Sexual & Reproductive Healthcare 14 (2017) 48–54

Contents lists available at ScienceDirect

Sexual & Reproductive Healthcare

journal homepage: www.srhcjournal.org

Choice of contraceptive methods by women's status: Evidence from large-scale microdata in Nepal

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ARTICLE INFO

Article history:
Received 24 April 2017
Revised 28 August 2017
Accepted 27 September 2017

Keywords:
Contraceptive choice
Women's status
Education
Fear of partner
Large-scale microdata
Nepal

ABSTRACT

Objective: We aimed to investigate how improvement in women's status affects the choice of contraceptive methods in Nepal.
Study design: We regressed the choice of contraceptive methods on women's status and other controlling variables by employing large-scale microdata representing over 12,000 married women aged 15–49 years in Nepal. Years of schooling and literacy were defined as women's status variables. We estimated how educational attainment affects the choice of contraceptive methods. We also analyzed how fear of their partners affected women's choices.
Results: Female sterilization was the most common choice among the contraceptive methods (25.5% of contraceptive users) in Nepal, followed by injections (19.9%). However, our estimation results showed that these options change with an improvement in women's status. An additional year of education increased the probability that women would choose condoms by 1.2 percentage points (95% confidence interval [CI]: 0.7, 1.6) and decreased the probability of choosing female sterilization by 1.4 percentage points (95% CI: −1.9, −0.8). For the well-educated women, injections and condoms became the first and second choices (29.5% and 21.5%), respectively, while female sterilization was the third option (17.9%) for contraceptive methods. Women's fear of their partners also affected the choice of contraceptive methods. The women who feared their partners were 7.0 percentage points more likely to choose female sterilization than condoms.
Conclusion: Improvement in women's status (more education and less fear of their partners) changed their contraceptive behaviors by increasing the probability of choosing condoms and decreasing the probability of choosing female sterilization in Nepal.

Introduction

Women's choices among contraceptive methods differ in relation to factors like culture, religion, education, and economic affluence. Typically, the level of development in a region also affects this choice (Fig. 1). In developed countries, birth control pills (17.7%) and condoms (18.4%) represent the major contraceptive methods; pills are most common in Europe (e.g., 40.6% and 37.2% of married women in France and Germany, respectively, choose this method), while condoms are most popular in East Asia (e.g., 50.3% in Hong Kong and 40.7% in Japan) [1]. In contrast, in developing countries, the percentage of women using modern contraceptive methods is lower than that in developed countries [1,2]. Of the modern methods, female sterilization is still most significant (20.6%) in developing countries, whereas this method is relatively rare in developed countries (8.4%). As China's level of development increased, for instance, the prevalence rate of sterilization (both female and male) decreased, while the rates of choosing pills and condoms increased [3].

Fig. 2 shows the choice of contraceptive methods in Nepal. It illustrates that in this country, 61.8% of women use no contraception, while 33.1% use modern contraceptive methods. In the group using contraception, female sterilization was the most common method (25.5% of those using contraception), followed by injections (19.9%). The methods that are most commonly used in developed countries, namely birth control pills and condoms, are not common in Nepal (8.3% and 10.1%, respectively). Such features are similar to other developing countries.

Although sterilization is the most effective contraceptive method [5], it has a significant disadvantage in that it is a permanent procedure and usually cannot be reversed. As a result, the number of women who express regret concerning sterilization is significant, particularly when they were aged 30 years or younger at the time of sterilization [6,7]. In Nepal, for example, 9.0% of

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https://doi.org/10.1016/j.srhc.2017.09.005
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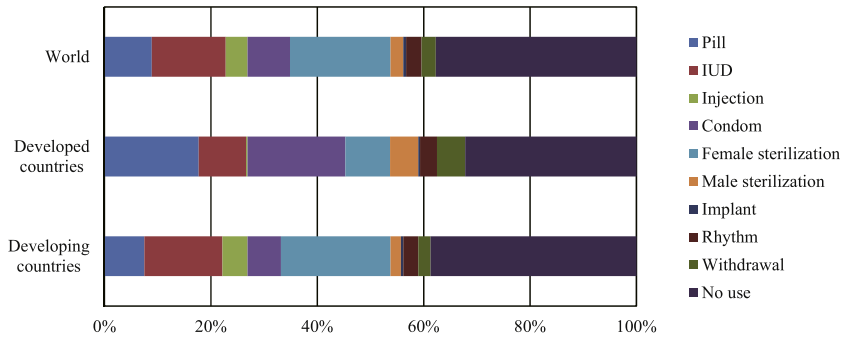

Fig. 1. Global trends in the choice of contraceptive methods [1].

