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The impact of accredited social health activists in India on uptake of modern contraception: A nationally representative multilevel modelling study

Catherine Moughalian[a], Josué Almansa[a], Tobias Vogt[b,c,d], Regien Biesma[a], Susanne Täuber[e], Arathi Rao[c], Ashish Srivastava[a,f] and Jelle Stekelenburg[a,g]

[a]Department of Health Sciences, Global Health Unit, University Medical Centre Groningen, Groningen, the Netherlands; [b]Faculty of Spatial Sciences, Population Research Centre, University of Groningen, Groningen, the Netherlands; [c]Prasanna School of Public Health, Manipal Academy of Higher Education, Manipal, India; [d]Max Planck Institute for Demographic Research, Rostock, Germany; [e]Sociology Department, University of Amsterdam, Amsterdam, the Netherlands; [f]Jhpiego – An Affiliate of Johns Hopkins University, Jhpiego, New Delhi, India; [g]Department of Obstetrics and Gynaecology, Medical Centre Leeuwarden, Leeuwarden, the Netherlands

ABSTRACT

The government of India introduced the Accredited Social Health Activist (ASHA) programme in 2006 to connect marginalised communities to the health system. ASHAs are mandated to increase the uptake of modern contraception through the doorstep provision of services. There is currently no evidence on the impact of ASHAs on the uptake of contraception at the national level. This paper examines the impact of ASHAs on the uptake of modern contraception using nationally representative National and Family Health Survey data collected in 2019–21 in India. A multilevel logistic regression analysis was performed to determine the effect of contact with ASHAs on the uptake of modern contraception, controlling for regional variability and socio-demographic variables. The data provide strong evidence that ASHAs have succeeded in increasing modern contraceptive use. Women exposed to ASHAs had twice the odds of being current users of modern contraception compared to those with no contact, even after controlling for household and individual characteristics. However, only 28.1% of women nationally reported recent contact with ASHA workers. The ASHA programme should remain central to the strategy of the government of India and should be strengthened to achieve universal access to modern contraception and meet sustainable development goals by 2030.

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Introduction

Global estimates show that 99% of maternal deaths occur in low and middle-income countries, making maternal mortality a key indicator of disparities between countries (World Health Organization, 2019). India accounts for 12% of maternal deaths globally and recorded approximately 1.3 million maternal deaths between 1997 and 2020 (Meh et al., 2022). India also has a high national incidence of abortion and unintended pregnancy, with nearly half of pregnancies being unintended

CONTACT Catherine Moughalian c.moughalian@umcg.nl Department of Health Sciences, Global Health Unit, University Medical Centre Groningen, Groningen 9700 RB, the Netherlands
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and one-third of all pregnancies ending in abortions. In 2015, there were an estimated 15.6 million abortions in India, only 22% of which occurred in health facilities (Singh et al., 2018).

Modern contraceptive use leads to indirect reductions in maternal mortality by decreasing the rates of unplanned pregnancies, unsafe abortions, and the health risks associated with early child-bearing, high parity, and closely spaced births (Ahmed et al., 2012). Expanding access to modern contraception is key to improving women's sexual and reproductive health and ensuring women's rights and bodily autonomy. It is also critical to meeting the 2030 Agenda for Sustainable Development Goals (SDGs), which were agreed upon by all 195 United Nations member states, including India, in 2015 (Subramanian et al., 2023). While enhanced access to modern contraception would accelerate all SDGs, SDGs 3 and 5 on good health and wellbeing and gender equality refer directly to modern contraception as a goal by calling for universal access to sexual and reproductive health and reproductive rights (Starbird et al., 2016). A recent study found that India is off target in meeting its goal of universal coverage of modern contraception, and even revealed worsening trends in some districts between 2016 and 2019 (Subramanian et al., 2023).

This study will examine the impact of India's community-based scheme for enhancing demand and access to modern contraception since it is a central aspect of the government's strategy to achieve universal health coverage for sexual and reproductive health services by 2030 (Muttreja & Singh, 2018). Despite being the first country in the world to establish a national family planning programme in 1956, India is currently the most populous country in the world, and at the current rate of progress will achieve universal coverage of modern contraception by 2046 only (Subramanian et al., 2023). While the programme initially focused on population control and set strict targets for the uptake of modern methods, particularly female sterilisation, today the Government of India has adopted a target-free approach focusing on the voluntary uptake of modern methods and enhancing the 'basket of choice' of different methods for women (Pandey, 2018).

