



# Revisiting Post-Sterilization Regret in India

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## Abstract

**Aim** This study analyses the socio-demographic characteristics associated with post-sterilization regret.

**Study Design** The study uses cross-sectional data from the fourth round of National Family Health Surveys (2015–2016).

**Methods** Simple bivariate and binary logistic regressions analyses were used.

**Results** Research shows that 7% of women aged 15–49 reported sterilization regret, which increased by 2% from 2005 to 2016. It was found that factors significantly associated with sterilization regret were years since sterilization, child loss experience, regions of residence, and quality of services. Women who got sterilized at the age of 30 or more were more likely to express regret, than women who were sterilised before 25 years of age, when adjusted for confounding variables (aO.R.= 1.006). Women having sons were less likely to report sterilization regret than women who had only daughters (aO.R.=1.3 for each) but on the contrary women having both son and daughter were significantly less likely to express regret in comparison with women having only sons (aO.R. = 0.8 for each. Women who had experienced child loss had higher odds of reporting sterilization regret in rural (aO.R.=1.2) as well as in urban (aO.R. = 1.3) areas respectively, compared to those who did not experience any child loss.

**Conclusion** Women need to be counselled about the permanent nature of sterilization in order to avoid future regret as sterilization is largely dominated by socio-economic conditions. Thus, couples' decision-making towards using the contraceptive from the basket of choice would help in uplifting the social and cultural status of women in conservative societies and will have a positive effect on contraceptive use. In addition, efforts should be made to educate both the partners equally about contraceptive methods that have higher efficiency. Further, there is also a need to improve the quality of services, both in terms of counselling and service provision. Lastly, health-related policies should tackle disparities in the empowerment, and economic status of women that would result in decreased post-sterilization regret, and will improve sexual relationships following sterilization.

**Keywords** Sterilization · Regret · National Family Health Survey · Regressions analysis

## Introduction

Female sterilization (FS) is the most widely utilized contraceptive method in the world. Globally, out of 661 million couples of reproductive age who were utilizing any modern

contraceptive method during the last decade, 223 million were utilizing FS alone [1]. Since sterilization is a permanent contraceptive method, any decision regarding sterilization ought to be made after careful thought and in the wake of having been educated/informed about its irreversibility as many women suffer from regret after sterilization because they later desire to have more children. Countries like the USA, Iran, and Brazil where acceptance of FS has been high have noticed that 10% of sterilized women who have undergone sterilization procedure experienced some degree of regret [2, 3]. Most of the studies regarding sterilization regret have been carried out in developed countries (FS is commonly performed in developing countries) or in countries where FS is not the dominant family planning (FP) method. Studies have found that among sterilization acceptors, women who adopted sterilization at an early age, i.e.

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under 30 years of age, women who are not participating in the labour force, women who have not completed high school education, experienced child loss, and had fewer number of living children; particularly women who only had girl children were significantly more likely to regret sterilization [7–13].

The FP program in India generally focused heavily on promoting permanent methods in view of the need to control rapid population growth and widespread poverty after the late 1970s [4–6]. Thus, there is a need to enhance the quality of sterilization counselling, as a higher extent of younger women with fewer children and women who had undergone sterilization operation before using any other method of contraception tend to regret being sterilized and only a small percentage of women ask for reversal of sterilization. Given this context, the objective of the present study was to revisit and examine post-sterilization regret among the socially and economically disadvantaged groups among women in India.

## Methods

Data for this study was drawn from the fourth round of the National Family Health Survey (NFHS-4) conducted during 2015–2016. It provides data of 601,509 households, 103,525 men, and 699,686 women who were successfully interviewed. The multistage stratified sampling design was adopted, and the 2011 Census served as the sampling frame for the selection of Primary Sampling Units (PSUs) for rural and urban areas. Villages in rural areas and Census Enumeration Blocks (CEBs) for urban areas were selected as PSUs from the sampling frame in the survey. Probability proportional to size (PPS) sampling was used to select the final sample PSUs. The detailed sampling technique adopted by the survey has been described elsewhere (Microdata World Bank 2018).

