and Health Surveys (DHS) that examine attitudes towards wife-beating, household decision-making, and freedom of movement. These dimensions have become theoretically significant for several reasons. First, women's attitudes towards wife-beating serve as a critical indicator of societal norms and values regarding gender-based violence. Acceptance of such violence is often associated with broader patterns of gender inequality and can perpetuate cycles of abuse. Research indicates that communities with higher acceptance of wife-beating tend to exhibit lower levels of women's empowerment and autonomy (Heise 1998). Second, participation in household decision-making is a vital aspect of women's empowerment. It reflects their ability to influence key aspects of family life, including health care, financial decisions, and education for children. Studies have shown that when women have a say in household decisions, it leads to improved health outcomes for themselves and their families (Doss 2013). Thus, assessing women's roles in decision-making can provide insights into the dynamics of power within households and highlight potential areas for promoting gender equality.

Lastly, freedom of movement is a fundamental aspect of women's autonomy. The ability to move freely without needing permission from a partner or family member is essential for accessing education, health care, and employment opportunities. Restrictions on movement can severely limit women's participation in public life and their overall well-being (Kabeer 1999). These DHS indicators point to certain crucial dimensions of women's empowerment that become critical for any major FP intervention that seeks to promote women-centered, rights-based care, that prioritizes individual autonomy. Therefore, analysis of these indicators using nationally representative cross-sectional data becomes critical.

Data

Data used for this analysis was obtained from the Round 4 (2015-'16) and Round 5 (2019-'21) of the National Family Health Survey (NFHS), a nationally representative cross-sectional survey in India providing information on household populations, housing characteristics, basic demographic and socioeconomic characteristics of respondents, fertility, family planning, maternal and child health, infant and child mortality,

nutrition, morbidity including adult health issues, women empowerment, and domestic violence at the nation, state and district level.

The survey rounds were implemented using a multi-stage sampling strategy, with primary sampling units (PSUs) selected as per probability proportional to size and households within PSUs were selected through systematic sampling. All women who were in the selected households the night before the survey were invited to participate in the survey. Across Round 4 (2015-'16) and Round 5 (2019-'21), data was collected from individual women aged 15-49 years on various topics including family planning, from 699,686 and 724,115 women respectively.

For the purposes of this analysis, we considered only those respondents who were asked questions regarding attitudes towards wife-beating, participating in decision-making within the household, and freedom of movement. This restricted the sample of respondents to 95,455 currently married women (aged 15-49 years) across both rounds. Since we consider only those respondents who were current users of modern methods of contraception (with exclusion of male sterilization) at the time of the survey in our analysis, the final analytical sample size was 79,391.

Research Methods

For the outcome variable, we considered all modern contraceptive methods (except male sterilization) and coded them as a binary variable (0 = modern permanent, 1= modern reversible).

For creation of empowerment-related variable, exploratory factor analysis (EFA) was conducted on questions pertaining to attitudes of the respondents to wife-beating in five situations (if the woman goes out without telling the husband; neglects the children; argues with her husband; refuse to have sex; and if she burns the food), decision-making in the household (w.r.t respondent's health care, major expenses and visits to family and relatives) and freedom of movement (whether women are allowed to go to market, health facilities, and places outside their own village/community, with three possible responses: "*alone*," "*with someone else*," and "*not at all*.")

For the questions on attitudes to violence, responses which said violence was justified were coded as 0 while those which said violence was not justified were coded as 2. There were five possible responses to the questions on decision-making: *'respondent alone*,' *'respondent and husband jointly*,' *'husband alone*,' *'someone else*,' and *'others*.' These responses were scored as 2 for *'respondent alone*,' 1 for *'respondent and husband jointly*,' and otherwise 0. Responses to the freedom of movement questions were coded as: 2 for *'alone*,' 1 for *'with someone else*,' and 0 for *'not at all*.'

Maximum likelihood factor analysis with varimax rotation was performed, extracting three factors. Goodness-of-fit estimates were calculated for the factor analysis performed – Root Mean Square Error of Approximation (RMSEA) was 0.07 (<0.08 is considered ideal) and Comparative Fit Index (CFI) was 0.93 (>0.9 is ideal) which indicated good fit of the model. Cronbach's Alpha of 0.79 indicated adequate internal consistency across all items.

Factor scores were predicted from the three-factor solution. Subsequently, principal component analysis (PCA) was performed on these factor scores to create a single composite empowerment measure for each respondent. The first principal component weights were applied to generate individual empowerment scores. These scores were standardized and then divided into tertiles: Low, Medium and High (coded 0, 1, and 2), to create the final individual empowerment index.

