Original Article

Determinants of the First Birth Interval Among Women in India

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Abstract

Objective: The first-birth interval after a marriage indicates the reproduction behavior of women and influences the population's birth rates and size. The present study assesses predictors of the interval between marriage and first childbirth in India.

Materials and methods: The study employed the Cox proportional hazard model and Kaplan Meier Survival plot based on the data collected from 79,787 ever-married women in the 15-49 age group from the National Family Health Survey 2019-2021.

Results: The median age of marriage to the first birth interval was 23 months in India. The older marriage cohort had longer birth intervals than the younger. The hazard ratios (HR) showed that the risk of first birth after marriage was much higher among women with higher education (HR= 2.05, 95% confidence interval (CI) = 1.98-2.11) than women without education. Women in urban areas (HR=1.22, 95% CI = 1.20-1.25) had a higher risk of first birth after marriage earlier than women from rural areas. Women from North-east (HR=1.14, 95%CI=1.10-1.18) and South (HR=1.15, 95%CI=1.12-1.19) had a higher risk of having their first birth earlier after marriage than women in the North region. The women who married within 18-24 years of age had a 69 percent higher likelihood of first birth interval than those women who were married below the age of 18. The risk of first birth after marriage increased as women delayed marriage up to age 25 years and more (HR=3.18, 95% CI=3.02-3.35) than others.

Conclusion: The timing of first birth was associated with the age at the first marital union, women's educational attainment, place of residence, region, economic status, exposure to mass media, contraception use, and history of pregnancy termination.

Keywords: First Birth Interval; Cox Proportional Hazards Model; Kaplan Meier Survival Curve; India

Introduction

First birth symbolizes a woman's entry into motherhood. The first child's birth is considered the most significant factor influencing birth rates and population size (1). The first-birth interval after marriage is one indicator that may be used to determine the fertility pattern of women in the reproductive age group (2). The length of the first birth interval impacts not just the length of the next birth intervals but also the reproduction behavior of women (3,4).

Demographic and socioeconomic factors, including women's education, age at first marriage (5), residence, wealth status, husband's education,

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use of contraception, mass media exposure, and employment status (6,7), have been identified to influence the first birth interval. The woman's age during her first birth is a significant factor affecting the population increase. Early pregnancy elongates the woman's reproductive lifespan compared to equally fertile women who have children later (8). Women's educational attainment was found to substantially influence the interval between marriage to first birth, with those with low or no educational attainment giving birth more soon than others (9, 10). Respondents' rural-urban location differences also influenced the first birth interval; the interval in rural areas where marriage occurs at young ages is higher than in urban areas (Kumar & Danabalan, 2006). Socioeconomic changes affect the self-selection of spouses and the economic stability of women. In the shift from arranged to love marriages, a partner takes a long time to search for a "suitable" partner, which results in shorter birth intervals since marriage (11). Cultural traditions and social norms may greatly impact marriage to first birth. A society that mandates that women spend time with their parents or their husband's parents after marriage may cause the first child to be delayed (8, 12).

Most Indian studies have focused on predictors of birth interval with limited focus on the interval between marriage and first birth (13-15). Moreover, only a few studies conducted sufficient statistical analyses for time, i.e., survival analysis. It is crucial to study marriage to the first birth interval due to its close association with women's reproductive health and rights, especially in the Indian context, where marriage age and spouse selection continue to be decided by parents/family for most. Thus, in the present study, a detailed analysis is made to estimate the marriage to first birth interval and assess its determinants.

Materials and methods

The present study used data from the fifth round of the National Family Health Survey (NFHS-5) conducted in 2019-2021 under the aegis of the Ministry of Health and Family Welfare (MoHFW), India. The NFHS-5 is a nationally representative large-scale survey that covers all states and union territories of India. The prime objective of NFHS is to provide reliable data on various health and family welfare issues, such as fertility, mortality, maternal and child health, sexual behaviors, and domestic violence. The NFHS-5 employed a stratified two-stage random sampling design for data collection (16). As this is a secondary analysis of NFHS data available in the public domain (https://www.dhsprogram.com), no ethical approval is necessary. Ever-married women aged 15-49 covered in the state module of the survey (n=79, 787) were considered in the present analysis. In this analysis, the births in the marital union were considered to define the interval between marriage and first birth. Although premarital pregnancy might result in a first birth, these sequences were not considered due to the rarity of their occurrences in India. The analysis included 79,787 women who had their first birth after marriage (90.9%) or had no births after marriage (9.1%). The first birth interval has been grouped into three categories: before 18 months, 18-35 months, and 36 months or above (10).

