International Journal of Community Medicine and Public Health
Banerjee A et al. Int J Community Med Public Health. 2023 Apr;10(4):1443-1451
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20230921

Original Research Article

Has childlessness rate increased in India? Evidence from national family health surveys

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Received: 11 January 2023
Revised: 19 February 2023
Accepted: 20 February 2023

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ABSTRACT

Background: In the recent years developing countries have been experiencing an increase in the number of women without children. Is India also one of them? This paper tries to analyse whether childlessness has increased in India and what are the factors which determine childlessness.
Methods: The present paper uses cross sectional data from the fourth and fifth round of the National Family Health Survey (NFHS 4 and NFHS 5). The analysis is based on complete childlessness which includes women above 40 years of age. Bi-variate analysis and binary logistic regression has been used.
Results: The results indicate that overall, 7% of women were childless in India in 2015-2016 which increased to 12% in 2019-2021; the increase was statistically significant. Childlessness was positively associated with level of education, age at marriage, body mass index (BMI) level, and presence of thyroid. Urban women were more prone to experience childlessness.
Conclusions: Although childlessness is less in India compared to the developed world, the percentage of childless women is likely to rise given the increasing trends of woman's schooling, age at marriage, media exposure, etc. This would in turn increase the demand on reproductive health care services.

Keywords: Childlessness, Education, Age at marriage, STI, NFHS, India

INTRODUCTION

Worldwide, fertility the most vital demographic event has grabbed attention of the researchers for a long time. However, concerns regarding infertility and or childlessness is relatively lower. Childlessness is defined as the absence of a live birth in a sexually active non-contracepting woman.[1] Though the term is used synonymously with infertility but there is a slight definitional difference. The International committee for monitoring assisted reproductive technology and the World Health Organization (WHO) defines infertility as 'a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse. However, childlessness implies failure to have a live birth.

Globally, infertility affects almost 48 million couples and nearly 180 million individual.[2] The developed countries have shown a remarkable increase in the proportion of women or couple with no children.[3] Existing literature shows that more than 20 percent of the women reaching the end of their reproductive life are childless in Germany, Switzerland and Austria.[4] Around 40 percent of women in their early thirties who have not yet passed their reproductive ages are childless in United Kingdom (UK), United States (US) and Germany.[3] Earlier studies in United States of America recorded that between 2010 and 2012

around 15% women were childless by the end of their reproductive life.[5]

The situation is however different in developing country and India is no exception to this. Childlessness in the developing world is often associated with emotional and mental distress resulting in anxiety, depression, frustration, grief and fear, marital distress leading to abandonment, divorce, or polygamy.[6] Yet over time the prevalence of infertility has increased in India over time the prevalence of infertility has increased in India. As per the third round of the district level household survey (DLHS 3) around 8.2% of currently married women of reproductive age in India had infertility problems.[7] At the national level, around 6.3% women had primary infertility whereas 1.9% had secondary infertility.[7] Based on the census reports of India for 2001, 1991 and 1981 researchers show that infertility in India has increased by about 2% points since 1981 i.e. from 4% in 1981 to 6.1% in 2001.[8]

Women mostly bear the burden of childlessness and are blamed for the same.[9] Childlessness is caused either due genetic or epidemiological factors like the presence of any infectious disease, STDs and obesity or is related to environmental factors like lifestyle and stress.[10,11] Higher education and job aspiration of couples also leads to delayed parenthood which ultimately results in childlessness.[11] The deterrence and suitable treatment of infertility has been stressed in the international conference on population and development (ICPD) programme of action, yet India's reproductive health programme did not focus on this. In India though most of the states and districts has reached the replacement level TFR, till date demographers and social scientists are mainly interested in explaining the prevalence and correlates of fertility decline.[12] However, infertility has found some place in previous literature, but childlessness remains an unexplored phenomena. The characteristics of women who remain childless are not much explored. Earlier studies have shown an association between childlessness and fertility.[13] The future needs of various services like housing, education, healthcare, and demand for products is determined by the level of childlessness, thus making it an important demographic phenomenon.[4] Given the role that childlessness and or infertility plays as an important demographic facet it is important to study this aspect. Thus, this paper tried to analyse the factors which determine childlessness in India.

