Parity Progression Analysis to Study the Urban-rural Differentials in Fertility in Uttar Pradesh

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Abstract:

The study made an effort to examine the rural –urban differentials in the staging of the process of childbearing in the state of Uttar Pradesh using birth history data from NFHS-3, using parity progression ratios. The results are useful to provide an empirical insights into the family building process in state of Uttar Pradesh. It is evident that without drastically reduction in values of PPR at parities 2,3 and 4, fertility reduction in the state of Uttar Pradesh to an applicable degree, could not be achieved in near future. Hence there is an urgent need to address the excess fertility in rural areas through wide coverage of information, education and communication of family planning benefits and by enhancing women's education, standard of living and access to modern family planning methods.

1. Introduction

The spacing between two successive births and progression from former birth to next birth are two important dimensions of fertility behavior of married women [1-5]. The first aspect, i.e., the inter-live birth interval is a good index of fertility measuring the level and pattern of reproduction of only those who continue to reproduce [5-6]. The index, however, has limited value in the study of human fertility particularly in societies where fertility is within the calculus of conscious choice of desired family size and the number of children already born to them becomes important determinant of limiting their family. The specific index which measures fertility in the second dimension is the parity progressive ratios (PPR) which gives the probability that a woman of a given birth order ever proceeds to the next child [1,6], has acquired dominant place in the study of fertility. Research suggests that two populations having same child spacing pattern, may have different limiting pattern and thereby may have different parity progression ratios [5,7]. The PPR is partly affected by incidence of secondary infertility which changes over age. It can be defined either at the time of birth of i^{th} child or at the time of

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survey, a random point in time after the occurrence of i^{th} child [6,8,9].

After independence India, several efforts have been to curtail population growth through various policy approaches [10-13] that resulted in reduction of fertility, improvement in infant and child survival [14-16]. But it remains far from satisfaction mainly because of great diversity in fertility levels and differentials among states [10,17-21]. In 2014, the total fertility rate (TFR) in India was around 2.3 children per woman which though varied from 2.5 children per woman in rural areas to 1.8 children per woman in urban areas [15]. Amongst states, TFR ranges from replacement level in some southern states to more than three children in northern states, particularly, in Uttar Pradesh and Bihar [14-16]. Despite the sharp decline in the percentage decadal population growth rate, India has added more than 181 million populations that is slightly lower than the population of Brazil in terms of absolute numbers during the decade 2001-2011 [14]. Around 16% of total Indian population lived in the state of Uttar Pradesh; which alone contributes around 18.42% in the growth Indian population during the decade 2001-2011 [14]. It may be then of immense interest to policy makers and programme managers to understand the circumstances and extent under which fertility of Uttar Pradesh is stalling. Reason for this slow decline may be early age marriage, high concentration of sexually active population, and a higher proportion of rural population which is around more than three quarter of the population in the state of Uttar Pradesh [14]. To the context of comparison of the reproductive performance of two or more populations having same child spacing patterns but different familial decisions about ultimate number of children, the analysis of PPR has special significance. Analysis of PPR disentangles the quantum and tempo aspects of fertility [7, 22] and is a convenient measure to assess the impact of dynamic population policies and programmes on fertility in a country [1,2, 22].

In India, there are very few studies which have used parity progression ratios to study family building process at national level as well as state level. It is Gandotra et al. (1998) which have studied fertility differential at national as well as state level using the second round of National Family and Health Survey (1998-99) and indicated that rural women were more prone to have greater PPRs than urban women [23]. In 1998, Kulkarni and Choe proposed a new measure of wanted and unwanted fertility in select states of India based on parity progression using data from 1991-92 National Family and Health Survey [24]. Alagarajan and Kulkarni in 1998 used parity progression ratios to examine the fertility differentials by

religion in Kerala [25]. Mutharayappa et al. (1997) [26] and Sanjukta Chaudhuri (2012) [27] studied the effect of son's desire on parity progression ratio at national as well as state levels. Using parity progression ratios, Spoorenberg in 2010 [28] studied the fertility transition in India between 1997 and 2004 using all three rounds of National Family and Health Surveys conducted in 1991-92 (NFHS-1), 1998-99 (NFHS-2) and 2005-2006 (NFHS -3) respectively. In 2012, Spoorenberg and Dommaraju [21] examined the regional fertility transition in India using synthetic parity progression ratios between 1997 and 2004 and provided a longer perspective on fertility changes by parity over a period of 25 years.

In the present study, an efforts has been made to examine the rural-urban differentials in the staging of the process of childbearing in the state of Uttar Pradesh using birth history data of third round of National Health Family Survey (2005-06) using parity progression ratios. The results are expected to provide an empirical insights into the family building process in the most populous state of Uttar Pradesh. Such analysis besides scientific reasons, may be important for evaluating the population policy and programmes of the most populous state of the country, Uttar Pradesh which tend to have goals formulated in terms of parity progression, e.g. stopping at two or three.

2. Data and method

2.1 Data

The study uses data from the third rounds of India's National Family Health Survey, 2005-06 (NFHS-3) for the state of Uttar Pradesh. The survey was conducted across the country during the period November 2005 to August 2006 [16,29]. It is a nationally representative survey, which covered more than 99 percent of India's population residing in all 29 states. The survey collected information on complete birth history of women age 15-49, besides demographic, and health indicators. All women were interviewed irrespective of their marital status, i.e., ever married and never married. During the survey, a uniform sampling design was used to ensure comparability and the highest data quality across the country. It used 2001 census list of villages in rural areas and the list of wards in urban areas as sampling frame. Multi-stage probability sampling design was adopted to select sampling units (women in reproductive age 15-49). Samples were selected in the two stages in rural areas and in three stages in the urban areas [16, 29]. Details of the study methodology and sampling are described elsewhere [29].