The first birth interval was the dependent variable. The time between marriage and the first live birth is considered the first birth interval.

The demographic predictors considered for analysis were: age at first marriage (<18 years, 18-24 years, and 25 years or above), caste (Scheduled Caste-SC, Scheduled Tribe-ST, Other Backward Classes-OBC, none of them), religion (Hindu, Muslim, others), place of residence (rural, urban), region (north, central, east, north-east, west, south), marriage cohort (before 1990, 1990-2000, 2001-2010, 2011-2021). Socioeconomic factors included were the education level of women and their husbands (none, 1-5 years, 6-8 years, 9-12 years, 13 years of schooling and above), wealth status (poorest, poor, middle, richer, richest), and mass media exposure (yes, no). In reproductive health-related factors included in the analysis was the mother's age at first birth (<18 years, 18-20 years, 20 years or above), ever use of any contraceptive method, and ever terminated pregnancy.

Statistical Analysis: The analysis was carried out using STATA 16.1. In addition to descriptive statistics, Cox's proportional hazards model and Kaplan Meier's survival plot were applied to the data to determine the key determinants that influence the marriage to the first birth interval in India. On the other hand, for those who had births, the survival time was the time interval between marriage and first birth.

Results

Marriage to First Birth Interval: The histogram presenting the distributional pattern of the duration of marriage to the first birth interval exhibits uni-

modality and positive skewness (Figure 1). Marriage to the first birth interval of most women was above 24 months, and the decline became sharper after 36 months. It implies that most births occurred within 36 months or three years after marriage. The detailed history of first birth among the women who had experienced at least one live birth is presented in (Table 1).

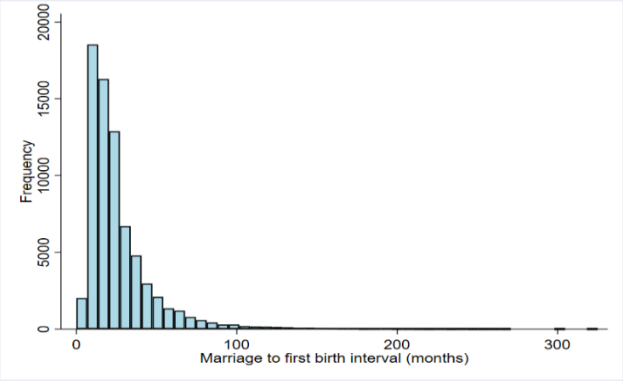

Figure 1: Histogram for length of marriage to first birth interval

All women had a median first birth interval of 20 months (1.7 years). The median interval was 24 months for women who married before age 18 and 15 months for those who married after age 25. The median first birth interval was 19 and 21 months in urban and rural areas. Among women with no education, the median first birth interval was 24 months compared with 16 months among those with higher educational attainment (13 years or above). Women in the SC category had 21 months of median first birth interval. The median interval of first birth in the marriage cohort before 1990 was 27 months, much longer than 17 months among those who married between 2011 and 2021.

Survival Functions of Marriage to First Birth Interval: This study presented the patterns of survival functions of marriage to first birth interval for various factors considered in this analysis using the Kaplan-Meier survival function curves in The most notable difference in marriage to the first birth interval was found between different categories of women's age at first marriage and at first motherhood (Figure 2). The older marriage cohort had longer birth intervals than the younger ones. In comparison to other categories of age at marriage, women who married before turning 18 showed a steeper fall. As the age at first marriage increases, women prefer to have their first child early. For other predictors, little difference in the duration of marriage to first birth interval has been observed among various categories of respondents. Urban women wanted children slightly earlier than women residing in rural areas. It has been implied that the interval in the eastern and central regions was longer than in the southern region. There is little difference in the length of marriage to first birth interval among the west and north regions. Different categories of a husband's education had varied first birth interval lengths, which is relevant. The length of the interval was wider for those who were from richer backgrounds. Women who did not ever use any contraceptive method had shown a negative relationship.