A central part of the family planning policy to enhance access to contraception is India's all-women cadre of community health workers known as Accredited Social Health Activists (ASHAs) (Agarwal et al., 2019). ASHAs are tasked with mobilising, counselling, and supporting women in the community on reproductive, maternal and child health, including generating demand for family planning services. Launched in 2006 under the National Rural Health Mission (NRHM), the programme aims to connect marginalised communities to the formal health system and operates as a volunteer-based programme with performance-based compensation for facilitating maternal health service utilisation (Agarwal et al., 2019). ASHAs are the first point of contact for communities in hard-to-reach urban and rural areas to access quality-assured family planning information and services. Today, around 1.4 million ASHAs are active and distributing contraceptives at home to women, at a ratio of about 1 ASHA to every 1000 population across the nation, making it one of the largest nationally implemented community-based health programmes in the world (Scott et al., 2019).

Despite the importance and scope of the programme, few studies have investigated the effectiveness of ASHAs in promoting the adoption of modern contraception at the national level. Previous studies have been limited to specific states (Dehingia et al., 2019), examined add-on interventions for frontline workers instead of the routine ASHA programme (Diamond-Smith et al., 2020; Sebastian et al., 2012; Subramanian et al., 2018), or examined other outcomes such as intention to use family planning (Kumar et al., 2020), or quality and timing of family planning advice (Dey et al., 2021; Yadav & Dhillon, 2015). Since the ASHAs are a core component of the government's strategy to generate demand for family planning and strengthen access to information and services for all girls and women, it is important to assess the impact of the programme on the uptake of modern contraception. Given the size of the programme, its assessment also has relevance for other countries investing in similar community health worker programmes, such as Brazil, Bangladesh, Iran, Rwanda, Zambia, and many others (Perry et al., 2017).

The aim of this study was therefore to examine the effect of recent contact with an ASHA worker on the uptake of modern contraception by women in India. For this aim, we focused only on women of reproductive age who want to avoid or delay pregnancy at the time of the ASHA

visit/contact. To isolate the impact of the programme, the study accounted for regional variability using multilevel analysis and controlled for sociodemographic factors that have previously been established as determinants of family planning (Kumar et al., 2020). The multilevel modelling technique employed allowed us to explicitly account for the hierarchical nature of the dataset used and to control for unmodelled regional or community-level factors that could influence the outcome.

Methodology

Data

This cross-sectional study was conducted using secondary data from the 5th round of the National Family Health Survey (NFHS-5) collected in 2019–2021 in India through the Demographic Health Survey (DHS) programme. The DHS are nationally representative household surveys, carried out every five years, that provide indicators in the areas of population, health, and nutrition in 90 low and middle-income countries, including indicators on maternal and child health outcomes. The NFHS-5 was designed to provide information for the 707 districts, 28 States and 8 Union Territories of India. Accordingly, it employed a stratified two-stage cluster sampling design where households were selected for interviewing from Primary Sampling Units (PSUs). PSUs were villages in rural areas and Census Enumeration Blocks in urban areas. Each PSU had approximately 100–150 households. Fieldwork for the NFHS-5 was conducted in two phases and covered information from 30,198 PSUs and 636,699 households throughout the country. Data for this study were derived from the Women's Questionnaire, which collected information from 724,115 eligible women aged 15–49 and covers all information relevant to this study. Interviewed women provided self-reported information on demographics, reproductive history, and modern contraceptive use, among other details. More information on the sampling procedure, data quality, and weight computation can be found in the NFHS-5 report (IIPS & ICF, 2021).

Since the study used secondary data, no ethical clearance was required. Data collection for the NFHS-5 received prior ethical clearance from the Institutional Review Board of ICF International and from the Government of India. The data is publicly available from the DHS website, and permission to utilise it was obtained by the first author from the DHS programme.

Study population

The target population was women of reproductive age who are fecund, have had sexual intercourse[1], are not currently pregnant, and report that they either do not want more children or wish to delay pregnancy for at least two years. Since the study examines regional variation, the final sample only included women who were permanent residents of the household where the interview took place. To examine the impact of contact with an ASHA worker, the analytic sample only included women who started using their current method 4 months prior to the interview date at the earliest. The NFHS-5 asks women if they met an ASHA worker anytime in the past 3 months since the date of the interview. Since the data relies on women's recall of when they met an ASHA or started using the contraceptive method, we extended the range by 1 month to stay conservative and avoid recall bias. Therefore, in the final analytical sample, the difference between the interview date and current method use is not larger than 4 months. The final sample included 185,427 women nested in 29,278 primary sampling units (PSUs).

Measures

Outcome measure

The outcome was whether a woman is a current user of modern contraception and who started the current method not before 4 months prior to the interview date. This variable was derived from a

question in the NFHS-5 that asked women which type of contraception they were using at the time of the survey. Modern contraceptive methods were defined according to the traditional/modern classification agreed upon by the WHO (Festin et al., 2016). A binary variable was created from this data, where users of modern methods (female or male sterilisation, intrauterine devices, injectables, oral contraceptive pill, female or male condom, diaphragm, foam/jelly, standard days method, lactational amenorrhoea) were coded as 1, and users of traditional methods (rhythm/calendar method and withdrawal) and non-users were coded as 0.

