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Original Research Article

Determinants of first birth interval in an Indian scenario: National Family Health Survey based analysis

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ABSTRACT

Background: First birth interval (FBI), a time gap between marriage and first live birth is an important predictor of population size of a country and has a significant impact on its age structure. Longer FBI (delayed fertility) is a burning issue in modern India and has socioeconomic, demographic, and biological determinants. It represents reproductive behaviour and capabilities of Indian couples. The determinants of prolonged FBI have not been analysed in Indian scenario yet. We aimed at evaluating first birth interval at 84 months and above to highlight the factors responsible for delayed fertility and produce evidence that can modify or improve the current reproductive health program policies in India.
Methods: Statistical analysis of sociodemographic data obtained from the National Family Health Survey-4 (NFHS-4, 2015-16) of Indian women in their reproductive age (15-49 years) and married for 7 years and above and having either a child delivered or yet to deliver it after 84 months of marriage was done to draw meaningful conclusions.
Results: 24% women had FBI of 84 months and above. Age at marriage had an "U-shaped" association with delayed fertility, early and late marriages exhibiting higher risk for delayed childbearing. Education of women was the most important determinant of prolonged FBI followed by wealth index, body mass index, religion, and residence.
Conclusions: This insight in Indian fertility dynamics highlights need of reformulating the reproductive health policies for better program outcomes in India.

Keywords: Age at marriage, Delayed fertility, First birth interval, NHFS India

INTRODUCTION

The interval between marriage and first child i.e. first birth interval (FBI) defines the fertile life of a couple and represents the beginning of the reproductive process. First child birth explains the reproductive capabilities of the couple and the timing of childbearing is a predictor of future population size and has some impact on the age structure of the country.[1] FBI along with its socio-economic and demographic determinants, describes fertility dynamics of the couple.[2] First child birth is an important determinant of fertility behaviour and population size.[3] FBI is frequently used to understand couples' reproductive patterns and behaviours.[4-15] Birth intervals are also used as tool to analyse fertility control in some studies.[13-15] The determinants for FBI are age at marriage, education, the present age, couples' involvement in decision making, and household per capita income. They also determine the fertility variations and hence the population dynamics.[16] In a study conducted in Jordan, a mediterranean country, has shown the risk estimate for "not having a first child within ten years of marriage" and

subsequent possible infertility was found to be 48%, 39%, and 26%, for FBIs of 15, 18, and 24 months respectively.[17]

Bratti et al have found the consequences of delaying the first childbirth on subsequent childbirth and population dynamics in contemporary Europe.[18] In Korean population, the percentage of first child delivery following the marriage decreased by 26.5% when "time of marriage" was 18 years and 5% when it was 22 years and above, showing an inverse relationship between age at marriage and FBI.[19]

Being a rapidly developing country, the necessity arises to study the fertility patterns and population dynamics of India by undertaking the evaluation of determinants of first birth interval (FBI). So, the present study was aimed to evaluate and analyse the determinants of first child birth at 84 months and above to highlight the current fertility behaviour of Indian population. This insight may be helpful in assessing, modifying and reimplementing the reproductive health program policies to improve the program outcomes in Indian scenario.

METHODS

To study the determinants of first birth interval (FBI), secondary data from National Family Health Survey-4 (NFHS- 4, 2015-16) was used, which is a complete enumeration survey information. For the present study, Indian married women with duration of 7 years (84 months) and above since marriage with at least one child born after 84 months or yet to deliver their first child and still experiencing their reproductive life (i.e. aged between 15-49 years) were considered as the eligible population.

Study was conducted in department of epidemiology and biostatistics, KLE Academy of Higher Education and Research (KAHER) Deemed to be University, Nehru Nagar, Belagavi, Karnataka, India, 590010. Since the present study involved analysis of secondary data, ethical clearance was not needed.