## Variables Description

The outcome variable of interest is all sterilized women were asked “Do you regret that you had undergone sterilization?”, the response was coded into “yes (1)” if there is regret post-sterilization or “no (0)” if there is no regret after sterilization. The predictor’s variables include the age at sterilization, years since sterilization, women’s education, women’s working status, parity at sterilization, caste, religion, wealth quintiles, place of residence. Indian states grouped into six regions namely: North, Central, East, North-east, West, and South—to account for geographic variance in fertility levels. In India, son preference is an important predictor of contraceptive use and fertility. Thus, sex composition of children, experience of child loss, woman informed that she cannot

have more children after sterilization (no, yes), rate of care (bad, all right, good), and compensation received (yes, no) were considered in the analysis.

## Statistical Analysis

Simple bivariate and binary logistic regression analyses were used to estimate the adjusted effects of the independent variables on post-sterilization regret using STATA version 14.2 software.

## Results

In India, nearly 7% of the sterilized women aged 15–49 reported sterilization regret in rural as well as urban areas (Table 1). The level of regret was highest in Jammu and Kashmir (14%) in North, Tamil Nadu (12%) in South, Jharkhand (8.4%) in East, Gujarat (7.4%) in West, and Chhattisgarh (7%) in Central. The lowest level of sterilization regret was found in Himachal Pradesh (3%). Among the smaller North-eastern states and UTs, sterilization regret was between 1 and 25% (Table 1).

Table 2 shows the percentage distribution of sterilization regret which varied significantly affected by factors such as age at sterilization, years since sterilization, sex composition of children, the experience of child loss, and region of residence including rural or urban region. Variables like age at sterilization, years since sterilization, and experience of child loss did not show a significant effect in urban areas. Overall sterilization regret did not vary by place of residence, though it varied across different regions of residence. Other variables like women’s education, parity at sterilization, caste, and wealth status were found to be significantly associated with sterilization regret, respectively. The woman who was informed that she could not have more children after sterilization, the quality of care, and the compensation received by them were significantly associated with sterilization regret.

Tables 3 and 4 show unadjusted and adjusted odds ratio identifying associations between sterilization regret and selected characteristics. Women who got sterilized at age 30 or older had higher odds of reporting sterilization regret when adjusted for other confounding variables as compared to women who had been sterilized before age 25 (aO.R = 1.006) (Table 4), while odds are lower when not adjusted for confounding variables (Table 3). Women number of years since sterilization positively associated with sterilization regret in both the situations when unadjusted and adjusted for confounding factors as shown in Tables 3 and 4, respectively (overall odds are significant in urban as well as in rural areas). Women sterilized 2–5, 6–10, and > 10 years before the survey were more likely

**Table 1** Percentage of sterilized women aged 15–49 reporting sterilization regret, by geographic region, NFHS-4 (2015–2016)

States (total no. of women)	Total (%)	States (total no. of women)	Total (%)	States (total no. of women)	Total (%)
<i>North</i>		<i>South</i>		<i>West</i>	
Jammu and Kashmir (901)	14.33	Andhra Pradesh (14,813)	7.25	Gujarat (7301)	7.46
Himachal Pradesh (883)	2.61	Karnataka (11364)	8.49	Maharashtra (22,482)	3.7
Punjab (3586)	3.58	Kerala (5759)	8.73	<i>Union territory's (UTs)</i>	
Uttarakhand (989)	5.09	Tamil Nadu (16,904)	11.52	Andaman and Nicobar (57)	5.64
Haryana (3956)	5.91	Telangana (8421)	4.63	Chandigarh (72)	3.59
Rajasthan (9757)	5.45	<i>North-east</i>		Dadra and Nagar Haveli (36)	6.6
Central		Assam (1061)	4.87	Daman and Diu (15)	4.55
Chhattisgarh (4713)	7.16	Arunachal Pradesh (42)	16.6	Goa (84)	1.25
Uttar Pradesh (10,780)	6.84	Manipur (22)	16.34	Lakshadweep (3)	26.76
Madhya Pradesh (12,145)	6.7	Meghalaya (53)	4.95	Delhi (1271)	5.32
<i>East</i>		Mizoram (52)	14.6	Puducherry (296)	12.02
Jharkhand (3573)	8.42	Nagaland (39)	10.49		
Orissa (4470)	6.64	Sikkim (31)	6.68		
Bihar (7828)	5.32	Tripura (205)	1.94		
West Bengal (11,331)	8.31			All India (165,292)	6.89