METHODS

Data source

The present study used secondary data from the two most recent rounds the NFHS i.e. 2015-2016 and 2019-2021. The NFHS collects data on key population, health and nutrition indicators, which covered for the first time 640 districts across 36 states and union territories in India during 2015-16. The International Institute for Population Sciences (IIPS), Mumbai, India, is the key agency for facilitation of the survey. Data collection procedures were approved by the ORC Macro institutional review board. A formal written consent was obtained and ethical issues were taken care of before interviewing the respondent and ethical approval was provided by the IIPS.

Study design

The study is based on secondary data that uses a cross sectional study design. It is a part of observational study design where the investigator measures the outcome and the exposures in the study participants at the same time. A representative sample of households (HHs) was selected using a stratified two-stage sampling design in both rural and urban areas. In rural areas, villages were selected in the first stage using a probability proportional to size (PPS) scheme. In the second stage, 22 HHs were selected using systematic sampling. In urban areas, census enumeration blocks (CEBs) were selected in the first stage using the PPS scheme, and in the second stage, 22 HHs were selected using systematic sampling. In NFHS-4 a total of 699,686 women age 15-49 were interviewed with a response rate of 97%. In NFHS-5 a total of 724,115 women of age 15-49 were interviewed with a response rate of 97%. The detailed methodology, with complete information on the survey design and data collection, was published in the survey report.[14,15]

Ethics and data availability statement

This study is based on datasets that are available in public domain. The data can be accessed from the demographic and health survey website after obtaining permission. The link to the site is https://dhsprogram.com/data/dataset/India_Standard-DHS_2015.cfm?flag=0. The dataset does not have any identifiable information of the survey participants. Hence, no ethical approval is required for the current study.

Outcome variable

The outcome variable for the study is childlessness which is defined as: currently married women, married for at least 5 years, currently not pregnant, never had a terminated pregnancy, never used contraceptives and have zero children born to them.

Childlessness rates computed for women in the age-group of 45-49 years, are referred to as completed childlessness rates. The advantage of using this is the potential for restricting the analysis to a specific cohort of ever married women who have completed the child-bearing ages. As has been observed the completed childlessness rate and the more general childlessness rate correlate with each other at levels 0.5 or higher.[16] In the present analysis childlessness rate is restricted to women in the age group of 40-49 years that is the end of the reproductive age group. Thus, the analysis is carried on a total of 52759 women (35239 for NFHS 4 and 17520 for NFHS 5). Childlessness was coded in dichotomous (0 "having a child", 1 "childless").

Explanatory variables

Earlier studies have identified a number of determinants of childlessness. These include education, economic status, place of residence, and age at marriage.[8,17] Based on review of earlier literature the explanatory variables used in the analysis are education (no education/primary/ secondary/higher), caste (SC/ST/OBC/Other category), religion (Hindu/Muslim/Christian/Others), household wealth status (poor/non-poor), age at marriage (less than 18/18-30/above 30), exposure to mass media (no exposure/exposure), place of residence (urban/rural), region of residence (North/East/Central, South, North-East/West). Nutritional status, health risk and lifestyle behavioural factors were also included. These factors include BMI level (underweight/normal/overweight/ obese), presence of diabetes (yes/no), thyroid (yes/no), smoking (yes/no) and drinking (yes/no). This information is available at the district level. A variable for the survey round (2015-2016 and 2019-2021) have also been included in the statistical model to see whether the change in the childlessness is significant or not. The information on occupational status and presence of STI is available in the state module and collected on sub-sample of the entire sampled population. These variables were also included in the statistical models.

Analytical approach

In order to identify the factors associated with childlessness among currently married women, bi-variate and multivariate analyses were performed. Bi-variate analyses were performed to examine the nature of association between childlessness and selected socioeconomic and demographic background characteristics and explanatory variables. Multivariable logistic regression model on pooled data from two surveys used to identify the factors which best explains and predicts childlessness among currently married women in India.