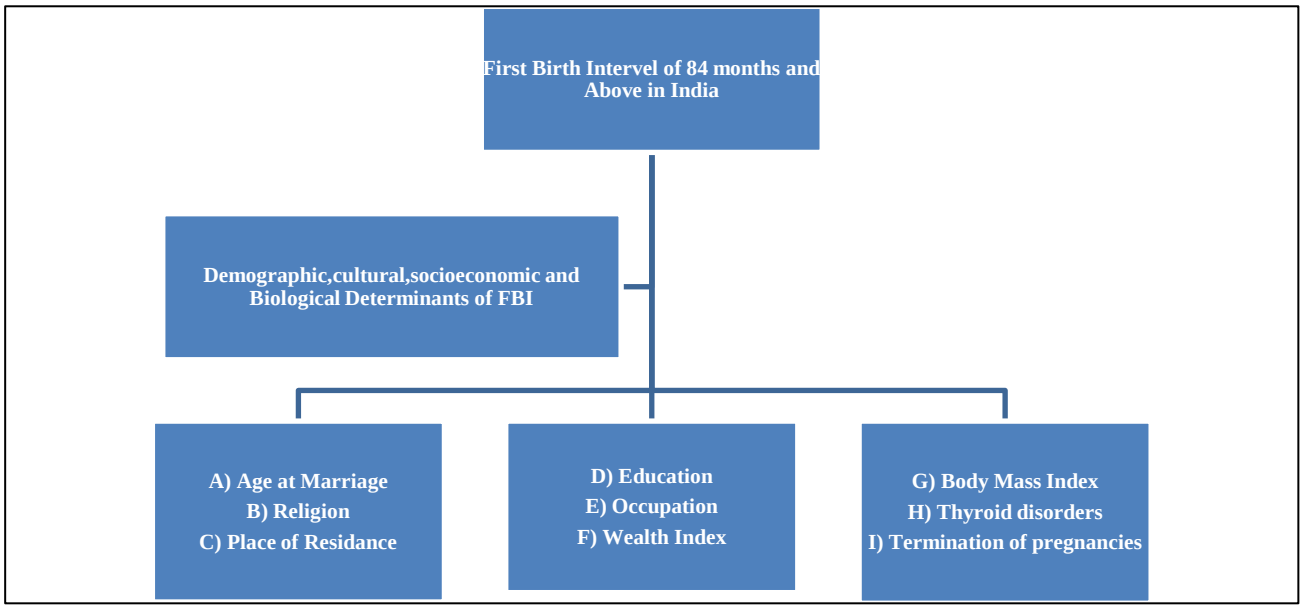

Figure 1: Conceptual model to study first birth interval (FBI) of duration 84 months and above with its determinants.

The conceptual model for first birth interval with its major determinants was formulated and statistical tests were applied to draw meaningful conclusions.

Conceptual model to study first birth interval (FBI) of duration 84 months and above with its determinants was is shown in Figure 1.

The data was statistically analysed as follows: chi-square test was used to study association of first birth interval of 84 months and above and its determinants. Logistic regression analysis was used to analyse first birth interval of 84 months and above as compared to FBI less than 84 months with its determinants. Microsoft Excel 2019 and IBM SPSS 20 version software was used to analyse the data.

RESULTS

Overall, 32058 women married for 7 years and above and were in their reproductive age (15-45 years) constituted study population for analysing FBI/delayed birth of 84 months and above. Among them 24% women were yet to deliver their first child after marriage or had a child only after 84 months of marriage.

Table 1 reveals that (A) first child birth at 84 months and above had significant ($p<0.001$) effect on age at marriage.

Women married before 20 years of age had 1.58 times higher risk of having births after 84 months and above with 95% CI; 1.5-1.67 as compared to age at marriage 20-29 years. Similar figures (OR) for age at marriage 30 years were 1.42 with 95%CI; 1.22-1.65, indicating inverse relationship of first child birth after 84 months and above with age at marriage. (B) First child birth at 84 months and above exhibited varying association with religion (p<0.001). Muslim women were with 1.37 times higher risk of late births with 95% CI; 1.26-1.5 as compared to Hindus, followed by Christian OR 0.93 with 95% CI; (0.84-1.04) and Sikh 0.43 with 95% CI (0.36-0.52). (C) First child birth at 84 months and above had significant (p<0.05) association with place of residence. (D) First child birth at 84 months and above had significant inverse association (p<0.001) with education of women, varying from 2.78 times to 1.97 times for respective education groups with 'no education' and 'primary education' with respect to 'secondary and above'. (E) First child birth at 84 months and above had no significant (p=0.17) association with occupation level of women. (F) First child birth at 84 months and above had negative association (OR=2.19, p<0.001) with 'poor' wealth index women with respect to women with 'middle and rich' wealth index. (G) First child birth at 84 months and above had significant (p<0.001) increasing association with body mass index, varying from 1.41 in BMI 'less than 18.5' and 0.97 in BMI '25 and above' with respect to BMI '18.5-24.9'. (H) First child birth at 84 months and above had no significant (p=0.73) association with presence of thyroid disorder. (I) First child birth at 84 months and above had no significant association (p=0.7) with termination of pregnancy.

Table 1: Analysis of first child birth at 84 months and above by its major determinants.