than recently sterilized women to report regret (aO.R = 1.1 for each in Table 4). Sex composition of children was independently associated with sterilization regret in both the cases when unadjusted and adjusted for confounding factors (Tables 3, 4). Women with single daughters were more likely to report sterilization regret (aO.R = 1.3 for each) than women having only sons. Women having both sons and daughters were significantly less likely to experience regret than women who had only sons (aO.R = 0.8 for each). The odds of reporting sterilization regret among women who had experienced one or two or more child losses were 1.2 in rural areas and 1.3 in urban areas times, respectively, compared to those women who did not experience any child losses (Table 4). Compared with women residing in the North region, those residing in the South, Central, and East regions were more likely to experience regret (aO.R = 1.1 for each). North-east region had more odds of reporting sterilization regret than in the North region (aO.R = 1.41; aO.R = 1.3 in rural; and aO.R = 1.6 in urban). Women with higher parity are less likely to regret both in rural as well as urban areas. Women who were educated that they could not have more kids after sterilization were more likely to regret compared to women who were not informed. Our analysis shows that women who reported bad quality of care are regretting more about their decision of sterilization compared to women who had good quality of care. We also found that women who received compensation after sterilization are less likely to regret than women who did not receive it.

Among women who had undergone sterilization in less than or equal to 5 years or greater than equal to 6 years preceding the survey, the odds of sterilization regret were higher for those who had only daughters than for those

having only sons (Table 5). However, for those sterilized five or less years and six or more years earlier, the odds of sterilization regret were significantly lower for women having both sons and daughters than for women having only sons (aO.R = 0.8). Sterilization regret was associated with child loss and region of residence regardless of the length of time since sterilization (Table 5).

## Discussion

Overall, 7% of women have post-sterilization regret, which has increased 2% [10] from 2005–2006 to 2015–2016, thus affecting the quality of care of women. Our study showed significant interstate and interregional variations; and the major factors associated with this regret are the age at sterilization, years since sterilization sex composition of children, the experience of child loss, and region of residence. Findings also revealed that the odds of women reporting sterilization regret who had been sterilized at age 30 or older are lower as compared to women who had been sterilized before age 25 and the finding endorsed by other studies as well [7]. The study confirms that post-sterilization regret in India is likely to increase with a decrease in age at sterilization. Findings suggest that for women who had undergone sterilization, and had only daughters, the odds of experiencing regret were higher as compared to those having only sons. Moreover, the odds of reporting post-sterilization regret among women who had undergone the procedure six or more years earlier were less likely to report regret among those who had both sons and daughters as compared with those who had only sons and the findings are consistent with