Predictor

The main predictor was contact with an ASHA worker, defined as having met an ASHA worker anywhere in the past 3 months.

Control variables

The study controlled for the following established determinants of modern contraceptive use in India: age (15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49), education (no education, primary, secondary, higher), marital status (never married, married, widowed/separated), current number of children (0, 1, 2, 3, 4, 5, 6 or more), ideal number of children (0, 1, 2, 3, 4, 5, 6 or more), having a living son (yes/no), religion (Hindu, Muslim, Christian, other), caste (scheduled caste, scheduled tribe, OBC, none of them, don't know), household wealth index in quintiles (poorest, poorer, middle, richer, richest), and exposure to media encouraging family planning (heard about FP on radio, TV, newspaper, magazine, or wall painting in the last few months).

Statistical analysis

We started with descriptive analyses of the socio-demographic profile of the sample and associations between all predictor and control variables with the outcome variable. Next, we conducted a multilevel logistic regression analysis to assess factors associated with modern contraceptive use and the effect of contact with an ASHA worker on the uptake of modern contraception. In all analyses, we considered the complex sample design and survey weights to account for differences in selection probability within each stratum and obtain population-representative estimates. Data management and descriptive analysis were performed using R version 4.0.2 and the 'survey' package was used to account for the sampling weights and clustering (Lumley, 2010). Rather than creating a subset of the sample for analysis, we ran the models using a subpopulation, meaning that only the cases defined by the subpopulation are used in the calculation of the estimate, but all cases are used in the calculation of the standard errors, which produces more accurate errors. Given the hierarchical nature of the dataset and the research questions, we then estimated multilevel logistic regression models to allow for correlation between current contraceptive use of women living within the same community, and to explore the extent of this variation across communities. Multilevel logistic regression was performed using MPlus version 8.7. The two-level model in this study implies that women (level-1) were nested within PSUs (level-2). PSUs were considered as random effects in the model to cater to the unexplained variability at the community level. The model was specified as follows:

$$logit(p_{ij}) = \beta_0 + \beta_{1xij} + u_j \quad (1)$$

Here, p_{ij} represents the probability of the outcome for the i-th individual in the j-th community. The logit function transforms the probability into log-odds. The model includes a fixed intercept β_0 and a fixed coefficient β_1 for the covariate vector x_{ij}, capturing the association between individual-level characteristics and the log-odds of the outcome. Additionally, the model incorporates a random intercept u_j at the community level, allowing for community-specific variations in the baseline log-odds.

Three multilevel models were fitted to the data to answer the research questions. The first model, without any explanatory variables, represents the total variance in modern contraceptive use at the community level (i.e. the PSU-level random effect). We ran this model to test for significant level-2 variation and confirm the need for a multilevel model. This model was also used to identify significant clustering of the outcome at the community level, i.e. to explore the extent to which the outcome varies between communities. This reflects community-level influences on the outcome due to factors that are not in the model. The variance partition coefficient (VPC) was used to quantify the proportion of total variance in the outcome that can be attributed to between-group variation. Next, a baseline model was built which included fixed effects of the level-1 control variables. Afterwards, the final model added the effect of contact with an ASHA worker at the individual level to examine this association after controlling for all socio-demographic characteristics. Model comparison and goodness-of-fit were assessed using Akaike's Information Criterion (AIC), with lower values representing better model fit. Model progression significantly improved model fit, indicated by the decreasing AIC, such that the final model was the best fit to the data (see Table 3). Odds ratios (ORs) and associated 95% confidence intervals (CIs) of the estimates of the main predictor and control variables are presented for the final model. These ORs are conditional ORs adjusted for the effects of the control variables as well as the random between-PSU variance.

While most NFHS-5 data were collected before the COVID-19 pandemic, data collection was halted during the lockdown in India in March 2020 and continued after pandemic measures were eased. To confirm that our results are not due to sampling bias or to changes in health service provision and use during the pandemic, we also conducted the analysis using NFHS-4 data. Moreover, since most of the literature on family planning in India focuses on married women, we conducted a sensitivity analysis including married women only (instead of all sexually active women) while keeping all other exclusion criteria using NFHS-5 data to compare our results to the literature. The results of these sensitivity analyses can be found in the supplementary material.