Determinants of FBI	Total	First child birth at 84 months and above	OR	95% CI of OR	
				Lower limit	Upper limit
A) Age at marriage in years; χ_2^2=293.73; p<0.001					
<20	15946	4447	1.58	1.5	1.67
20-29	15153	2973	1		
30+	959	247	1.42	1.22	1.65
B) Religion; χ_4^2=168.2; p<0.001					
Hindu	25323	6085	1		
Muslim	2813	852	1.37	1.26	1.5
Christian	1871	427	0.93	0.84	1.05
Sikh	1091	131	0.43	0.36	0.52
Other	960	172	0.69	0.58	0.82
C) Place of residence; χ_1^2=202.14; p<0.001					
Urban	38258	1026	0.68	0.64	0.71
Rural	83173	1978	1		
D) Education; χ_2^2=1247.38; p<0.001					
No education	6833	2620	2.78	2.62	2.95
Primary	3555	1087	1.97	1.82	2.13
Secondary and above	21670	3960	1		
E) Occupation; χ_1^2=1.9; p=0.168					
No working	3992	920	1		
Working	28066	6747	1.06	0.98	1.14
F) Wealth index; χ_1^2=824.06; p<0.001					
Poor	8862	3100	2.19	2.08	2.32
Middle and rich	23196	4567	1		
G) Body mass index; χ_2^2=84.79; p<0.001					
<18.5	3719	1113	1.41	1.3	1.52
18.5-24.9	17859	4155	1		
25+	9800	2234	0.97	0.92	1.03
H) Thyroid disorder; χ_1^2=0.122; p=0.727					
No thyroid disorder or status unknown	30883	7391	1.02	0.89	1.18
Thyroid disorder present	1175	276	1		
I) Ever had a terminated pregnancy; χ_1^2=0.153; p=0.695					
No	25057	6005	1		
Yes	7001	1662	0.99	0.93	1.05

Table 2 reveals that standardised odds ratio (OR) for women married in age groups; <20, and 30 years and above were 1.29, 1.38 with respect to women married in age group 20-29 years, indicating U-type of risk of delayed delivery by age at marriage, p<0.001. Furthermore, unstandardised odds ratios are higher as compared to standardised, indicating multicollinearity of first child birth at 84 months and above with its determinants. Standardised odds ratios of first child birth at 84 months and above was significantly (p<0.001) lower amongst Sikh women (OR=0.52) and the highest in Muslim (1.27) as compared to Hindus, p<0.001. Standardised odds ratios of first child birth at 84 months and above was 0.93 in urban resident women as compared to rural resident women, p<0.05. Standardised odds ratios of first child birth at 84 months and above for illiterate and primary educated women were 2.16 and 1.65 with respect to secondary and above educated women, p<0.001. Odds ratio of first child birth at 84 months and above decreased consistently by increasing level of education of women from 2.78 to 1.97. Standardised odds ratio (OR) for women having BMI groups; '<18.5' and '25+' were 1.09 (p<0.05), 1.23 (p<0.001) with respect to '18.5-24.9' BMI women.

Table 2: Logistic regression estimates of first child birth at 84 months and above by its determinants.

Variables in the equation		Odds ratio (OR)		95% CI for standardised OR	
		Unstandardised	Standardised	Lower	Upper
Age at marriage	<20***	1.58	1.29	1.22	1.37
	20-29	1	1		
	30+***	1.42	1.38	1.18	1.61
Religion	Hindu	1	-		
	Muslim***	1.37	1.27	1.16	1.38
	Christian	0.93	1.00	0.89	1.13
	Sikh***	0.43	0.52	0.43	0.62
	Others***	0.69	0.66	0.56	0.79
Place of residence	Urban*	0.68	0.93	0.87	0.99
Education	No Education***	2.78	2.16	2.01	2.31
	Primary***	1.97	1.65	1.52	1.8
	Secondary and above	1	-		
Wealth index	Poor***	2.19	1.48	1.39	1.59
	Middle and rich	1	-		
Body mass index	<18.5*	1.41	1.09	1.00	1.18
	18.5-24.9	1	-		
	25+***	0.97	1.23	1.16	1.31
Constant		-	0.085	-	-

*p≤0.05, ***p≤0.001, determinants: age at marriage, place of residence, religion, education, wealth index, body mass index.