**Table 2** Percentage of women reporting sterilization regret, by selected characteristics, NFHS-4 (2015–2016)

Background variables	Total (%)	Rural (%)	Urban (%)	Total number of women
<i>Age at sterilization</i>	Pr=0.001	Pr=0.001	Pr=0.454	
<25	7.39	7.49	7.19	71,484
25–29	6.59	6.54	6.69	58,152
>30	6.38	6.21	6.73	35,656
<i>Years since sterilization</i>	Pr=0.012	Pr=0.048	Pr=0.188	
<2	6.47	6.34	6.82	14,657
2–5	6.97	7.02	6.84	32,372
6–10	7.19	7.31	6.95	32,219
>10	6.82	6.76	6.93	86,044
<i>Sex composition of children</i>	<i>p</i> =0.000	<i>p</i> =0.000	<i>p</i> =0.000	
Only sons	8.2	8.19	8.2	39,532
Only daughters	10.87	9.42	12.05	12,768
Both sons and daughters	5.99	6.03	5.97	112,992
<i>Experience of child loss</i>	Pr=0.002	Pr=0.001	Pr=0.149	
No loss	6.8	6.83	6.76	139,814
1 loss	7.59	7.32	8.43	22,012
>2 losses	6.55	6.25	7.67	3466
<i>Region of residence</i>	Pr=0.000	Pr=0.000	Pr=0.000	
North	5.46	5.27	6.01	35,261
Central	6.83	6.64	7.46	40,418
East	7.19	7.34	6.61	26,584
North-east	5.48	5.11	6.84	6777
West	4.62	5.28	3.67	18,362
South	8.52	8.35	8.76	33,907
UTs	6.21	10.17	5.77	3983
<b>Control variables</b>				
<i>Woman's education</i>	Pr=0.000	Pr=0.045	Pr=0.000	
None	6.57	6.93	6.87	71,237
Primary	6.8	6.7	7.61	28,591
Secondary	7.26	7.28	8.35	58,600
Higher	6.98	6.98	7.84	6864
<i>Woman's work status</i>	Pr=0.189	Pr=0.440	Pr=0.113	
Not working	6.71	6.73	6.67	17,193
Working	6.91	6.9	6.94	148,099
<i>Parity at sterilization</i>	Pr=0.000	Pr=0.000	Pr=0.000	
0	6.82	1.97	31.35	46
1	7.75	7.87	7.58	66,374
2–3	6.44	6.62	6.06	50,674
>4	5.78	5.67	6.12	48,198
<i>Caste</i>	Pr=0.002	Pr=0.006	Pr=0.00	
Scheduled castes	6.86	6.87	6.84	34,020
Scheduled tribes	6.66	6.68	6.59	23,182
Other backward classes	7.06	6.88	7.38	72,060
Other	6.69	7.01	6.27	36,030
<i>Religion</i>	Pr=0.000	Pr=0.000	Pr=0.000	
Hindu	6.81	6.86	6.7	141,068
Muslim	8.59	8.74	8.46	11,230
Other	5.96	5.59	6.58	12,994
<i>Wealth quintiles</i>	<i>p</i> =0.005	<i>p</i> =0.018	Pr=0.209	

**Table 2** (continued)

Background variables	Total (%)	Rural (%)	Urban (%)	Total number of women
Poorest	6.53	6.5	7.15	29,247
Poorer	7.05	6.95	7.86	35,251
Middle	7.01	6.99	7.08	37,203
Richer	7.11	7.25	6.97	34,566
Richest	6.6	6.48	6.65	29,025
<i>Place of residence</i>				
Rural	6.88	–	–	55,365
Urban	6.91	–	–	109,926
<i>Woman informed that she cannot have more children after sterilization</i>	Pr=0.000	Pr=0.000	Pr=0.000	
No	5.21	5.37	4.86	34,761
Yes	7.33	7.29	7.41	130,531
<i>Quality of care</i>	Pr=0.000	Pr=0.000	Pr=0.000	
Very good	7.76	7.79	7.71	78,913
All right	5.57	5.68	5.32	79,402
Not so good/bad	10.89	9.95	13.23	6977
<i>Compensation received</i>	Pr=0.000	Pr=0.020	Pr=0.000	
No	7.16	7.33	6.92	59,568
Yes	6.73	6.66	6.91	105,734

**Table 3** Unadjusted odds ratios from logistic regressions identifying associations between sterilization regret and selected characteristics after controlling for other variables, NFHS-4 (2015–2016)