Risk Analysis of Marriage to First Birth Interval: Overall median survival time was 23 months, with 21 months in urban areas and 24 months in rural areas. The median survival time of the first birth interval was 18 months among women with higher education (13 years of schooling or above) and 32 months among those without educational attainment. The overall incidence rate of marriage to the first birth interval was 0.04 among those women who married between 18-24 years, 0.05 among those married after attaining the age of 25 years, and 0.02 among women married below 18 years. The univariate proportional hazard model estimates of the relative risk of factors influencing the interval between marriage and the first birth in India are shown in (Table 2).

In the bivariate analysis, various predictors identified significantly affected marriage to the first birth interval. The hazard ratios showed that the risk of first birth after marriage was much higher among women with higher education (HR= 2.05, 95% CI=1.98-2.11) than women without education. Women in urban areas (HR=1.22, 95% CI= 1.20-1.25) had a higher risk of first birth after marriage earlier than women from rural areas. Among all ever-married women, those exposed to mass media (HR=1.43, 95%CI=1.40-1.46) were at a higher risk of having their first birth earlier than their counterparts.

Table 3 illustrates Cox's regression after adjusting for all significant factors affecting the marriage to the first birth interval. Age at marriage was a significant factor that considerably positively affected the period between marriage and the first birth. In the regression model, women from the North-east (HR =1.14, 95%CI=1.10-1.18) and South (HR=1.15, 95% CI=1.12-1.19) had a higher risk of having their first birth earlier after marriage than women in the North region.