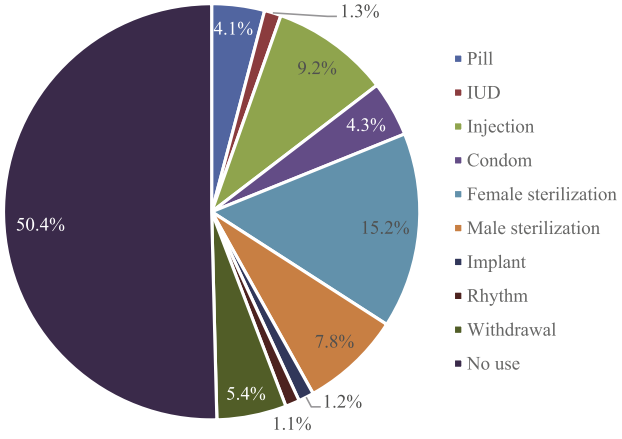

Fig. 2. Rates of use of contraceptive methods in Nepal [4].

currently married women expressed regret about their sterilization [4]. The main reasons for this regret were side effects (5.1%) and the desire to have another child (2.0%). Because effective temporary contraceptive methods are available and they are commonly used in developed countries, it appears that lack of knowledge/information on family planning, lack of availability of comprehensive reproductive and sexuality education, inability to access the full range of contraceptive options, and women's lower status in society in developing countries limit the contraceptive options available to the women in these countries [8].

There is also an issue of involuntary or forced sterilization of women [9]. In developed countries, this phenomenon is no longer apparent. However, it is still occurring in developing countries and causes problems like death due to contaminated medicines or rusty surgical equipment [10].

Many studies have been carried out targeting contraceptive methods in developing countries [2,3,8,11,12]. In addition, research has been conducted on the factors that affect the selection of contraceptive methods from various perspectives [13–19]. However, no studies have assessed how an improvement in women's status affects this choice. It is important to consider this issue to further understand the relationship between women's social status and family planning. The purpose of this study is to clarify how improvement in women's status changes the choice of contraceptive methods by focusing on the case of Nepal.

Materials and methods

Methods and study design

In this study, we attempt to provide empirical evidence concerning the relationship between women's status and the choice of contraceptive methods in Nepal. Nepal is listed by the United Nations Children's Fund as among the 25 prioritized countries requiring improvement in the status of women [20]. We hypothesize that improving women's status will increase the probability of choosing contraceptive methods comparable to those preferred in developed countries; that is, women with a higher status will be less likely to use female sterilization and more likely to opt for condoms and pills.

To test our hypothesis, we regress choice of contraceptive methods on women's status variables, such as years of schooling and literacy, using multinomial logit models. These variables are closely related to women's status and affect their family planning. Female schooling affects family planning by increasing female autonomy and bargaining power in their decisions [21]. In the other words, without more education and literacy, women display increased dependence on their partners when it comes to making household choice.

To control for the different roles of household and regional characteristics, other household-level and regional variables are employed in our estimations. The variables we used are described in detail in the *Data* section.

In the final part of this study, we expand our analysis to investigate the effects of women's fear of their partners on their contraceptive choices. Women who fear their partners tend not to choose condoms and/or pills, since such fear may suppress women's sexual autonomy.

Data

The data employed in this study were retrieved from the Demographic and Health Survey (DHS), which has been carried out in many developing countries as a part of the Measure DHS Program, funded by the United States Agency for International Development, to assess fertility, family planning, and maternal and child health. In Nepal, the DHS has been conducted every 5 years since 1996. This study employed the latest survey results, which were published in 2011. The 2011 survey results comprise data from nationally representative samples, covering over 12,000 married women aged 15–49 years. The respondents were asked questions on the type of contraception they were using, educational background, economic status, and experience of physical and mental violence in the household.

To focus on women's choice of contraceptive methods, we excluded respondents who did not use any contraceptive methods and modern methods. Respondents who answered that they were currently not using any methods included women who wanted to become pregnant.[1] Thus, the sample we employed in the analysis comprised 4172 women.

[1] Estimations including these respondents may capture not only women's status concerning choice of contraceptive method, but also selection effects.