Background variables	Total [95% CI]	Rural [95% CI]	Urban [95% CI]
<i>Age at sterilization</i>			
< 25 (ref)	1.00	1.00	1.00
25–29	0.981 [0.939,1.025]	0.967 [0.917,1.019]	1.01 [0.932,1.095]
> 30	0.981 [0.932,1.032]	0.979 [0.922,1.040]	0.975 [0.886,1.072]
<i>Years since sterilization</i>			
< 2 (ref)	1.00	1.00	1.00
2–5	1.110** [1.030,1.198]	1.107* [1.014,1.207]	1.125 [0.967,1.308]
6–10	1.108** [1.027,1.195]	1.112* [1.018,1.213]	1.101 [0.948,1.279]
> 10	1.033 [0.963,1.107]	1.032 [0.952,1.119]	1.03 [0.897,1.182]
<i>Sex composition of children</i>			
Only sons (ref)	1.00	1.00	1.00
Only daughters	1.302*** [1.208,1.404]	1.410*** [1.283,1.550]	1.126 [0.994,1.277]
Both sons and daughters	0.773*** [0.740,0.807]	0.789*** [0.749,0.832]	0.737*** [0.681,0.799]
<i>Experience of child loss</i>			
No loss (ref)	1.00	1.00	1.00
1 loss	1.127*** [1.067,1.190]	1.135*** [1.067,1.208]	1.113 [0.994,1.248]
> 2 losses	1.025 [0.898,1.171]	0.963 [0.827,1.121]	1.307 [0.992,1.721]
<i>Region of residence</i>			
North (ref)	1.00	1.00	1.00
Central	1.156*** [1.090,1.226]	1.180*** [1.103,1.263]	1.088 [0.968,1.222]
East	1.157*** [1.085,1.234]	1.220*** [1.134,1.313]	0.962 [0.837,1.105]
North-east	1.544*** [1.405,1.696]	1.386*** [1.235,1.555]	1.904*** [1.614,2.246]
West	0.878** [0.813,0.949]	0.976 [0.892,1.069]	0.660*** [0.567,0.769]
South	1.446*** [1.363,1.534]	1.439*** [1.340,1.546]	1.394*** [1.252,1.552]
UTs	1.782*** [1.596,1.989]	1.505*** [1.241,1.825]	1.781*** [1.536,2.065]

*p* < 0.001\*\*\* significant at 95% CI

**Table 4** Adjusted odds ratios from logistic regressions identifying associations between sterilization regret and selected characteristics, NFHS-4 (2015–2016)

Background variables	Total [95% CI]	Rural [95% CI]	Urban [95% CI]
<i>Age at sterilization</i>			
<25 (ref)	1.00	1.00	1.00
25–29	0.997 [0.953,1.043]	0.985 [0.933,1.039]	1.029 [0.948,1.118]
>30	1.006 [0.953,1.062]	1.005 [0.942,1.072]	1.007 [0.911,1.112]
<i>Years since sterilization</i>			
<2 (ref)	1.00	1.00	1.00
2–5	1.118** [1.036,1.206]	1.110* [1.017,1.212]	1.14 [0.980,1.327]
6–10	1.124** [1.041,1.213]	1.119* [1.024,1.222]	1.135 [0.977,1.320]
>10	1.063 [0.989,1.142]	1.038 [0.955,1.129]	1.117 [0.970,1.286]
<i>Sex composition of children</i>			
Only sons (ref)	1.00	1.00	1.00
Only daughters	1.286*** [1.192,1.387]	1.396*** [1.270,1.535]	1.117 [0.984,1.266]
Both sons and daughters	0.806*** [0.769,0.846]	0.827*** [0.781,0.875]	0.761*** [0.698,0.829]
<i>Experience of child loss</i>			
No loss (ref)	1.00	1.00	1.00
1 loss	1.215*** [1.145,1.289]	1.223*** [1.143,1.309]	1.185** [1.048,1.340]
>2 losses	1.135 [0.989,1.303]	1.073 [0.917,1.256]	1.371* [1.029,1.827]
<i>Region of residence</i>			
North (ref)	1.00	1.00	1.00
Central	1.188*** [1.116,1.265]	1.256*** [1.166,1.352]	1.059 [0.939,1.196]
East	1.120** [1.045,1.200]	1.207*** [1.115,1.307]	0.893 [0.772,1.033]
North-east	1.411*** [1.273,1.564]	1.321*** [1.166,1.496]	1.551*** [1.279,1.881]
West	0.825*** [0.762,0.894]	0.953 [0.867,1.046]	0.595*** [0.510,0.695]
South	1.367*** [1.284,1.456]	1.423*** [1.320,1.534]	1.230*** [1.096,1.380]
UTs	1.641*** [1.465,1.837]	1.435*** [1.182,1.743]	1.633*** [1.403,1.902]
<b>Control variables</b>			
<i>Woman's education</i>			
None (ref)	1.00	1.00	1.00
Primary	0.964 [0.912,1.020]	0.930* [0.872,0.992]	1.105 [0.984,1.242]
Secondary	1.022 [0.972,1.074]	0.961 [0.906,1.020]	1.208*** [1.095,1.333]
Higher	0.936 [0.840,1.042]	0.823* [0.692,0.978]	1.153 [0.989,1.345]
<i>Woman's work status</i>			
Not working (ref)	1.00	1.00	1.00
Working	1.072* [1.007,1.141]	1.047 [0.969,1.131]	1.108 [0.995,1.234]
<i>Parity at sterilization</i>			
1 (ref)	1.00	1.00	1.00
2–3	0.923** [0.878,0.969]	0.939* [0.885,0.997]	0.883** [0.806,0.967]
>4	0.830*** [0.778,0.884]	0.822*** [0.762,0.886]	0.859* [0.760,0.970]
<i>Caste</i>			
Scheduled castes (ref)	1.00	1.00	1.00
Scheduled tribes	1.120** [1.046,1.199]	1.093* [1.013,1.180]	1.235** [1.054,1.447]
Other backward classes	0.992 [0.941,1.045]	0.985 [0.926,1.048]	0.992 [0.897,1.098]
Other	1.063 [0.999,1.131]	1.093* [1.015,1.176]	1.006 [0.897,1.129]
<i>Religion</i>			
Hindu (ref)	1.00	1.00	1.00
Muslim	1.544*** [1.441,1.654]	1.623*** [1.481,1.780]	1.497*** [1.348,1.663]
Other	1.072 [0.994,1.157]	1.055 [0.961,1.157]	1.082 [0.942,1.243]
<i>Wealth quintiles</i>			
Poorest (ref)	1.00	1.00	1.00
Poorer	1.019 [0.956,1.086]	1.028 [0.962,1.099]	1.046 [0.822,1.330]
Middle	0.971 [0.908,1.039]	0.975 [0.906,1.050]	1.02 [0.813,1.278]