DISCUSSION

Prolonged first birth interval (FBI) is an indicator of reproductive behaviour of couple after marriage. In present study, Indian women with married for 84 months and above and experiencing their reproductive age (i.e. 15-45 years) were investigated for delayed birth using its determinants vis. age at marriage, place of residence, religion, education, occupation, wealth index, body mass index, thyroid disorder, and medical termination of pregnancy. The effort is made to investigate the current fertility patterns in the country and to establish the evidence to modify, reimplement and improve the reproductive health programs and their outcomes. Total 32058 Indian women married at least for 7 years (84 months) constituted study population for analysing delayed fertility of 84 months and above, with its determinants. Among them 24% women had experienced one child or yet to deliver their first child birth only after 84 months of marriage. Similar study done by Singh et al from regional Indian state of Uttar Pradesh (India), had the lower percentage of delayed fertility of 20%. The reason might be place of residence of women in Uttar Pradesh.[24]

The present study revealed a U-shaped association between age at marriage and the risk of delayed first childbirth. The odds ratio (OR) of women who married before age of 20 and those who married at 30 years of age or older were 1.29 and 1.38, respectively, experiencing high risk of delayed their first childbirth after 84 months of marriage. The cause of the high risk in early marriages may be socioeconomic challenges; in later marriages, the contributing factor might be biological reasons or decisions made in lifestyle that postpone motherhood. This type of finding is consistent with study done by Miri et al in Iran, Dehesh et al in Kerman, Tai-Hun in Korea,

Rahman et al in Bangladesh, and by Singh et al in Uttar Pradesh (India).[9,12,19,23,24] Religion had significant impact on timing of first childbirth. Muslim women showed 1.27 times higher risk of late childbirth compared to Hindu women, while Sikh women had 0.52 times lower risk. This discrepancy could be explained by differing cultural norms, religious views, and marriage and birthing habits. Sikh women may have lower risks because they engage in more active reproductive healthcare and health-seeking activities, whereas Muslim women might have greater odds because they have cultural aspirations for bigger family sizes, potentially postponing the timing of their first birth. The similar type of findings was found in studies done by Singh et al in Uttar Pradesh (India) and by Singh et al in Manipur.[24] Urban women were found to have 0.93 times lower risk of delayed first childbirth compared to their rural resident women. This could be associated with more facilities for medical resources, education, and birth control programs in urban areas, which are supported to good decisions about reproductive life and better health outcomes for mother and child. This type of finding is consistent with studies done by Singh et al in Uttar Pradesh (India) and by Tesema et al in Ethiopia.[20,24]

Education was strongly inversely associated with risk of delayed first childbirth. Illiterate women or primary educated women were 2.16 and 1.65 times more in risk of delayed first birth compared to secondary and higher educated women. The reason is; more educated women have appropriate knowledge about reproductive health and healthcare services, and due to that, the ability to make decisions about family planning will increase. Whereas, similar types of findings were observed by Gurmu et al Ethiopia, by Singh et al in India's Uttar Pradesh and Kerala states, Feng et al in China, Rahman et al in Bangladesh and by Khan et al in urban and rural areas of Bangladesh.[23,25-29] Wealth index had an impact on the timing of first childbirth. Due to less access to healthcare, nutritious food, and other necessary medical support for timely childbirth and financial stress, poor wealth index women were more at risk of delaying first childbirth as compared to middle and rich wealth index women.[30] This type of findings is consistent with studies by Al Shanfari et al in Jordan, by Mubiru et al in Uganda, Nath et al in India, Nath et al in Indian urban society and by Rahman et al in Bangladesh.[16,17,23,31,32]

The study also found that women with a BMI less than 18.5 and 25+ were at a higher risk of delayed first childbirth compared to those with a BMI of 18.5-24.9. This suggests that extremes of body weight could negatively impact fertility, either through malnutrition or obesity-related health issues, both of which can affect reproductive health. These findings are consistent with studies done by Gesink et al in 12 centres in the United States from 1959 to 1965, by Nohr et al in Denmark and by Pandey et al in a literature search done from 1950 to July 2010.[33-35]

Present study found no significant association between delayed first childbirth and women's occupation, thyroid disorders, or history of terminated pregnancies. This suggests that these factors might influence reproductive health, but they do not play a significant role in the timing of the first childbirth within the context of this study. Similar findings were found by Inagaki et al in Japan and Bucci et al in Italy.[36-40,42]

In this study, women's characteristics were only examined for analysing the delayed first child birth after marriage, although male traits also have some contribution to change fertility pattern, which is not considered. Furthermore, due to a lack of data on contraception practices during first conception after marriage and women's medical histories, fertility patterns could not be fully explained.

CONCLUSION

The significant correlations between delayed first childbirth and individual factors such as age at marriage, religion, place of residence, education, wealth index, and BMI reveal the need for emphasized interventions. Efforts should be concentrated on enhancing access to education and healthcare, particularly in rural areas and among economically disadvantaged people. Addressing those factors through education, healthcare access, and community-based interventions has the potential to lower the prevalence of delayed first childbirth in India, contributing toward better reproductive health and population growth overall. The study findings can help in reformulating the existing reproductive health policies and reproductive health programs for better program outcomes in India.

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