Table 1
Descriptive statistics.[a]

	Current contraceptive methods							
	All	Pill	IUD	Injection	Condom	Female sterilization	Male sterilization	Implant
Female status								
years of schooling	3.19	4.34	4.30	3.30	6.56	1.88	2.36	2.73
	(4.00)	(4.07)	(4.34)	(3.93)	(4.24)	(3.23)	(3.57)	(3.82)
age	33.84	30.57	31.83	31.48	28.33	36.86	37.43	32.69
	(7.79)	(7.28)	(7.12)	(7.47)	(7.52)	(6.75)	(6.53)	(6.93)
literacy: *none*	0.41	0.29	0.29	0.40	0.15	0.54	0.44	0.47
	(0.49)	(0.45)	(0.45)	(0.49)	(0.36)	(0.50)	(0.50)	(0.50)
literacy: *partial*	0.11	0.08	0.07	0.10	0.06	0.12	0.13	0.12
	(0.31)	(0.28)	(0.26)	(0.3)	(0.24)	(0.32)	(0.34)	(0.33)
literacy: *complete*	0.48	0.63	0.64	0.50	0.78	0.34	0.43	0.41
	(0.50)	(0.48)	(0.48)	(0.50)	(0.41)	(0.47)	(0.50)	(0.49)
Household characteristics								
years of schooling of husband	5.98	6.58	6.65	5.60	8.39	5.07	5.98	5.83
	(4.01)	(3.78)	(4.02)	(3.92)	(3.37)	(4.04)	(3.89)	(4.01)
wealth: *poorest*	0.16	0.15	0.11	0.24	0.10	0.10	0.20	0.25
	(0.37)	(0.36)	(0.31)	(0.43)	(0.30)	(0.30)	(0.40)	(0.43)
wealth: *poorer*	0.17	0.14	0.24	0.19	0.12	0.18	0.17	0.22
	(0.38)	(0.35)	(0.43)	(0.39)	(0.32)	(0.39)	(0.38)	(0.42)
wealth: *middle*	0.20	0.18	0.17	0.20	0.14	0.23	0.20	0.18
	(0.40)	(0.38)	(0.38)	(0.40)	(0.35)	(0.42)	(0.40)	(0.39)
wealth: *richer*	0.21	0.21	0.16	0.19	0.19	0.23	0.22	0.15
	(0.41)	(0.41)	(0.37)	(0.39)	(0.39)	(0.42)	(0.41)	(0.36)
wealth: *richest*	0.26	0.32	0.32	0.19	0.45	0.25	0.21	0.20
	(0.44)	(0.47)	(0.47)	(0.39)	(0.50)	(0.43)	(0.40)	(0.40)
Region of settlement[b]								
region: *mountain*	0.16	0.12	0.28	0.21	0.10	0.04	0.31	0.27
	(0.37)	(0.33)	(0.45)	(0.41)	(0.29)	(0.19)	(0.46)	(0.45)
region: *hill*	0.36	0.36	0.31	0.40	0.42	0.24	0.47	0.48
	(0.48)	(0.48)	(0.46)	(0.49)	(0.49)	(0.43)	(0.50)	(0.50)
region: *terai*	0.48	0.52	0.41	0.39	0.49	0.72	0.23	0.24
	(0.50)	(0.50)	(0.49)	(0.49)	(0.50)	(0.45)	(0.42)	(0.43)
Number of observations	4172	400	136	964	484	1230	826	132
Female characteristics								
fear of partner[c]	0.41	0.40	0.55	0.38	0.33	0.45	0.42	0.57
	(0.49)	(0.49)	(0.50)	(0.49)	(0.47)	(0.50)	(0.49)	(0.50)
Number of observations	1523	150	53	364	186	430	305	35

Source: Nepal Demographic and Health Survey 2011 [4].
[a] Standard deviations are reported in parentheses.
[b] The regions of Nepal are divided into three categories as follows: mountain for the northern area, hill for the central area, and terai for the southern area.
[c] Respondents who reported that they are afraid of their husbands/partners most of the time or sometimes are defined as women who have experienced fear of partners.

The empirical variables used in the analysis were defined according to the contraceptive methods respondents used at the time of the survey, and they are summarized in Table 1. The variables can be classified into three categories, as follows: female status, household characteristics, and region of settlement. The variables on female status were women's educational attainment (*years of schooling*), age (*age*), and literacy capacity (*none*, *partial*, and *complete*). Household characteristics were the educational attainment of the husband (*years of schooling of husband*) and household wealth (*poorest*, *poorer*, *middle*, *richer*, and *richest*).

The regions of Nepal are divided into three ecological zones (i.e., Terai, Hill, and Mountain), ranging from the north to south of the country and covering different altitudes. The Terai region is found in the southern part of Nepal and shares a border with India. Culturally, this region is more similar to India than the other two regions. Indo-Aryan languages are spoken by most people in the Terai region. Because the land is relatively flat, the Terai region is the most populated area in Nepal, and infrastructure and transportation are more developed than they are in the other two regions. The Mountain region forms the northern part of the country and comprises the area of high altitude. The population of the Mountain region is only about 7% of the total population. The infrastructure is extremely limited compared with that in the other regions [4]. The Hill region is located between the Terai and Mountain regions. The Kathmandu Valley falls within this region. Infrastructure and transportation are much more developed here than in the Mountain region [4]. In our analysis, we control for these differences in regional characteristics by using regional dummy variables (*Terai*, *Hill*, and *Mountain*).