Instead of the linear probability model, logistic regression function is preferable to fit some kind of sigmoid curve when the response variable is dichotomous (i.e., binary or 0–1) and that reasonably portrays the reality about outcome events.[18] The binary response (y, childless or not) for each individual women was related to a set of categorical predictors, X, and a fixed effect by a logit link function as following

$$\text{Logit}(\pi i) = \log\left[\frac{\pi_i}{1-\pi_i}\right] = \beta_0 + \beta(X) + \varepsilon$$

The probability of an individual who is childless is π_i. The parameter β_0 estimates the log odds of childlessness and the parameter β estimates with maximum likelihood, the differential log odds of childlessness associated with the predictor X, as compared to the reference group. It is worth mentioning, e represents the error term in the model. The results of logistic regression are presented by estimated odds-ratio with 95% confidence interval (CI). Finally, a multivariable logistic regression on a 15% sub-sample of women was estimated by additionally including information related to women's occupation (not working, professional/sales, agriculture/domestic) and presence of STI (yes, no). The entire analysis was performed using STATA version 15.0.

RESULTS

Sample characteristics

Almost half (56%) of the sample women had no education in 2015-16 which dropped to 49.6% in 2019-2021. 16% and around 40% of the women belonged to schedule caste population and OBC population respectively in 2015-2016. In 2019-2021, 18% belonged to SC population and 36% belonged to OBC population. 69% of the sample population belonged to Hindu religious category in 2015-2016, while 66% belonged to the same religious category in 2019-2021. 52.6% of the women belonged to non-poor household in 2015-2016 and 53.5% of the women belonged to non-poor household in 2019-2021. Among the currently married sampled women 10.5% were married above 30 years of age and almost 8% women were married above 30 years of age in 2019-2021. 25.8% and 23% of the women belonged to the urban area in 2015-2016 and 2019-2021 respectively. In 2015-2016, 20.7% of the women were overweight while in 2019-2021, 24% of the women were overweight (Table 1).

Prevalence of completed childlessness based on background characteristics

In 2015-2016, 6.9% of currently married women 40-49 years of age married for at least 5 years, never used a contraception, never had a terminated pregnancy and was not currently pregnant at the time of the survey. In 2019-2021, 12% of the women were childless by the end of their reproductive life. 6% of the women without education were childless in 2015-16 and 11% were childless in 2019-2021. Maximum childlessness is seen among women who had higher level of education in both the survey rounds i.e. 11% in 2015-2016 and 15% in 2019-2021. Women belonging to poor household had lower prevalence of childlessness compared to women belonging to non-poor households for both the survey rounds. Childlessness is more among women who were married above 30 years of age. 14.3% of the women married above 30 years of age were childless while 31% of the women were childless in 2019-2021. The BMI level of the women also affects childlessness with 5% of underweight women being childless while around 8% of obese women childless in 2015-2016. In 2019-2021, 11% of underweight women were childless while 14% of overweight women and 12% of obese women were childless. Among those women who suffer from thyroid 11% and 16% were childless in the two survey rounds respectively. Not much variation in childlessness is found among women who either drink alcohol or smoke (Table 2).

Multivariable binary logistic regression

The results of binary logistic regression based on socio-economic characteristics of the women are presented in Table 3. Model 1 reports the unadjusted odds ratio of childlessness among the women while model 2 reports the adjusted odds after controlling for nutritional, health and lifestyle behaviour. Survey round was associated with childlessness as the odds ratio was higher for NFHS 5 compared to NFHS 4 (OR: 2; 95% CII: 1.86, 2.14). The result from model 1 reveals that that compared to non-educated women, women with primary education are 1.16 times more likely to be childless (OR: 1.16; 95% CII: 1.05 1.29). Women with secondary (OR: 1.12; 95% CII: 1.02 1.23) and higher (OR: 1.16; 95% CII: 0.99 1.26) level education are also more likely to be childless compared to women without education. The women belonging to Schedule tribe category (OR: 1.23; 95% CII: 1.1 1.38) were more likely to have childlessness compared to Schedule caste women. Compared to Hindu women, Muslim women were less likely to be childless (OR: 0.65; 95% CII: 0.58 0.74). The women belonging to non-poor households were less likely to be childless (OR: 0.85; 95% CII: 0.78 0.92). Age at marriage is a significant determinant of childlessness as women married above 30 years of age are more likely to be childless (OR: 3.98; 95% CII: 3.59 4.41). Women exposed to mass media also are more likely to b childless (OR: 1.13; 95% CII: 1.04 1.23). Women living in the rural areas are less likely to be childless compared to the urban areas (OR: 0.93 95% CII: 0.85 1.01). The second model also shows similar results.