**Table 4** (continued)

Background variables	Total [95% CI]	Rural [95% CI]	Urban [95% CI]
Richer	0.962 [0.894,1.036]	1.002 [0.922,1.091]	0.919 [0.735,1.149]
Richest	0.877** [0.805,0.956]	0.944 [0.847,1.052]	0.813 [0.646,1.022]
<i>Place of residence</i>			
Rural (ref)	1.00	–	–
Urban	0.956 [0.911,1.003]	–	–
<i>Woman informed that she cannot have more children after sterilization</i>			
No (ref)	1.00	1.00	1.00
Yes	1.389*** [1.320,1.461]	1.381*** [1.302,1.466]	1.409*** [1.278,1.554]
<i>Quality of care</i>			
Good (ref)	1.00	1.00	1.00
All right	0.758*** [0.728,0.788]	0.751*** [0.716,0.787]	0.778*** [* [0.722,0.838]
Not so good/bad	1.505*** [1.389,1.630]	1.483*** [1.352,1.628]	1.560*** [1.331,1.829]
<i>Compensation received</i>			
No <sup>®</sup> (ref)	1.00	1.00	1.00
Yes	0.918*** [0.881,0.956]	0.900*** [0.857,0.946]	0.959 [0.891,1.032]

*p* < 0.001\*\*\* significant at 95% CI

**Table 5** Adjusted odds ratios from logistic regressions identifying associations between sterilization regret and selected characteristics by number of years since sterilization, NFHS-4 (2015–2016)

Background variables	Years since sterilization		Background variables	Years since sterilization	
	≤ 5 years	≥ 6 years		Regions	≤ 5 years
Sex composition of children					
Only sons (ref)	1	1	North (ref)	1	1
Only daughters	1.41*** [1.23–1.61]	1.26*** [1.15–1.38]	Central	1.09 [0.98–1.21]	1.19*** [1.11–1.28]
Both sons and daughters	0.89*** [0.75–0.88]	0.75*** [0.72–0.79]	East	1.12* [1.00–1.26]	1.17*** [1.081–1.26]
<i>Experience of child loss</i>			North-east	1.40*** [1.18–1.66]	1.62*** [1.44–1.81]
No loss (ref)	1	1	West	0.93 [0.81–1.08]	0.86** [0.78–0.94]
1 loss	1.15** [1.04–1.27]	1.12** [1.05–1.18]	South	1.33*** [1.18–1.49]	1.49*** [1.39–1.60]
> 2 losses	1.07 [0.84–1.36]	1.00 [0.86–1.17]	UTs	1.40** [1.12–1.76]	1.93*** [1.7–2.19]

*p* < 0.001\*\*\* significant at 95% CI

other studies [10, 14]. Women who experienced child loss in the general population, specially those in urban area, were more likely to regret post-sterilization than those who did not due to below-replacement fertility and fertility decline, and decline in infant mortality (stagnated at unacceptably high levels) in the majority of the Indian states [15].