Information on fear of partners/husbands was obtained from still-married women, and to maintain confidentiality, only one woman per household was randomly selected for the collection of these data.[2] Thus, the sample related to fear of partners consisted of 1523 women.

Although female sterilization was the most common method among modern contraceptive methods in Nepal (Fig. 2), the use of contraceptive methods differs by educational background and household wealth (Table 1). There was a positive correlation between women's average years of schooling and the proportion of women choosing condoms. Furthermore, respondents in the "richest" category in terms of household wealth tended to choose condoms. Women choosing female sterilization had only 1.9 years of schooling on average compared to the overall average of 3.2 years. There was also a negative correlation between the level of literacy and the choice of female sterilization. The illiteracy rate was highest among the women who chose sterilization.

[2] For more details concerning the data collection methods, see Ref. [4].

Table 1 also reports the respondents' experience of fear of partner. In the sample, 41.5% of women had experienced fear of their partners. This figure was increased in women who had opted for female sterilization (44.7%) and decreased in women who used condoms (33.3%).

Results

Women's status and contraceptive methods in Nepal

Table 2 shows the estimation results from the multinomial logit model for the choice of contraceptive methods. The results show that every choice includes variables with statistically significant coefficients. This means that these seven contraceptive methods must be treated separately in the model.

Table 3 reports the marginal effects based on the multinomial logit estimation. At mean, an additional year of schooling for women increased the probability of choosing condoms by 1.2 percentage points (pps; 95% confidence interval [CI]: 0.7, 1.6) and injections by 0.7 pps (95% CI: 0.2, 1.3) as contraceptive methods. In contrast, an additional year of schooling for women decreased the probability of choosing female sterilization by 1.4 pps (95% CI: −1.9, −0.8) and male sterilization by 0.7 pps (95% CI: −1.1, −0.2).

Fig. 3 shows the simulation result of the effect of an additional year of schooling for women on the choice of contraceptive methods. A higher number of years of schooling increased the probability of choosing condoms from 6.3% at zero years of schooling to 21.5% at 11 years of schooling. Conversely, the probability of choosing female sterilization decreased from 34.0% to 17.9% with increased years of schooling.

Notably, the choice of contraceptive methods differed by literacy status (Table 3). A higher literacy capacity decreased the probability of choosing female sterilization by 4.1 pps (95% CI: −8.2, −0.1; *partial*) or 3.6 pps (95% CI: −7.6, −0.4; *complete*). However, it increased the probability of choosing male sterilization by 3.2 pps (95% CI: −0.5, 6.9; *partial*) or 4.2 pps (95% CI: 0.7, 7.6; *complete*).

Household status and contraceptive methods in Nepal

Table 3 illustrates the effect of household wealth on contraceptive methods. The coefficients of household wealth in terms of condoms were statistically insignificant at the 10% level. The coefficients of wealth concerning female sterilization were positive, ranging from 8.7% to 11.4%, and they were statistically significant at the 1% level. In contrast, the coefficients of wealth for injections ranged from −5.5% to −11.9%, and they were statistically significant at the 5% level.

An additional year of schooling for the husband increased the probabilities of choosing condoms and male sterilization by 0.8 pps. Furthermore, it decreased the probabilities of injections and female sterilization by 0.8 pps and 0.6 pps, respectively.

Fear of partner and contraceptive methods

As mentioned in the section on *Women's status and contraceptive methods in Nepal*, improvement in women's education increased the probability of choosing condoms and decreased the probability of choosing female sterilization. Thus, we focused on these two types of contraceptive methods. The estimation results for choosing either of the two methods are presented in Table 4. The dependent variable for the logit estimation is a dummy vari-

Table 2
Estimation results for determinants of contraceptive methods.[a,b,c,d,e]