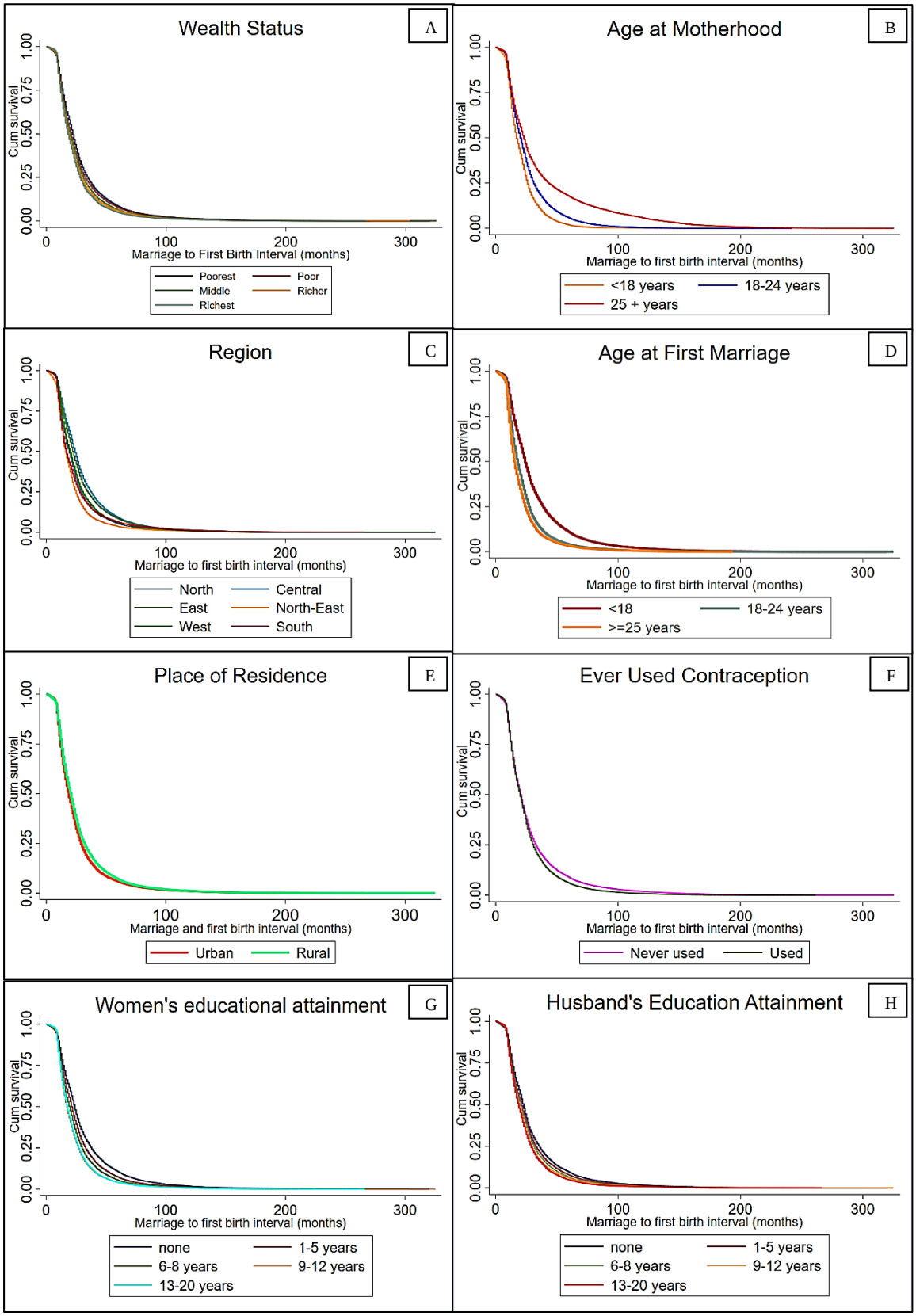

Figure 2: The Kaplan Meier survival functions of interval between marriage and first birth by respondent's characteristics

Table 1: Socio-demographic characteristics of married women with at least a birth in India, 2019-21

Variables	n	%	Median	Interval between marriage and first birth (months)		
				< 18 months n= 29,837	18-35 months n=27,209	>35 months n=15,493
Demographic factors						
Age at first marriage (y)						
less than 18	32,046	44.2	24	32.49	38.08	29.43
18-24	36,060	49.7	18	47.33	37.46	15.21
25 and above	4,433	6.1	15	53.2	33.78	13.02
Caste						
SC	15,584	21.5	21	39.67	37.76	22.57
ST	6,649	9.2	19	40.4	38.87	20.73
OBC	31,799	43.8	21	41.16	36.56	22.28
None of them	18,507	25.5	19	42.58	38.44	18.98
Religion						
Hindu	59,060	81.4	21	39.8	37.88	22.33
Muslim	9,781	13.5	19	44.15	37.39	18.46
Others	3,698	5.1	16	54.43	32	13.58
Region						
North	10,116	14.0	19	41.23	39.63	19.14
Central	16,488	22.7	24	31.69	39.68	28.62
East	17,289	23.8	22	36.79	39.79	23.42
North-east	2,713	3.7	16	48.35	38.77	12.88
West	10,227	14.1	20	44.08	37.54	18.37
South	15,706	21.7	17	52.59	31.12	16.3
Place of residence						
Urban	22,754	31.4	19	44.96	37.31	17.73
Rural	49,785	68.6	21	39.38	37.6	23.02
Marriage Cohort						
Before 1990	4,556	6.3	27	29.17	35.51	35.32
1990-2000	23,446	32.3	23	34.93	37.34	27.73
2001-2010	24,931	34.4	20	40.97	37.82	21.21
2011-2021	19,606	27.0	17	51.53	37.79	10.68
Socioeconomic factors						
Women's Education level (y)						
None	21,462	29.6	24	31.92	38.26	29.81
1-5	10,474	14.4	21	38.11	39.22	22.68
6-8	12,136	16.7	20	42.15	38.03	19.82
9-12	20,084	27.7	17	49.42	35.34	15.24
13 and above	8,383	11.6	16	47.15	37.91	14.94
Wealth Status						
Poorest	13,776	19.0	22	34.04	38.45	27.51
Poor	14,870	20.5	21	38.21	38.21	23.58
Middle	14,942	20.6	20	41.1	37.56	21.34
Richer	14,833	20.5	19	45.63	35.97	18.4
Richest	14,118	19.5	18	46.43	37.41	16.15
Mass media exposure						
No	18,193	25.1	23	33.75	38.55	27.7
Yes	54,346	74.9	19	43.6	37.16	19.23
Husband's education (y)						
None	13,474	18.6	23	34.65	38.26	27.1
1-5	10,682	14.7	21	39.71	37.06	23.23
6-8	12,517	17.3	20	41.44	37.7	20.86
9-12	25,109	34.6	19	44.2	36.69	19.11
13 and above	10,757	14.8	19	43.15	38.72	18.13

Table 1: Socio-demographic characteristics of married women with at least a birth in India, 2019-21 (continue)