The unadjusted odds ratio based on nutritional, health and lifestyle behaviour of the women show that compared to underweight women, overweight women were more likely to be childless (OR: 1.21; 95% CII: 1.07 1.25). Women with thyroid were also more likely to be childless (OR: 1.26; 95% CII: 1.06 1.5). Women who smoke had higher odds of childlessness compared to women who do not smoke (OR: 1.26; 95% CII: 1.07 1.47). The adjusted odds also show similar results (Table 4).

Table 1: Background characteristics of sampled population.

Background characteristics	NFHS 4		NFHS 5	
	%	N	%	N
Educational status				
Not educated	56.1	19775	49.6	8684
Primary	14.0	4940	14.9	2616
Secondary	25.3	8920	30.6	5356
Higher	4.6	1604	4.9	864
Caste				
Schedule caste	16.0	5373	18.3	2983
Schedule tribe	25.3	8535	25.7	4199
OBC	39.6	13354	36.0	5876
None of the above	19.1	6423	20.1	3276
Religion				
Hindu	69.3	24421	65.5	11471
Muslim	14.0	4919	15.6	2727
Christian	12.5	4403	12.2	2136
Other	4.3	1496	6.8	1186
Wealth index				
Poor	47.4	16696	46.5	8152
Non-poor	52.6	18543	53.5	9368
Age at marriage				
Less than 18	40.4	14243	37.9	6637
18-29	49.1	17299	54.3	9515
30 and above	10.5	3697	7.8	1368
Exposure to media				
Not at all	34.3	12093	36.4	6372
Exposed	65.7	23146	63.6	11148
Place of residence				
Urban	25.8	9073	23.0	4031
Rural	74.3	26166	77.0	13489
Region of residence				
North	11.7	4135	16.4	2868
Central	24.1	8493	18.0	3155
East	21.6	7596	14.3	2497

Continued.

Background characteristics	NFHS 4		NFHS 5	
	%	N	%	N
North East	20.5	7227	23.4	4095
West	7.6	2686	11.5	2022
South	14.5	5102	16.5	2883
Nutritional status				
Underweight	15.7	5394	10.7	1794
Normal	56.6	19505	56.5	9500
Overweight	20.7	7132	24.0	4030
Obese	7.1	2442	8.9	1498
Diabetes				
Yes	3.5	1201	4.4	763
No	96.5	33309	95.6	16438
Thyroid				
Yes	2.6	925	3.6	624
No	97.1	34067	95.9	16705
Smoking status				
Yes	3.9	1360	13.0	2268
No	96.1	33879	87.1	15252
Drinking alcohol				
Yes	4.3	1527	3.6	624
No	95.7	33712	96.4	16896
Total	100	35239	100	17520

Table 2: Percentage of currently married women 40-49 years age who ended their reproductive life childless.

Background characteristics	NFHS 4	NFHS 5
Educational status		
Not educated	5.7	10.7
Primary	7.3	12.2
Secondary	8.4	13.4
Higher	10.9	15.3
Caste		
Schedule caste	6.8	12.8
Schedule tribe	6.7	12.4
OBC	6.7	12.3
None of the above	7.8	11.7
Religion		
Hindu®	7.2	12.8
Muslim	4.4	8.1
Christian	10.3	15.1
Other	10.8	10.6
Wealth index		
Poor	5.7	11.1
Non-poor	7.8	12.7
Age at marriage		
Less than 18	4.6	8.0
18-29	7.7	13.1
30 and above	14.3	30.8
Exposure to media		
Not at all	4.8	9.5
Exposed	8.0	13.4
Place of residence		
Urban	8.7	13.3
Rural	6.1	11.5

Continued.

Background characteristics	NFHS 4	NFHS 5
Region of residence		
North	7.0	8.9
Central	4.7	10.5
East	4.5	10.1
North East	5.3	7.3
West	9.1	10.7
South	10.9	19.1
Nutritional status		
Underweight	5.0	10.6
Normal	6.9	11.8
Overweight	7.6	13.7
Obese	8.2	11.7
Diabetes		
Yes	6.8	13.6
No	6.9	12.0
Thyroid		
Yes	10.5	15.5
No	6.6	11.9
Smoking status		
Yes	5.9	9.7
No	6.9	12.3
Drinking alcohol		
Yes	6.4	15.3
No	6.9	12.0
Total	6.9	12.1

Table 3: Determinants of probability of ending reproductive life childless based on NFHS 4 and 5.