	Pill	IUD	Injection	Condom	Male sterilization	Implant
Female status						
years of schooling	0.09***	0.09**	0.11***	0.20***	0.02	0.08*
	(0.03)	(0.04)	(0.02)	(0.03)	(0.02)	(0.05)
age	−0.33***	−0.19**	−0.31***	−0.58***	0.04	−0.13
	(0.07)	(0.10)	(0.05)	(0.06)	(0.07)	(0.11)
squared age	0.00***	0.00	0.00***	0.01***	−0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
literacy: *partial*	0.18	0.14	0.19	0.32	0.37**	0.15
	(0.23)	(0.37)	(0.16)	(0.26)	(0.16)	(0.30)
literacy: *complete*	0.39*	0.53*	0.12	−0.07	0.40**	−0.29
	(0.20)	(0.31)	(0.16)	(0.25)	(0.16)	(0.34)
Household characteristics						
years of schooling of husband	0.01	0.02	−0.01	0.11***	0.07***	0.04
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
wealth: *poorer*	−0.61***	0.22	−0.65***	−0.48*	−0.64***	−0.45
	(0.23)	(0.35)	(0.17)	(0.25)	(0.17)	(0.29)
wealth: *middle*	−0.63***	−0.40	−0.80***	−0.79***	−0.73***	−0.75**
	(0.23)	(0.39)	(0.17)	(0.25)	(0.18)	(0.31)
wealth: *richer*	−0.54**	−0.36	−0.83***	−0.83***	−0.40**	−0.77**
	(0.24)	(0.43)	(0.18)	(0.26)	(0.18)	(0.33)
wealth: *richest*	−0.37	0.09	−1.00***	−0.33	−0.63***	−0.62*
	(0.25)	(0.45)	(0.20)	(0.26)	(0.20)	(0.37)
Region of settlement						
region: *hill*	−0.93***	−1.96***	−1.22***	−0.62**	−1.55***	−1.29***
	(0.24)	(0.29)	(0.19)	(0.25)	(0.18)	(0.27)
region: *terai*	−1.80***	−2.88***	−2.36***	−1.72***	−3.32***	−3.13***
	(0.23)	(0.30)	(0.18)	(0.25)	(0.18)	(0.30)
Intercept	7.57***	4.22**	8.76***	10.87***	0.72	3.91**
	(1.14)	(1.65)	(0.93)	(1.06)	(1.20)	(1.88)

[a] The dependent variable is the choice of contraceptive methods, and female sterilization is the base category.
[b] Numbers in parentheses are robust standard errors.
[c] * Significant at 10%, ** significant at 5%, *** significant at 1%.
[d] Number of observations is 4172. Pseudo R^2 is 0.1451. Log-pseudo likelihood is −6114.09.
[e] The base categories are *none* for literacy, *poorest* for wealth, and *mountain* for region of settlement.

Table 3
Marginal effects on contraceptive methods.[a,b,c]

	Pill	IUD	Injection	Condom	Female sterilization	Male sterilization	Implant
Female status							
years of schooling	0.001	0.001	0.007**	0.012***	−0.014***	−0.007***	0.000
	(0.002)	(0.001)	(0.003)	(0.002)	(0.003)	(0.002)	(0.001)
age	−0.011**	0.000	−0.026***	−0.035***	0.036***	0.034***	0.002
	(0.005)	(0.003)	(0.007)	(0.004)	(0.007)	(0.008)	(0.003)
squared age	0.000	−0.000	0.000**	0.000***	−0.000***	−0.000***	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
literacy: *partial*	0.000	−0.001	−0.002	0.015	−0.041**	0.032*	−0.002
	(0.016)	(0.009)	(0.023)	(0.023)	(0.021)	(0.019)	(0.010)
literacy: *complete*	0.024*	0.012	−0.005	−0.022	−0.036*	0.042**	−0.014
	(0.015)	(0.009)	(0.021)	(0.020)	(0.021)	(0.018)	(0.010)
Household characteristics							
years of schooling of husband	−0.002	0.000	−0.008***	0.008***	−0.006***	0.008***	0.000
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)
wealth: *poorer*	−0.015	0.022**	−0.055**	−0.002	0.087***	−0.037**	0.000
	(0.016)	(0.010)	(0.024)	(0.019)	(0.021)	(0.019)	(0.009)
wealth: *middle*	−0.005	0.005	−0.059**	−0.017	0.114***	−0.033*	−0.005
	(0.017)	(0.009)	(0.024)	(0.019)	(0.022)	(0.020)	(0.009)
wealth: *richer*	−0.001	0.004	−0.079***	−0.026	0.097***	0.013	−0.008
	(0.017)	(0.010)	(0.025)	(0.019)	(0.022)	(0.021)	(0.009)
wealth: *richest*	0.012	0.018	−0.119***	0.018	0.101***	−0.027	−0.004
	(0.019)	(0.012)	(0.027)	(0.020)	(0.024)	(0.022)	(0.011)
Region of settlement							
region: *hill*	0.016	−0.037***	−0.028	0.048***	0.136***	−0.126***	−0.008
	(0.014)	(0.012)	(0.021)	(0.014)	(0.014)	(0.022)	(0.010)
region: *terai*	0.021	−0.037***	−0.084***	0.033**	0.378***	−0.277***	−0.035***
	(0.014)	(0.013)	(0.020)	(0.014)	(0.014)	(0.020)	(0.010)

[a] Numbers in parentheses are standard errors calculated using the delta methods.
[b] * Significant at 10%, ** significant at 5%, *** significant at 1%.
[c] The base categories are *none* for literacy, *poorest* for wealth, and *mountain* for region of settlement.