Variables	n	%	Median	Interval between marriage and first birth (months)		
				< 18 months n= 29,837	18-35 months n=27,209	>35 months n=15,493
Reproductive characteristics						
Age at first motherhood (y)						
less than 18	13,767	19.0	17	50.05	37.89	12.06
18-20	48,505	66.9	20	40.32	38.67	21.01
>20	10,267	14.2	23	33	31.53	35.47
Ever used contraception						
Never used	20,664	28.5	20	39.21	36.12	24.67
Used	51,875	71.5	20	41.9	38.06	20.04
Ever had terminated pregnancy						
No	60,472	83.4	20	42.44	37.28	20.28
Yes	12,067	16.6	23	34.57	38.66	26.76
Total	72,539	100	20	41.1	37.5	21.4

The women who married within 18-24 years of age had a 69 percent higher likelihood of first birth interval than those who were married below 18. The risk of first birth after marriage increased as women delayed marriage up to age 25 years and more (HR=3.18, 95% CI=3.02-3.35) than others.

Women's education strongly positively influenced marriage to the first birth interval. The analysis shows that the respondents who had 1-5 years of schooling have a 17 percent higher likelihood of having their first birth after marriage than their uneducated counterparts. It is also observed that women who had 9-12 years (secondary) and 13 years and above (higher secondary education) had a 30 percent and 23 percent higher likelihood of giving birth than illiterates. Including the husband's education in this model suggests that women with better-educated husbands than those with less education were at a higher risk of having their first child after marriage (HR=1.01, 95%CI=0.96-1.04). Women who ever used any method of contraception had a 14 percent higher risk of having shorter first birth intervals than those who never used it. Mothers having their first birth at 18 to 24 years had a 41 percent lower risk of first birth than those who had births on or before attaining 18 years.

Discussion

This study found that the average time between marriage and first birth among women is nearly two years. The significant predictors of marriage to first birth interval include women's age at first marriage, caste, religion, geographical region, place of residence, marriage cohort, women and their husband's educational attainment, ever use of contraception, and pregnancy termination.

The study found that the median interval between marriage and first birth is 23 months. This estimated interval time is three months more than an earlier district-level study conducted one and half decades ago (8). Significant differences in the median interval between marriage and first birth across the respondent's characteristics existed. The median interval between marriage to first birth decreased with delayed age at first marriage. This study discovered a larger likelihood of a lengthy marriage to first birth interval for women who marry before becoming 18 years old. This concurred with previous studies (9, 12, 17). This implies that women who postpone marriage often start having children shortly after marriage to compensate for their delayed entry into motherhood.

This study found that women from the older marriage cohort (Before 1990) had a longer duration of marriage to the first birth interval than younger cohorts. The young age at marriage of the women in the older cohort of marriages might be responsible for this. Early-married women are neither mentally nor physiologically ready to become a mother. In addition, women used to spend a long time in their native homes before having their first birth. No education, apprehension, distress, early stage of physiological development, and unjustifiable extrapolation from family members could have affected the readiness of young girls to enter into motherhood and have reproductive health-related challenges due to young age (12).

Table 2: Results of the univariate Cox proportional hazards analysis (crude analysis) to evaluated factors related to interval between marriage and first birth among ever-married women, India 2019-21