Background characteristics	Model 1	Model 2
Time		
2015-16®		
2019-21	2***(1.86-2.14)	1.96***(1.83-2.1)
Educational status		
Not educated®		
Primary	1.16***(1.05-1.29)	1.18***(1.07-1.31)
Secondary	1.12**(1.02-1.23)	1.13***(1.03-1.25)
Higher	1.16*(0.99-1.36)	1.17*(1-1.38)
Caste		
Schedule caste®		
Schedule tribe	1.23***(1.1-1.38)	1.2***(1.07-1.36)
OBC	1 (0.91-1.1)	1.01 (0.91-1.11)
None of the above	1.06 (0.95-1.19)	1.06 (0.94-1.19)
Religion®		
Hindu®		
Muslim	0.65***(0.58-0.74)	0.65***(0.57-0.73)
Christian	0.72***(0.62-0.83)	0.74***(0.63-0.85)
Other	0.95 (0.81-1.12)	0.95 (0.81-1.12)
Wealth index®		
Poor		
Non-poor	0.85***(0.78-0.92)	0.84***(0.77-0.92)
Age at marriage®		
Less than 18		
18-29	1.47***(1.36-1.59)	1.47***(1.36-1.6)
30 and above	3.98***(3.59-4.41)	4***(3.6-4.45)

Continued.

Background characteristics	Model 1	Model 2
Exposure to media®		
Not at all		
Exposed	1.13***(1.04-1.23)	1.13***(1.04-1.23)
Place of residence®		
Urban		
Rural	0.93*(0.85-1.01)	0.92*(0.85-1.01)
Region of residence®		
North		
Central	1.03 (0.9-1.16)	1.01 (0.89-1.15)
East	0.99 (0.87-1.13)	0.99 (0.86-1.13)
North East	0.64***(0.55-0.74)	0.6***(0.51-0.7)
West	1.09 (0.95-1.26)	1.1 (0.95-1.27)
South	1.68***(1.49-1.9)	1.64***(1.45-1.86)

Note: Model 2 controls for selected nutritional and lifestyle behaviour and health risk of women, ®: reference category, ***p<0.01; **p<0.05; *p<0.1

Table 4: Determinants of probability of ending reproductive life childless based on NFHS 4 and 5.

Background characteristics	Model 1	Model 2
Time®		
2015-16		
2019-21	1.88***(1.76-2.01)	1.96***(1.83-2.1)
Nutritional status		
Underweight®		
Normal	1.11**(1.01-1.24)	1.14**(1.03-1.27)
Overweight	1.21***(1.07-1.35)	1.16**(1.03-1.32)
Obese	1.13 (0.97-1.31)	1.04 (0.88-1.22)
Diabetes		
No®		
Yes	0.96 (0.81-1.14)	0.94 (0.79-1.12)
Thyroid		
No®		
Yes	1.26***(1.06-1.5)	1.18*(0.98-1.41)
Smoking status		
No®		
Yes	1.26***(1.07-1.47)	1.2**(1.02-1.42)
Drinking alcohol		
No®		
Yes	0.93 (0.82-1.06)	1.12*(0.98-1.28)

Note: Model 2 controls for education, religion, caste, place of residence, region, wealth status, age at marriage and exposure to mass media, ®: reference category, ***p<0.01; **p<0.05; *p<0.1.

Table 5: Subsample multivariable logistic regression showing the odds of ending the reproductive life being childless.

Background characteristics	Odds ratio
Time®	
2015-16	
2019-21	2.22***(1.88 2.63)
Educational status®	
Not educated	
Primary	1.37***(1.08 1.74)
Secondary	1.26**(1.02 1.56)
Higher	1.14**(0.76 1.69)
Occupation status®	
Not working	

Continued.