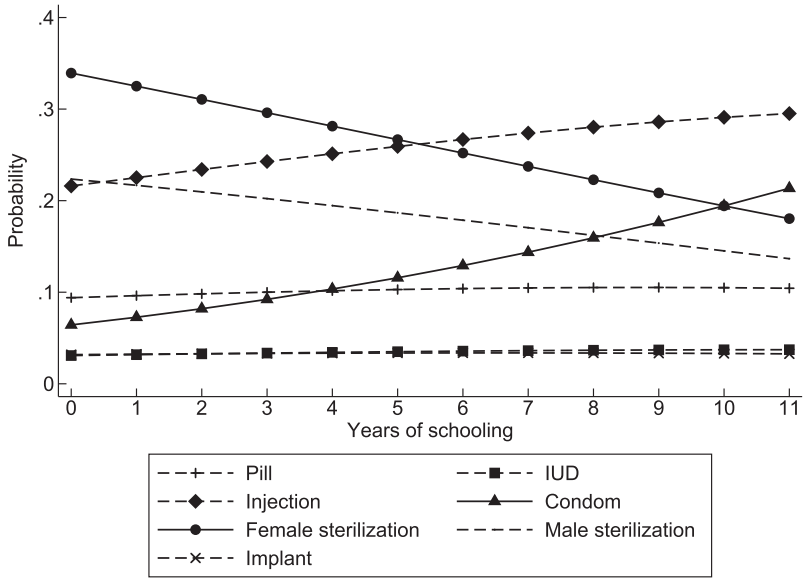

Fig. 3. Probability of choice of contraceptive methods by years of schooling.

able that takes a value of one if a respondent used condoms and zero if a respondent used female sterilization.

The coefficient for *fear of partner* was negative and statistically significant at the 5% level, indicating that a respondent who feared her partner would be more likely to select female sterilization than to use condoms for contraception. The marginal effects are also shown in the third column of Table 4. Fear of partner decreased the probability of choosing condoms by 7.0 pps (95% CI: −12.7, −1.4).

Discussion and conclusion

This paper examined how women's status affects the choice of contraceptive methods using large-scale microdata from Nepal. The estimation results suggest that the improvement of the respondents' status changed their contraceptive behaviors by increasing the probability of choosing condoms and decreasing the likelihood of selecting female sterilization. This reflects the fact that women with higher educational attainment or status in Nepal

Table 4
Estimation results and marginal effects of fear of partner.[a,b,c,d]

	Coefficients	Marginal effect
Female status		
afraid of partner	−0.628**	−0.070**
	(0.263)	(0.288)
years of schooling	0.231***	0.026***
	(0.056)	(0.006)
age	−0.567***	−0.064***
	(0.139)	(0.015)
squared age	0.006***	0.001***
	(0.002)	(0.000)
literacy: *partial*	0.281	0.032
	(0.500)	(0.057)
literacy: *complete*	0.145	0.016
	(0.481)	(0.054)
Household characteristics		
years of schooling of husband	0.089	0.010
	(0.056)	(0.006)
wealth: *poorer*	0.127	0.015
	(0.550)	(0.065)
wealth: *middle*	−0.565	−0.063
	(0.573)	(0.065)
wealth: *richer*	−0.358	−0.041
	(0.575)	(0.066)
wealth: *richest*	−0.046	−0.005
	(0.614)	(0.072)
Region of settlement		
region: *hill*	−0.648	−0.091
	(0.613)	(0.088)
region: *terai*	−2.014***	−0.257***
	(0.619)	(0.086)
Intercept	10.554***	
	(2.333)	

[a] Numbers in parentheses are robust standard errors.
[b] * Significant at 10%, ** significant at 5%, *** significant at 1%.
[c] Number of observations is 616. Pseudo R^2 is 0.4138. Log-pseudo likelihood is −377.30.
[d] The base categories are *none* for literacy, *poorest* for wealth, and *mountain* for region of settlement.

are more likely to choose condoms than female sterilization as a contraceptive method.