Results

At the time of the survey, 8.8% of the women who met our inclusion criteria were users of modern contraception, compared to 56.4% among married women overall (see Table 1). Among married women overall, the most commonly used method was female sterilisation (67.2%) while this prevalence was 20.9% in the analytical sample. Moreover, the prevalence of condom use (42.2%) was higher in our analytical sample compared to female sterilisation (20.9%). These results indicate that female sterilisation might be less commonly used now relative to other modern methods compared to the past. Among those in our study sample exposed to an ASHA, 12.3% were current users of modern contraception, compared to 4.8% of those not exposed to an ASHA worker. Contact with ASHAs at the national level, however, was at a low of 28.1% (see Table 2).

Among those who were using a modern method of contraception, 63.8% were between the ages of 20-29, 71.5% had completed secondary or higher education, 97.9% were married, 66% had at least two children, 71.5% had at least one son, 80.4% were Hindu, 74.1% were from marginalised castes or tribes, and 58.3% were middle or upper class.

The final model in Table 3 presents the results of the multilevel logistic regression that examines the association between the receipt of ASHA services and the current use of modern contraception. This model was the best fit for the data, as evidenced by the reduction in the AIC compared to the null and baseline models. The VPC indicates that 45% of unexplained variation in modern contraceptive use across India is due to community-level factors. The model showed that even after adjusting for control variables, the odds of current use of modern contraception were significantly higher among women who had contact with an ASHA worker compared to those who did not. After accounting for regional variability, women who had contact with ASHAs had almost twice the odds of using a modern method of contraception compared to those without contact, beyond the effects of socio-demographic characteristics (OR = 1.94, $p < .001$, 95% CI:1.83–2.06). This

Table 1. Percentage of women of reproductive age using contraception in India, NFHS-5, 2019–2021.

Method (%)	Overall sample (*N* = 724,115)	Married women (*N* = 512,408)	Study sample* (*N* = 185,427)	Study sample exposed to ASHAs* (*N* = 50,688)	Study sample not exposed to ASHAs* (*N* = 134,739)
Using any method	50.1	66.7	35.1	42.3	32.3
Using any modern method	42.7	56.4	8.8	15.6	6.1
Using a reversible modern method	13.4	18.2	6.9	12.3	4.8
Modern method users currently using:					
Pill	8.6	9.0	15.4	15.5	15.3
IUD	3.6	3.7	6.7	6.7	6.7
Injections	0.9	1.0	3.9	3.7	4.2
Diaphragm	0.01	0.01	0.01	0	0.01
Male condom	16.5	16.8	42.2	38.8	45.6
Female sterilisation	68.1	67.2	20.9	20.7	21.1
Male sterilisation	0.5	0.5	0.1	0.1	0.2
Lactational amenorrhoea	1.3	1.3	10.2	14.2	6.1
Female condom	0.1	0.1	0.2	0.1	0.2
Foam or jelly	0.0	0.01	0.0	0.01	0.0
Emergency contraception	0.1	0.1	0.3	0.2	0.4
Standard days method (SDM)	0.3	0.3	0.1	0.1	0.02

*The study sample includes women aged 15–49 who are permanent residents of the household, fecund, not currently pregnant, do not want children, have previously had sexual intercourse, and started using their current method within the previous 4 months since the time of the interview. All reported sample sizes are unweighted and the %s are weighted.

association between exposure to ASHAs and current use of modern contraception was robust to different sample specifications (e.g. $OR_{married,\ NFHS\text{-}5} = 1.95$, 95% CI: 1.84–2.07). While the magnitude of the association varied, the association was significant across all three other samples tested (see Supplementary Tables 1–3).

Discussion

Findings from this study demonstrate that the current use of modern contraception is significantly higher among women who had contact with an ASHA worker compared with those who did not, even after controlling for regional variability and various socio-demographic factors that impact uptake. While recent uptake of modern contraception among sexually active women who want to delay pregnancy and the prevalence of contact with ASHAs were both very low (9% and 28% respectively), the findings provide strong evidence that ASHAs are successful in increasing the use of modern contraception at the national level. Our findings also show that contrary to expectations, the most commonly used modern method in India based on the 4 months prior to the survey date is the male condom, followed by female sterilisation and the pill. Finally, our models showed significant community-level variation in the current use of modern contraception in India indicating strong regional or geographic factors impacting uptake.

We have provided evidence that the ASHA programme not only successfully connected marginalised communities to maternal health services such as antenatal care visits, skilled birth attendance, and facility births, as was shown in previous studies (Agarwal et al., 2019; Burger et al., 2022; Seth et al., 2017), but also helped to increase the uptake of modern contraceptives at the national level. As stated in the introduction, there are few studies that have investigated the effect of ASHA worker visits on the uptake of modern contraception, and those that do focus on specific States in India. Not only does it remain unclear whether the findings of these studies will hold across multiple geographies, but previous studies also focus on add-on educational interventions for ASHAs *in addition* to the routine government programme. All but one of these interventional studies

Table 2. Socio-demographic characteristics of the study sample stratified by current use of a modern contraceptive method, India, 2019–2021.