Background characteristics	Odds ratio
Professional/sales	1.02 (0.69 1.5)
Agriculture	1.09 (0.91 1.31)
Wealth index®	
Poor	
Non-poor	1.05 (0.86 1.27)
Age at marriage® (years)	
Less than 18 years	
18-29	1.36***(1.12 1.66)
30 and above	3.57***(2.79 4.56)
STI in last 12 months®	
No	
Yes	2.12***(1.45 3.1)

Note: The regression is limited to women for whom occupational information is available, all other selected variables are controlled while reporting the Odds ratio, ®: reference category, ***p<0.01; **p<0.05; *p<0.1.

The result from the sub-sample regression analysis show that survey round is significantly associated with childlessness with higher odds of childlessness in NFHS 5 compared to NFHS 4 (OR: 2.22; 95% CII: 1.88 2.63). Education is a significant determinant as with increasing educational status the odds of childlessness increases. Presence of STI in the last 12 months also is significantly associated with childlessness as women with STI has higher odds of childlessness (OR: 2.12; 95% CII: 1.45 3.1).

DISCUSSION

Childlessness among currently married women age 40-49 years in India increased from 7% in 2015-2016 to 12% in 2019-2021. The percentage of childlessness in India is not the highest and the developed countries have a higher prevalence of childlessness. But when expressed in absolute numbers childlessness is indeed a matter of concern in India. The factors determining childlessness are the educational level of the women, age at marriage, the nutritional status and diseases burden (like presence of thyroid). In the sub-sample analysis, it is noted that women's education, age at marriage and history of sexually transmitted infection (STI's) have a positive bearing on childlessness.

Childlessness increases with increasing level of education. As noted in earlier literature, increased enrolment in schools/colleges, economic development, and better job opportunity for women may compel women to marry late and thus delay childbearing or remain childless.[19] Based on this framework, a positive relation was found to exists between childlessness and educational level and they explained the relation as a U-shaped curve.[17] As per the findings from the present study age at marriage is the most important determinant of childlessness. This finding corroborates with contemporary literature that indicated that the age of marriage has a positive bearing on childlessness and with increasing age childlessness increases.[20] Delayed parenthood may lead to lower overall fertility and also to childlessness, so that one can expect mean age of first birth to be positively associated with cohort childlessness.[11] The study has also found variations in childlessness based on place of residence, region religion and household wealth status. Past study in India has also found variations in childlessness across religious groups with lowest childlessness rates among the Muslim population and across regions with childlessness more in the southern part of the country.[21,22] Study has also found that poor women have a much higher probability of being childless than others.[17]

The findings also list factors related to women's health status. BMI is an important determinant of childlessness as childlessness is more among overweight and obese women. Childlessness is also more among women who suffers from thyroid. The presence of STI also increases the risk of childlessness among women. In Indian context also a higher prevalence of reported symptoms of RTIs/STIs and menstrual problems is observed among women who ever had infertility.[23] Moreover it has been found in medical research that women with various symptoms of STI has higher probability of being childless.[24] The BMI level of the women is also an important factor which influences childlessness. Overweight women have a higher incidence of menstrual dysfunction and anovulation. The risk of subfecundity and infertility, conception rates, miscarriage rates, and pregnancy complications are increased in these women.[25]

Limitations

This study suffers from few limitations. A major limitation of the study is it tries to define childlessness from the data which doesnot include direct question on childlessness, which too some extent may give biased results. It only includes the causes of childlessness related to women, thus neglecting the male-related issues of childlessness. Since this is a cross sectional data no causal explanations can be made.

CONCLUSION

In India, where motherhood is embraced as a blessing yet women nowadays are marying late and sometimes postponing childbirth and hence childlessness rates are increasing. In the years to come this phenomenon which has been a part of the western world might also be a part of

the developing countries as well. Childlesness now is an issue of global concern which has not been given much attention particularly in Indian context. The findings places this work as an important study in the field of fertility. The study has important policy implication. The recent debate on increasing the legal age for marriage for girls from 18 to 21 may impart schooling, work, empowerment benefits to women, it may have implications for childlessness in the country. More women that ever may require ARTs for getting rid of childlessness. The poor and marginalized women are likely to face greater burden as the findings suggests lesser odds of childlessness among the non-poor.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Banerjee A, Singh AK. Has childlessness rate increased in India? Evidence from national family health surveys. Int J Community Med Public Health 2023;10:1443-51.