Variables	IR	Median ST (in months)	β	HR	SE (β)	95% CI for HR	P-value
Demographic factors							
Age at first marriage (y)							
less than 18	0.022	30		Ref.			
18-24	0.037	20	0.45	1.57	0.010	[1.53-1.60]	<0.001
25 and above	0.045	16	0.62	1.86	0.018	[1.79-1.92]	<0.001
Caste							
SC	0.027	24	-0.19	0.01	0.827	[0.80-0.85]	<0.001
ST	0.030	22	-0.10	0.01	0.906	[0.88-0.93]	<0.001
OBC	0.029	24	-0.14	0.01	0.872	[0.85-0.89]	<0.001
None of them	0.034	21		Ref.			
Religion							
Hindu	0.029	24		Ref.			
Muslim	0.029	22	-0.05	0.95	0.015	[0.92-0.98]	<0.01
Others	0.037	18	0.17	1.19	0.015	[1.15-1.22]	<0.001
Region							
North	0.033	21		Ref.			
Central	0.023	29	-0.31	0.73	0.014	[0.71-0.75]	<0.001
East	0.025	26	-0.24	0.79	0.015	[0.76-0.81]	<0.001
North-east	0.037	19	0.08	1.08	0.016	[1.05-1.11]	<0.001
West	0.032	22	-0.01	0.99	0.017	[0.96-1.03]	0.638
South	0.036	18	0.06	1.06	0.015	[1.03-1.09]	<0.001
Place of residence							
Urban	0.034	21	0.20	1.22	0.009	[1.20-1.25]	<0.001
Rural	0.029	24		Ref.			
Marriage Cohort							
Before 1990	0.014	47	-1.24	0.29	0.024	[0.27-0.31]	<0.001
1990-2000	0.021	30	-0.80	0.45	0.012	[0.44-0.46]	<0.001
2001-2010	0.032	23	-0.41	0.66	0.011	[0.65-0.68]	<0.001
2011-2021	0.049	17		Ref.			
Socioeconomic factors							
Women's Education level (y)							
None	0.020	32		Ref.			
1-5	0.027	25	0.32	1.37	0.015	[1.33-1.42]	<0.001
6-8	0.033	22	0.50	1.65	0.014	[1.61-1.69]	<0.001
9-12	0.041	18	0.67	1.96	0.013	[1.91-2.01]	<0.001
13 and above	0.042	18	0.72	2.05	0.016	[1.98-2.11]	<0.001
Wealth Status							
Poorest	0.023	28		Ref.			
Poor	0.027	24	0.17	1.19	0.015	[1.15-1.22]	<0.001
Middle	0.031	22	0.29	1.33	0.015	[1.29-1.37]	<0.001
Richer	0.035	21	0.39	1.47	0.015	[1.43-1.52]	<0.001
Richest	0.038	19	0.47	1.60	0.015	[1.55-1.65]	<0.001
Mass media exposure							
No	0.022	28		Ref.			
Yes	0.033	21	0.36	1.43	0.011	[1.40-1.46]	<0.001
Husband's education (y)							
None	0.021	29		Ref.			
1-5	0.026	26	0.18	1.20	0.017	[1.16-1.24]	<0.001
6-8	0.030	23	0.32	1.38	0.016	[1.33-1.42]	<0.001
9-12	0.034	21	0.43	1.53	0.014	[1.49-1.58]	<0.001
13 and above	0.038	20	0.54	1.72	0.017	[1.66-1.77]	<0.001

Table 2: Results of the univariate Cox proportional hazards analysis (crude analysis) to evaluated factors related to interval between marriage and first birth among ever-married women, India 2019-211 (continue)

Variables	IR	Median ST (in months)	β	HR	SE (β)	95% CI for HR	P-value
Reproductive characteristics							
Age at first motherhood (y)							
less than 18	0.032	22	0.02	1.02	0.014	[0.99-1.04]	0.224
18-24	0.031	23	-0.21	0.81	0.017	[0.79-0.84]	<0.001
>=25	0.024	24		Ref.			
Ever used contraception							
Never used	0.029	23		Ref.			
Used	0.031	23	0.07	1.07	0.010	[1.05-1.09]	<0.001
Ever had terminated pregnancy							
No	0.031	22	0.09	1.09	0.013	[1.07-1.12]	<0.001
Yes	0.027	26		Ref.			

IR: Incidence Rate; HR: Hazard Ratio, CI: Confidence Interval; SE: Standard Error

This indicated that marriage at a later age tends to decrease fertility rates among women. The impact of women's educational attainment of marriage to first birth interval has been found in this study, which conforms to some previous studies (5 ,8, 12, 18, 19). These studies also have recorded that women with no or low levels of education had longer intervals from marriage to first birth.

A strong association exists between marriage to first birth interval and women's educational attainment. This may be explained by the fact that women with higher levels of education are more prepared for marriage, better aware, and have more options when selecting their spouses. As a result, they get intimate with their partners more quickly, which leads to shorter first-birth intervals. This enabling environment might result in a shorter time between marriage and the first child and fewer births per woman.

Marriage to the first birth interval was more prolonged among women in rural areas than in urban areas. A similar result was also found in previous works in China (9), Bangladesh (5, 20) and Ethiopia (12). These variations could be attributed to the fact that most women in metropolitan areas are better prepared for marriage than those in rural areas, and as a result, they are much more inclined to give birth shortly after getting married. The disparities may have also been affected by the availability of improved medical treatment in urban areas (21). The lengthy timing of first births in rural areas among women who married early and are illiterate or have low education could be attributed to high gestation loss, which is common among these women due to poor antenatal care services (21, 22).