The respondent-level empowerment scores (standardized z-scores) were aggregated to districts using DHS sampling weights. The resulting district mean empowerment represents the local gender-norms status (again, also divided into tertiles: Low, Medium and High). Each woman's relative empowerment was then group-mean-centered. Thus, mean-centered individual empowerment measures how many standard deviations (SDs) a woman is above (positive) or below (negative) her district average, while district mean empowerment

captures between-district variation. Including both terms in mixed-effects models cleanly separates within-district (compositional) and between-district (contextual) effects and eliminates collinearity between the two levels.

A mixed-effect multi-level regression model was run with usage of modern methods being considered as the dependent variable and the individual empowerment score and district empowerment score as the main independent variables.

Various control variables, such as demographic, economic, and social contexts, were also included in the analysis. The demographic variables include age in years (15–24 = 0, 25–34 = 1, and 35–49 = 3); place of residence (urban = 0, rural = 1); number of children ever born (0-1 = 0, 2 or more = 1); and age at first marriage (less than 18 years = 0, equal to or more than 18 years = 1). The economic variables include woman's education (no education = 0, primary = 1, secondary = 2, and higher = 3); wealth index (poorest = 0, poorer = 1, middle = 2, richer = 3, and richest = 4); and husband's employment (Not working = 0, agricultural = 1, and non-agricultural working = 2). Social context variables include caste (Others = 0, Scheduled Castes/Scheduled Tribes (SC/ST) = 1, Other Backward Class (OBC) = 2); who is the decision-maker on contraception use (Others = 0, Respondent and husband jointly = 1, respondent alone = 2). Informed choice was considered through access to family planning information (knowledge about side effects, what to do about side effects, and awareness of other contraceptive methods).

Findings

After controlling every measured characteristic and allowing for a district-specific random intercept, several determinants of modern-contraceptive use remained pronounced while others faded. Age showed a clear inverse gradient: women aged 25–34 were about half as likely to use a modern method as those aged 15–24 (adjusted odds ratio [AOR] 0.50, 95 % CI 0.39–0.65), and women aged 35–49 showed a similar reduction (AOR 0.48, 0.34–0.68). Marrying at or after 18 years increased the odds of uptake (AOR 1.38, 1.18–1.61) for modern reversible methods of contraception. Marginalized caste groups (SC/ST and OBCs) had reduced odds of reversible contraceptive use. Religious affiliation, by contrast, remained strongly positive with Muslim women having almost three-fold higher odds of modern-reversible method use (AOR 2.72, 2.04–3.62).

Most traditional socioeconomic markers: wealth quintile, respondent's education, her husband's education, employment status, lost statistical significance once the full set of variables was in the model, indicating that their crude associations were explained by other factors. However, what did matter was empowerment at the contextual level: residence in a medium-empowerment district (AOR 2.26, 1.66–3.06) and in a high-empowerment district (AOR 2.88, 2.13–3.91) had significantly increased odds of reversible contraceptive use. However, our analysis did not find respondent's own empowerment score to be independently associated (AOR 1.04, 0.98–1.1) with use of reversible contraceptives, a pattern that needs deeper qualitative exploration. Women who had been counselled by a health worker about family-planning options were also twice as likely to use a modern method (AOR 2.03, 1.69–2.43).

After all adjustments, about one-third of the residual variance in modern-method use remained clustered at the district level (intraclass correlation ≈ 0.30), underscoring persistent contextual differences that extend beyond measured individual and service-side factors.

Conclusion

Women situated within districts that have relatively high levels of gender autonomy, are significantly more likely to use reversible methods. Even after accounting for age, marital timing, caste, religion, parity,

empowerment and other sociodemographic markers, roughly one-third of the unexplained variation still clusters at the district level, signaling local programmatic and normative influences that the survey cannot directly measure. This seems to indicate that modern reversible contraceptive use in India is not merely a function of individual characteristics but is profoundly shaped by district level empowerment climates and local community norms.

The study findings argue for moving beyond individual-level interventions to comprehensive, community-centered strategies that transform entrenched gender norms and strengthen women's collective agency, creating enabling environments for voluntary, informed contraceptive choice. Suggested strategies include localized community engagement involving dialogues with men, religious leaders, and community leaders to challenge and reshape norms that promote permanent methods of contraceptive use, particularly female sterilization. The policy and programs should look at strengthening women's agency through steps for increasing participation in household decision making, focusing on women's mobility and rejection of gender-based violence through existing community platforms like women's groups. In addition, training frontline health workers on gender-transformative counselling during family planning visits, and promoting choice based contraceptive use through designing behavior change communications may help address social norms that explicitly limit reversible method adoption.

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