				Stratified by current use of modern contraception				
		N (total)	% (total)	No	%	Yes	%	*p*-value*
Exposed to ASHA	No	134,739	71.9	126,988	74.0	7,751	50.0	<.001
	Yes	50,688	28.1	43,052	26.0	7,636	50.0	
Age	15–19	7,162	4.1	6,298	3.9	864	6.4	<.001
	20–24	28,363	15.8	23,852	14.4	4,511	30.2	
	25–29	36,656	19.9	31,463	18.6	5,193	33.6	
	30–34	30,246	16.0	27,502	15.9	2,744	17.4	
	35–39	28,687	15.2	27,362	15.8	1,325	8.2	
	40–44	25,843	13.7	25,340	14.7	503	2.8	
	45–49	28,470	15.3	28,223	16.7	247	1.5	
Education	No education	53,227	28.5	50,437	29.7	2,790	17.0	<.001
	Primary	24,563	12.9	22,765	13.1	1,798	11.5	
	Secondary	85,685	45.0	77,413	44.2	8,272	52.9	
	Higher	21,952	13.5	19,425	13.0	2,527	18.6	
Marital Status	Not married	7,155	2.9	6,820	3.0	335	1.8	<.001
	Married	162,147	88.7	147,147	87.9	15,000	97.9	
	Widowed/separated	16,125	8.4	16,073	9.1	52	0.3	
Total Children	0	16,448	8.4	15,427	8.6	1,021	6.5	<.001
	1	43,812	25.1	39,748	24.9	4,064	27.5	
	2	60,793	33.1	55,089	32.7	5,704	37.3	
	3	33,485	17.2	30,730	17.2	2,755	17.2	
	4	16,802	8.8	15,648	9.0	1,154	7.3	
	5	7,802	4.1	7,370	4.2	432	2.7	
	6 or more	6,285	3.2	6,028	3.4	257	1.5	
Ideal number of children	0	7,972	4.2	7,546	4.4	426	2.9	<.001
	1	11,854	7.6	11,018	7.7	836	6.1	
	2	107,856	61.8	97,705	61.2	10,151	68.4	
	3	32,201	16.3	29,607	16.4	2,594	15.6	
	4	17,958	7.7	16,852	7.9	1,106	5.8	
	5	3,192	1.0	3,044	1.0	148	0.6	
	6 or more	2,150	0.6	2,073	0.6	77	0.3	
	missing	2,244	0.8	2,195	0.8	49	0.3	
Living Sons	None	49,648	26.9	45,275	26.8	4373.0	28.5	<.001
	At least one son	135,779	73.1	124,765	73.2	11014.0	71.5	
Religion	Hindu	131,867	78.6	120,139	78.4	11,728	80.4	<.001
	Muslim	25,922	16.1	23,725	16.2	2,197	15.7	
	Christian	17,305	2.2	16,558	2.3	747	1.3	
	Other	10,333	3.0	9,618	3.1	715	2.6	
Caste	Scheduled caste	34,199	21.2	30,950	21.1	3,249	23.0	<.001
	Scheduled tribe	38,441	9.3	35,857	9.3	2,584	8.8	
	Other Backward Caste	67,072	41.8	61,187	41.8	5,885	42.3	
	None	34,518	21.4	31,723	21.5	2,795	20.0	
	Don't know	11,197	6.3	10,323	6.3	874	5.9	
Household Wealth	Poorest	44,983	22.0	41,550	22.1	3,433	20.9	<.05
	Poorer	42,345	20.8	38,937	20.8	3,408	20.7	
	Middle	36,144	19.3	32,976	13.2	3,168	20.2	
	Richer	32,527	19.1	29,648	19.1	2,879	19.5	
	Richest	29,428	18.8	26,929	18.8	2,499	18.6	
Exposed to FP media	No	55,138	28.3	51,754	29.0	3,384	21.0	<.001
	Yes	130,289	71.7	118,286	71.0	12,003	79.0	

*The *p*-value represents the significance of a chi-square test for categorical variables and a *t*-test for cont. variables, calculated with weighted data.

(Diamond-Smith et al., 2020) reported higher odds of contraceptive use by intervention compared to control groups (Dehingia et al., 2019; Sebastian et al., 2012; Subramanian et al., 2018) thus indicating potential inadequacies in the routine programme. Our study shows the impact of the routine ASHA programme at the national level, and shows that ASHAs increase the likelihood of modern contraceptive use despite potential shortcomings in the programme. While a study by Seth et al. (2017) did not find a relationship between ASHA visits and uptake of a modern method of family

Table 3. Multilevel logistic regression models of factors associated with current use of modern contraception among women in the study sample, India, NFHS-5, 2019–2021.