The southern region was an exception to the trend, reflecting the region’s heavy use of sterilization which could be due to the high demand for fertility limitation. However, high fertility states in northern and eastern regions generally have poor access to reproductive health services; and the most common reason for undergoing FS is because of the incentives or the compensation they receive. Studies have shown that husband and family were mostly considered to be responsible for FS, as they push them to go for sterilization just for incentives and avoid a different variety of contraceptive method existing in the basket of choice to limit their family size [10, 16, 17].

Also, religious beliefs and fear of side effects for using other contraceptive methods were commonly cited barriers that pressurize most women to undergo sterilization. In India, post-sterilization regret has shown variation across states, and the previous study also confirms our findings [10] despite the fact that there are no targets for sterilization in the current program. The acceptance of the method is voluntary, perplexity, and ambiguity about targets remain a major issue.

### Conclusions

Though no new conclusions were derived from this study, few points are worth to be noted. The findings of our study suggest a few points that would benefit many couples and make them reassess their fertility desires. Firstly, the government should discourage sterilization among couples and focus on providing temporary or reversible contraceptive methods in

FP programme methods so that they can resume childbearing if they desire. Secondly, it is important to understand that in India in the public healthcare system, reversal procedures to resume childbearing are not at present offered. Although these procedures are available only through private providers, it involves huge costs, thus impossible for the poor to go for reverse sterilization. Like Brazil, a law should be passed in India also to prohibit men and women from undertaking sterilization procedure until they have had at least two offsprings [10, 18]. Finally, the government should provide more reversible methods under family planning, which should be accessible to everyone, and Bangladesh is one such example where sterilization has declined dramatically over time [19]. Further, beyond sterilization, there is a need for sex education and contraception in India. In India, the overall literacy is increasing, while in some parts of the country girls' education is lacking. There is a concern about the lack of knowledge among healthcare workers regarding how and when to use different contraceptives, sexual and reproductive health and rights of adolescents and myths surrounding the use of contraceptives.

## Policy Implications

Government of India (GOI), in its pledge to FP2020, announces that FP would be central to its efforts to achieve Universal Health Coverage, the partnership between governments and donors resulting from the 2012 London Summit on FP. It added three new contraceptives in addition to the current basket of contraceptives—an injectable contraceptive, a Progesterone pill, and a weekly non-hormonal pill. Considering this, the GOI is also planning to introduce another Long Acting Reversible Contraceptive (LARC) method named as Implanon NXT in the FP programme which has proven to be cost-effective in other developing countries as well as in India and is being used in many countries for years [20–23]. According to India's National Health Policy 2017, the government plans to increase the proportion of male sterilization from less than 5% to at least 30%. This policy somehow neglects to define how it will reach this goal. At the same time, India is implementing different proposals, which include an endorsement to social health activists and community health volunteers who provide services like delivering contraceptives directly to women. Lastly, the most difficult challenges to overcome are—changing the social norms against child marriages, preventing girls and women from making their own decisions, gender inequality, and to break the taboos related to the use of contraceptives.

## Limitations

Firstly, information on sterilization regret was sought only for females in all the rounds of survey, so we could not examine sterilization regret associated with male sterilization.

Secondly, we could not include divorced, separated, and widowed women in our analyses because the numbers of such women in these categories were very small. Thirdly, we could not examine the specific reasons for post-sterilization regret as there were no such questions related to it in NFHS-4.

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**Data Sharing Statement** The authors confirm that all data underlying the findings are fully available without restriction. Data are publicly available from the Demographic and Health Survey website: <https://dhsprogram.com/data/available-datasets.cfm>

## Compliance with Ethical Standards

**Conflict of interest** The authors declare no conflict of interest.

**Ethical Approval** Ethical approval for this study was not sought as this study was based on secondary data.

**Informed Consent** The study used the data set that is available online in the public domain; hence, there was no need to seek ethical consent to publish this study.

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