Women who reported that they had ever used contraceptives had a shorter duration of the first birth interval than those who did not use them. On the other hand, respondents who ever had terminated their pregnancy had a higher risk of longer first-birth intervals. This can be explained in this way since any contraceptive prevents pregnancy temporarily. On the contrary, since such women are more likely to experience pregnancy complications due to a previous medical termination or abortion, this may decrease the likelihood and health of another new conception (23, 24).

The present study has several strengths and limitations. The results are based on the most recent large-scale nationally representative data, allowing us to reflect on the current situation of the first birth interval in the country. However, the cross-sectional nature of the dataset does not allow for any causal inference. Moreover, other biological, economic, social, and cultural factors also affect the timing of the first birth, which the current research could not include due to data unavailability.

Conclusion

The median interval between marriage and first birth in India is 23 months. The timing of first birth is associated with the age at the first marital union, women's educational attainment, place of residence, region, economic status, exposure to mass media, contraception use, and history of pregnancy termination. Moreover, women from the older marriage cohort had a longer duration of marriage to the first birth interval than younger cohorts.

Table 3: Cox's Proportional Hazard Regression coefficients of marriage to first birth interval by different covariates

Variables	HR	SE	95% CI
Demographic factors			
Age at first marriage (y)			
less than 18	Ref.		
18-24	1.69***	0.021	[1.65,1.73]
25 and above	3.18***	0.084	[3.02,3.35]
Caste			
SC	0.90***	0.014	[0.88,0.93]
ST	0.98	0.017	[0.95,1.02]
OBC	0.92***	0.012	[0.90,0.95]
None of them	Ref.		
Religion			
Hindu	Ref.		
Muslim	0.92***	0.015	[0.89,0.95]
Others	1.01	0.018	[0.97,1.04]
Region			
North	Ref.		
Central	0.83***	0.013	[0.81,0.86]
East	0.94***	0.016	[0.91,0.97]
North-east	1.14***	0.021	[1.10,1.18]
West	1.02	0.018	[0.98,1.06]
South	1.15***	0.018	[1.12,1.19]
Place of residence			
Urban	1.01*	0.012	[0.98,1.03]
Rural	Ref.		
Marriage Cohort			
Before 1990	0.33***	0.009	[0.31,0.35]
1990-2000	0.50***	0.007	[0.48,0.51]
2001-2010	0.68***	0.008	[0.67,0.70]
2011-2021	Ref.		
Socioeconomic factors			
Women's Education level (y)			
None	Ref.		
1-5	1.17***	0.019	[1.13,1.20]
6-8	1.23***	0.02	[1.19,1.27]
9-12	1.30***	0.021	[1.26,1.34]
13 and above	1.23***	0.028	[1.18,1.29]
Wealth Status			
Poorest	Ref.		
Poor	1.08***	0.017	[1.05,1.12]
Middle	1.14***	0.019	[1.10,1.18]
Richer	1.20***	0.022	[1.16,1.25]
Richest	1.28***	0.028	[1.22,1.33]
Mass media exposure			
No	Ref.		
Yes	1.08***	0.014	[1.06,1.11]
Husband's education (y)			
None	Ref.		
1-5	1.02**	0.018	[0.98,1.06]
6-8	1.03*	0.018	[1.00,1.07]
9-12	1.02**	0.017	[0.98,1.05]
13 and above	1.01*	0.021	[0.96,1.04]

Table 3: Cox's Proportional Hazard Regression coefficients of marriage to first birth interval by different covariates (continue)

Variables	HR	SE	95% CI
Reproductive characteristics			
Age at first motherhood (y)			
less than 18	Ref.		
18-24	0.59***	0.009	[0.57,0.61]
>=25	0.26***	0.006	[0.24,0.27]
Ever used contraception			
Never used	Ref.		
Used	1.14***	0.012	[1.12,1.17]
Ever had terminated pregnancy			
No	1.11***	0.014	[1.08,1.13]
Yes	Ref.		
Log-likelihood		-474576.34	
Model P-value		<0.001	

* p<0.05, ** p<0.01, *** p<0.001; HR: Hazard Ratio; SE: Standard Error; CI: Confidence Interval

Conflict of Interests

Authors declare no conflict of interests.

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