	Null Model			Baseline Model			Final Model		
	OR	Lower 2.5%	Upper 2.5%	OR	Lower 2.5%	Upper 2.5%	OR	Lower 2.5%	Upper 2.5%
ASHA exposure (ref = no)							1.94***	1.83	2.06
Age (ref = 15-19)									
20–24				0.75***	0.65	0.86	0.76***	0.66	0.87
25–29				0.47***	0.41	0.54	0.50***	0.43	0.58
30–34				0.24***	0.21	0.28	0.28***	0.24	0.32
35–39				0.10***	0.09	0.12	0.13***	0.11	0.15
40–44				0.03***	0.03	0.04	0.04***	0.04	0.05
45–49				0.02***	0.01	0.02	0.02***	0.02	0.03
Education (ref = no education)									
Primary				1.17**	1.06	1.29	1.16**	1.05	1.29
Secondary				1.39***	1.28	1.50	1.36***	1.25	1.47
Higher				1.98***	1.78	2.21	1.94***	1.74	2.16
Marital status (ref = never married)									
Married				4.09***	3.24	5.16	3.94***	3.12	4.98
Widowed/separated				0.16***	0.11	0.25	0.17***	0.11	0.25
Total children (ref = 0)									
1				1.40***	1.21	1.63	1.10	0.95	1.28
2				2.45***	2.10	2.85	1.92***	1.65	2.24
3				3.59***	3.04	4.24	2.78***	2.35	3.28
4				4.63***	3.83	5.60	3.52***	2.91	4.26
5				5.67***	4.52	7.10	4.23***	3.37	5.30
6 or more				6.27***	4.86	8.09	4.63***	3.59	5.98
Ideal number of children (ref = 0)									
1				1.14	0.94	1.39	1.14	0.93	1.38
2				1.19*	1.01	1.39	1.16	0.99	1.36
3				1.12	0.94	1.33	1.07	0.90	1.28
4				1.07	0.89	1.30	1.03	0.85	1.25
5				1.05	0.76	1.45	1.01	0.73	1.41
6 or more				1.03	0.65	1.62	0.98	0.62	1.56
missing				0.58*	0.35	0.96	0.57*	0.34	0.93
Living sons (ref = none)				1.01	0.95	1.09	1.04	0.97	1.12
Religion (ref = Hindu)									
Muslim				0.95	0.86	1.04	0.94	0.85	1.03
Christian				0.64***	0.52	0.78	0.68***	0.56	0.83
Other				0.97	0.80	1.17	1.01	0.83	1.22
Caste (ref = none)									
Scheduled Caste				1.09	0.99	1.20	1.07	0.97	1.18
Scheduled Tribe				1.07	0.95	1.19	1.02	0.91	1.14
Other Backward Caste				1.00	0.92	1.09	0.98	0.91	1.07
Don’t know				1.05	0.88	1.24	1.05	0.89	1.25

Wealth (ref = poorest)									
Poorer				0.99	0.91	1.07	1.01	0.93	1.09
Middle				1.04	0.95	1.14	1.08	0.99	1.18
Richer				1.04	0.95	1.15	1.10*	1.00	1.21
Richest				1.18**	1.06	1.32	1.28***	1.15	1.43
Exposed to FP media (ref = no)				1.36***	1.27	1.46	1.30***	1.21	1.40
	Estimate	S.E.	*p*-value	Estimate	S.E.	*p*-value	Estimate	S.E.	*p*-value
Random effect (level-2 variance)	1.40	0.04	0.00	1.58	0.05	0.00	1.54	0.05	0.00
Variance partition coefficient (VPC)	35.53%			48.34%			45.40%		
Model fit statistic (AIC)	103,955			90,390			89,499		

$^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

planning, these contrary results could be explained by the increased policy focus since 2016 on the role of ASHAs in expanding access to modern contraception through the *Mission Parivar Vikas* initiative (Muttreja & Singh, 2018). Other studies conducted since then also support our findings. For example, although not directly focusing on ASHAs, a recent study showed that counselling and moral support by frontline workers is a primary influence on contraceptive uptake through the provision of information and dismantling of misconceptions about contraception (Bahuguna et al., 2023). Another study found that family planning counselling was associated with increased modern contraceptive use and reduced discontinuation in rural Uttar Pradesh (Dehingia et al., 2019). Health worker outreach for family planning has also shown positive effects on intention to use contraception nationally in India (Kumar et al., 2020). These studies suggest that the ASHA programme may also contribute to increases in modern contraceptive usage due to its focus on outreach, counselling, and education. Other countries with community health worker programmes can replicate the successful features of the ASHA programme to improve the uptake of modern contraception (Perry et al., 2017).