In terms of the choice of contraceptive methods, one of the significant features of Nepal, a least developed country (LDC), is that although the percentage of women not using any contraceptive methods is comparable to the LDC average (61.8% vs. 65.7%) [1], the female sterilization rate is between the levels of LDCs and developing countries (LDCs: 3.0%, Nepal: 9.8%, and developing countries: 20.6%). The reason for this is that the number of sites (including temporal and seasonal) providing sterilization services has been expanding since the late 1970s [22]. In addition, Nepal borders India, where the percentage of female sterilization is 35.8% [1], accounting for three-quarters of modern contraceptive methods. Thus, India has an important influence on Nepal, particularly in the Terai region, which is the region sharing a border with this country; as indicated in Table 3, the female sterilization rate is higher in the Terai region than in the other areas.

Additional years of schooling and literacy change the contraceptive behavior of women, especially in terms of reducing the percentage of female sterilization. Female sterilization is the most common contraceptive method in Nepal. However, for well-educated women, female sterilization is not the main choice; these women most frequently choose injections, followed by condoms, and female sterilization is only the third most popular option. The probabilities of choosing condoms and injections overtake the likelihood of choosing female sterilization for women with more than 10 and 6 years, respectively, of education. This implies that education and literacy will provide women with contraceptive options other than female sterilization, just as access to information can improve their knowledge about contraceptive methods [23].

This study also showed that fear of partner was associated with the selection of contraceptive methods. Women who are afraid of their partners are more likely to choose female sterilization over condoms as a contraceptive method. This implies that fear of partner discourages women from expressing their opinions in sexual relationships. Previous studies found that domestic violence reduced the rate of using any contraceptive methods and negatively affected women's reproductive health [24,25]. Fear of partner is related to domestic violence [26].

Our results also suggested that the effect of household wealth was negligible in terms of the likelihood of choosing condoms. The National Family Planning Program in Nepal has played a role in the improvement of access to modern contraceptive methods. Distribution of condoms is one of the goals of the program [27]. Family planning services provided by the public sector and non-governmental organizations are available free of charge, targeting poor households [27,28]. This may have contributed to the fact that, in Nepal, there is no difference in terms of the selection of condoms between richer and poorer households. In other words, condoms are accessible for all households, regardless of their wealth.

To summarize, improving women's status has a significant effect on changing the choice of contraceptive methods. Providing more educational opportunities and reducing women's fear of their partners may increase the probability that women will choose the contraceptive methods they desire.

Some limitations in our estimations should be mentioned here. One possible problem is sample selection bias due to the exclusion of respondents who were not using any contraceptive methods. If the choice not to use any methods is determined by women's status, this may mean that the variables related to status were biased. The second limitation is a possibility of bias due to omitted variables. If women's educational backgrounds are determined by their heritage, this may have caused educational effects to be biased. Although we controlled the variables in our estimations to correct the endogeneity problem, some biases may still remain.

Although there are such limitations, having delineated the findings of our study, we can now describe their policy implications. Family planning in Nepal has mainly focused on poor households. However, to make family planning more effective in this country (by promoting condoms and injections, which are popular in developed countries), its targets should be broadened to women with lower education. Furthermore, it would be reasonable to link the policy on caring for women fear their partners or suffer domestic violence to that of family planning, as fear of partner hinders any reduction in the use of sterilization.

Finally, providing comprehensive information on contraceptive methods will also have significant effect on improving the contraceptive knowledge and behaviors. Thus, opportunities to provide information on contraceptive methods, including the advantages and disadvantages (e.g., female sterilization is the most effective contraceptive method, but it is a permanent procedure and usually cannot be reversed), in family planning services are essential for women and couples for choosing the suitable methods for them considering the characteristics of each method.

Acknowledgement

This work was supported by JSPS KAKENHI Grant Nos. 16K17127, 15K16161, 15K00669, and 25257102.