Given the crucial role of ASHAs in providing community-level access to modern contraception as well as other maternal and child health services, continued efforts are needed to strengthen the programme and address any limitations in reaching the target population effectively. Our results showed that women's contact with ASHA workers at the national level was limited, with most women not having contact with ASHAs at all. It is unclear based on the available data whether this limited contact was due to the absence of ASHA workers in some communities or due to lack of enough outreach by them. However, our results are in line with previous studies conducted in India which document the limited reach and family planning advice received through community health workers by women (Burger et al., 2022; Mukherjee et al., 2021; Seth et al., 2017). This could be due to operational challenges that have been reported in previous evaluations of the ASHA programme (Scott et al., 2019). These include inadequate health system support received by ASHAs and their reliance on incentive-based payments that impede job security (Bhatia, 2014). ASHAs report receiving inadequate supervision (Mishra, 2014), challenges in making referrals (Scott & Shanker, 2010), and supply-side challenges like stockouts and delayed contraceptive supplies delivery to women (Basu et al., 2017). Such challenges are also reported by community health workers in other low and middle-income countries (Desta et al., 2017; Stekelenburg et al., 2003). It is imperative to tackle these challenges at the programme level to enhance the sustainability and efficacy of the programme (Burger et al., 2022). This could include providing supplementary family planning training for ASHAs, ensuring supportive supervision, recognising and rewarding well-performing ASHAs, releasing timely payments to ASHAs, and ensuring timely availability of the range of contraceptive supplies. ASHAs are the primary point of contact for communities with the health system and more efforts are needed to scale the programme. Their crucial role in increasing access to modern contraception is not only a fundamental aspect of women's sexual and reproductive health and rights, but would help the government target multiple SDG goals at once, including decreasing maternal mortality (SDG target 3.1), achieving gender equality and empowering all women and girls (SDG target 5.6), and achieving universal health coverage for sexual and reproductive health, including family planning (SDG target 3.7)(Subramanian et al., 2023).

Since the family planning policy aims to increase both modern contraceptive use and method choice for women, we estimated the prevalence of all modern methods and reversible modern methods among the study sample. Firstly, we found a strikingly lower prevalence of all modern methods among the study sample compared to the prevalence among married women in the official NFHS-5 report (9% vs. 56%) (International Institute for Population Sciences (IIPS) & ICF, 2021). This can be explained by our inclusion criteria where we restricted the sample to those who started using their current modern method within the past 4 months of the survey. This means that while the modern contraceptive prevalence rate is 56% among married women nationally, as per the NFHS-5 report, uptake among eligible women in the past 4 months is low, and the higher national prevalence is due to the inclusion of the cumulative percentage of female

sterilisation acceptors. Secondly, the most common modern method used among all modern method users in our study sample was the male condom and not female sterilisation. Therefore, while previous studies have shown the concerning dominance of female sterilisation in India (Ewerling et al., 2021; Oliveira et al., 2014), which comprises three-quarters of modern method users, our results provide preliminary evidence that the share of users of female sterilisation in India could be decreasing. This is despite the fact that ASHAs receive lower financial incentives for the promotion of reversible contraceptive methods compared to female sterilisation (Kumar et al., 2020). However, a more thorough trends analysis is needed to provide conclusive evidence of the decrease in the share of female sterilisation acceptors relative to other modern methods. Moreover, our analysis does not show the link between contact with ASHAs and the type of method chosen by women. Future research could investigate the role of ASHAs in promoting and facilitating contraceptive choice and method mix, and the interplay of their own preferences and the incentive system in their health promotion activities. This would aid the government in making tailored interventions for increasing the prevalence of reversible methods and method choices for women.

It is also worth noting that the share of users of reversible methods was extremely low (7%) and the majority of contraceptive users were actually relying on traditional methods (26%). This is in line with recent research which has shown that the share of traditional method users in India is increasing (Namasivayam et al., 2023). It is unclear based on the results of the current study whether the low uptake of reversible modern methods is due to supply-side barriers, such as lack of available method choice for women and inability to procure needed methods, or due to demand-side barriers such as preference for traditional methods or low perceived need for modern contraception (Mukherjee et al., 2021). However, the supply-side situation can be improved by improving the supply chain and financial investments in reversible methods, which currently take only 1.45% of the governmental budget for family planning, compared to 85% towards female sterilisation (Muttreja & Singh, 2018). Providing women with method choice is a core component of rights-based family planning programmes, and non-use of reversible methods could indicate indirect coercion of women to use specific methods (either through unavailability of the method or biased counselling by providers) (Senderowicz, 2019; Unnithan, 2022). Future research could also explore the characteristics of women who prefer modern versus traditional methods to tailor interventions differently to these groups.

These results have important theoretical and practical implications for community health worker programming. Firstly, the significant association between contact with ASHA workers and an increased likelihood of current modern contraceptive use underscores the pivotal role of community health workers in promoting reproductive health. This finding highlights the effectiveness of grassroots-level interventions, positioning ASHA workers as key agents for fostering positive health behaviours. Given the considerable impact of ASHAs on the uptake of modern contraception and sexual and reproductive health services in general, scaling the programme is crucial. However, understanding the low exposure of women to ASHA workers nationally is imperative. The revelation that very few women across the nation have contact with ASHA workers points to a potential gap in the reach of the programmes. Exploring the barriers to exposure can guide targeted efforts, enhancing outreach and engagement with ASHA workers and ensuring broader access to essential reproductive health services.

Secondly, the observed regional variation in the current use of modern contraception necessitates exploration to unpack community-level factors influencing uptake. Future research should delve into these factors and their potential interaction with the impact of ASHA workers. For instance, it may be that the influence of ASHAs interacts with health system factors, such as expenditure on family planning programmes and supply chain management in different districts.

Finally, the finding that the male condom is the most commonly used modern contraceptive method points to a potentially shifting landscape in contraceptive practices, where female sterilisation used to be the dominant method (Oliveira et al., 2014). This discovery warrants further

investigation into evolving socio-cultural dynamics, gender roles, and awareness campaigns influencing contraceptive choices in India. Additionally, exploring supply and demand-side factors impacting method use in different regions can provide a more comprehensive understanding of the changing contraceptive landscape. Despite the strengths of this study, the findings need to be interpreted with caution. The study was cross-sectional, and the tested models remain descriptive rather than causal or predictive. A major limitation is the lack of experimental design which means that it was difficult to separate the effect of ASHAs from potential influences from other health workers. While this study focused on ASHAs, India's community health workforce involves other cadres including Auxiliary Nurse Midwives and Anganwadi workers who have distinct but complementary responsibilities (Burger et al., 2022). It is possible that women in our study sample also had contact with these health workers. The non-experimental design also means that unobserved factors could be associated with tthe uptake of modern contraception. However, we (partly) account for this by controlling for most determinants of contraceptive use in India reported in the literature, and by applying a multilevel model which controls for community-level similarities between women. Moreover, evaluations of community health worker programmes using randomised trials have often failed to replicate in real-world settings (Agarwal et al., 2019), therefore this design might provide a better picture of effectiveness. Additionally, the question about ASHA visits referred to the previous 3 months without specifying if this was the first-ever ASHA visit, while the target population was women who started their current method use within 4 months prior to the interview date. Therefore, the effect of ASHA visits might be biased (i.e. overestimated or underestimated) based on these measurement limitations. The quality of the ASHA service was not evaluated in this study and could be playing a role in women's response to the programme. This study assumed that the ASHA impact is through contact with women, but research has shown that the quality of visits is also important (Dehingia et al., 2019). Women's attitudes towards and acceptance of ASHAs might also play a role in women's response to the programme. However, while it is important to assess community attitudes towards ASHA workers in future research, the current study measures actual behaviour change after contact with an ASHA worker and thus circumvents the intention-behaviour gap in health promotion research (Jain et al., 2021; Rhodes & de Bruijn, 2013). Due to limitations in data availability, we were not able to assess the quality of visits and attitudes towards ASHAs in this study. Finally, the method used in this study assumed that the ASHA effect is fixed across communities. However, while the ASHA programme is implemented fairly uniformly across India, their characteristics, as well as the health system and wider socio-economic context where they are active varies. As such, future research could explore whether the effect of ASHAs also varies across contexts. Despite these limitations and their associated scope for future research, our study is among the first to show the impact of recent contact with ASHA workers on the uptake of modern contraception by women who wish to avoid or delay pregnancy in India.

Conclusion

Increasing access to modern contraception is a core component of universal health coverage and is essential in meeting Sustainable Development Goals by 2030. United Nations Health Agencies, including the WHO, have highlighted the importance of optimising community health worker programmes and integrating family planning services into such programming (Cometto et al., 2018; World Health Organization, 2018). Our results show an encouraging picture of the ASHA programme in increasing the uptake of modern contraceptive methods in India. However, we found that exposure to the programme and uptake of modern methods, especially reversible methods, are both low at the national level. We recommend investing in scaling the programme to enhance the reach of ASHAs and devising strategies to support, retain, and compensate ASHAs to enhance their effectiveness. Finally, we recommend increased investment in the promotion of reversible methods to provide method choice for women and achieve universal access to all methods.

Note

1. Women who reported that they have never had sexual intercourse were filtered out.

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Data availability statement

The data that support the findings of this study are available from the DHS programme after submitting an application at https://dhsprogram.com/.

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