References

[1] United Nations. World contraceptive patterns 2013; 2013. <http://www.un.org/en/development/desa/population/publications/pdf/family/worldContraceptivePatternsWallChart2013.pdf> [accessed 04.04.17].
[2] Darroch JE. Trends in contraceptive use. Contraception 2013;87(3):259–63.
[3] Wang C. Trends in contraceptive use and determinants of choice in China: 1980–2010. Contraception 2012;85(6):570–9.
[4] Ministry of Health and Population. Nepal Demographic and Health Survey 2011; 2011. <http://dhsprogram.com/pubs/pdf/fr257/fr257%5B13april2012%5D.pdf> [accessed 04.10.17].
[5] World Health Organization, Johns Hopkins Bloomberg School of Public Health, United Stated Agency for International Development. Family planning: a global handbook for providers; 2011. <http://apps.who.int/iris/bitstream/10665/44028/1/9780978856373_eng.pdf> [accessed 04.10.17].
[6] Hillis SD, Marchbanks PA, Tylor LR, Peterson HB. Poststerilization regret: findings from the United States collaborative review of sterilization. Obstet Gynecol 1999;93:889–95.
[7] McKay R, Schunmann C. Male and female sterilization. Obstet Gynaecol Reprod Med 2015;25(5):128–32.
[8] Mbizvo MT, Phillips SJ. Family planning: choices and challenges for developing countries. Best Pract Res Clin Obstet Gynaecol 2014;28(6):931–43.
[9] Cook RJ, Dickens BM. Voluntary and involuntary sterilization: denials and abuses of rights. Int J Gynecol Obstet 2000;68(1):61–7.
[10] Alfred C. Deaths after mass sterilization put India's top contraception method under scrutiny; 2014. <http://www.huffingtonpost.com/2014/11/12/female-sterilization-contraception_n_6145278.html?utm_hp_ref=world> [accessed 04.04.17].
[11] Ali MM, Cleland J. Oral contraceptive discontinuation and its aftermath in 19 developing countries. Contraception 2010;81(1):22–9.
[12] Stanback J, Lebetkin E, Orr T, Malarcher S. Sale and provision of injectable contraceptives in drug shops in developing countries: conclusions from a technical consultation. Contraception 2015;91(2):93–6.
[13] Kiykac Altinbas S, Bayoglu Tekin Y, Dilbaz B, Kilic S, Khalil SS, Kandemir O. Impact of having a high-risk pregnancy on future postpartum contraceptive method choice. Women Birth 2014;27:254–8.
[14] Padmadas SS, Lyons-Amos M, Thapa S. Contraceptive behavior among women after abortion in Nepal. Int J Gynecol Obstet 2014;127(2):132–7.
[15] Terplan M, Hand DJ, Hutchinson M, Salisbury-Afshar E, Heil SH. Contraceptive use and method choice among women with opioid and other substance use disorders: a systematic review. Prev Med 2015;80:23–31.
[16] French M, Albanese A, Gossett DR. Postpartum contraceptive choice after high-risk pregnancy: a retrospective cohort analysis. Contraception 2016;94(2):173–80.
[17] Hoopes AJ, Gilmore K, Cady J, Akers AY, Ahrens KR. A qualitative study of factors that influence contraceptive choice among adolescent school-based health center patients. J Pediatr Adolesc Gynecol 2016;29(3):259–64.
[18] Kabagenyi A, Reid A, Ntozi J, Atuyambe L. Socio-cultural inhibitors to use of modern contraceptive techniques in rural Uganda: a qualitative study. Pan Afr Med J. 2016;25. https://doi.org/10.11604/pamj.2016.25.78.6613.
[19] Luster JE, Turner AN, Alkhalaileh D, Gallo MF. Contraceptive method and self-reported HIV status among women in Malawi. Contraception 2017. https://doi.org/10.1016/j.contraception.2017.03.001.
[20] United Nations Children's Fund. Accelerating progress in girls' education; 2003. <https://www.unicef.org/teachers/girls_ed/accelerating_girls_ed.pdf> [accessed 04.10.17].
[21] Mason KO. The status of women: conceptual and methodological issues in demographic studies. Sociol Forum 1986;1:284–300.
[22] Thapa S, Friedman M. Female sterilization in Nepal: a comparison of two types of service delivery. Int Fam Plan Prespect 1998;24:78–83.
[23] Johnson D, Juras R, Riley P, Chatterji M, Sloane P Choi SK, Johns B. A randomized controlled trial of the impact of a family planning mHealth service on knowledge and use of contraception. Contraception 2017;95:90–7.
[24] Olorunsaiye CZ, Brunner Huber L, Laditka SB, Kulkarni S, Boyd AS. Associations between women's perceptions of domestic violence and contraceptive use in seven countries in West and Central Africa. Sex Reprod Healthc 2017. https://doi.org/10.1016/j.srhc.2017.01.003.
[25] Akyuz A, Yavan T, Sahiner G, Kilic A. Domestic violence and woman's reproductive health: a review of the literature. Aggress Violent Behav 2012;17:514–8.
[26] Bradley F, Smith M, Long J, O'Dowd T. Reported frequency of domestic violence: cross sectional survey of women attending general practice. BMJ 2002;324:271.
[27] Robinson WC, Ross JA, editors. The global family planning revolution. Washington DC: World Bank; 2007.
[28] National Planning Commission of Nepal. Tenth plan (2002–2007); 2002. <http://www.npc.gov.np/images/category/10th_eng.pdf> [accessed 06.20.17].