This study has focused on the ever-married women from the state of Uttar Pradesh. The data collection in the state was carried out from November 2005 to May 2006. During the survey, around 12,183 women (unweighted, de-facto population) were interviewed

with 93.9 percent response rate from 10,026 households with 96.6 percent response rate in the state of Uttar Pradesh [16, 21].

Inclusion and exclusion criteria

Women who married before the age of 9 years and had child birth before attaining the age 13 years were excluded from the study. The proportion of women with premarital births (who had child births before their first marriage) was negligible in Uttar Pradesh and excluded from this study. At a specific parity, multiple births, twins or higher order births were treated as a single birth and assigned the same order for all in this analysis. In this study, out of total 12,183 women in Uttar Pradesh, only 9,273 ever married women had fulfilled the inclusion conditions. To control the interaction effects of parities and predictors, each parity progression was analyzed separately.

Study Variable

In this study, the main study variable was parity progression ratios which is a conditional probability that a woman at a given parity will progress to next higher parity. Parity i represented by p_i which stands for all ever-married women in the study sample with at least i births where i=1, 2, 3, …, 12.

Independent Variables

The measures included in the analysis were- woman's age, education, religion, caste, standard of living, exposure to mass media and exposure to family planning messages. Education had classified into three categories- No education, Less than 10 years (<10), and 10 years or more years (≥10). Caste into four categories, namely, Schedule Caste (SC), Schedule Tribes (ST), Other Backward Class (OBC) and Others (included- no caste/tribes, and don't know). Religion had classified into three major categories - Hindu, Islam and others (included- Christian, Sikh, Jain, and Buddhist/Neo-Buddhist). Standard of living was directly derived from wealth index quintiles of NFHS-3 data [16, 29] and categorized into three categories- Low (poorest & poorer quintiles), Medium (middle quintiles), and High (rich & richer quintiles). Exposure to mass media was classified into two categories - Yes and No (not exposed to mass media regularly). Women who read the newspapers, watch TV, listen radio at-least once in a week considered as exposed to mass media regularly. Exposure to family planning messages was classified dichotomously - Yes (heard family planning massages in radio, television and newspapers in a month) and No (not heard family planning massages in radio, television and newspapers during past 1 month preceding the survey).

2.2 Method

Estimation of Parity Progression Ratios

Parity progression ratios are conditional probabilities with which

women at a parity would progress to next parity. For women of specific parity, it has been measured / estimated as the probability of progression to next higher birth by adopting life table approach. A sample of 9,273 ever married women residing in the state of Uttar Pradesh, India during 2005-2006 was analyzed. The closed and open birth intervals of specific birth orders were pooled to construct life table for all parities [3, 30, 31]. Life tables have been constructed separately for each parity and truncated at 10 years [32]. Note that PPRs have been estimated up to twelve birth order though at each parity the sample included women who may have continued to parity 12 or beyond.

Cox Proportional Hazards Regression Model

Cox proportional hazard regression model [33] was used to examine the effect of predictors on the parity progression at each parity by the place of residence of the ever-married women in Uttar Pradesh as follows:

Suppose $\lambda(t; x)$ be the hazard at time t for a woman with explanatory variables $x_1, x_2, x_3, \ldots$ given by the vector x, then

$$\lambda(t; \mathbf{x}) = \lambda_0(t)\, e^{\beta}$$

where, $\lambda_0(t)$ is the baseline hazard for which no specific function is assumed and represents the hazards for individuals for whom all the variables are set at 0, and $\beta = (\beta_1, \beta_2, \beta_3, \ldots)$ a vector of regression coefficients. Estimates of the coefficients β1, β2, β3, … can be used to assess the effects of the explanatory variables $x_1, x_2, x_3, \ldots$

In this study, only three parity transitions are analyzed: progression from first marriage to first birth (M→1), third birth to fourth birth (3→4) and fourth birth to fifth birth (4→5). The choice of these three parity transitions was governed by the desire to examine a transition in which a substantial proportion of women opt to stop having children, so that the estimated effects of the predictor variables on parity progression at both the place of residence would be relatively large and easy to identify. And we also wished to examine a parity transition that would be of interest to policymakers and programme managers.

The parity transitions 3→4 and 4→5 were determined by rounding off the TFR for the three-year period immediately preceding the survey to the nearest whole number for urban and rural areas respectively. In Uttar Pradesh, TFR for urban areas was 3.0 children per woman and 4.1 children per women in rural areas (which rounded to 4) [16]. Hence, the transition 3→4 is a critical point for deciding whether to stop childbearing in urban areas and the transition 4→5 is a critical point for deciding whether to stop childbearing in rural areas. It is, so to speak, 'where the action is'.

Three multivariate Cox hazard regressions were estimated (one for each parity transition) to determine a woman's hazard of progressing to the next parity by the place of residence and per socio-economic measures. The independent variables- woman's age, education, residence, religion, caste, standard of living, exposure to mass media, and exposure to Family Planning messages were used in the multivariate models.

Note that in NFHS-3 survey data analysis, there are three features namely stratification, sampling (clustering) and sampling weight which have been accounted in analysis. In fact they led to overestimation of the standard error and bias in the estimates if not accounted in such analysis. The NFHS-3 used complex survey design with stratification, multi-stage clustering, and unequal sampling weights [16, 29]. Hence, states weights are used to maintain representative quality of indicators and adopted STATA-13 for statistical analysis in the present study to reduce the bias of the estimate and the underestimation of variability's and overestimation of the standard error.

Implied Total Fertility Rate

The total fertility rate (TFR) has been estimated based on parity progression ratios (TFR_p) as aggregated measure of fertility level in the study population. For greater exposition, let p_m represents the PPR from first marriage to first birth and p_i denotes the PPR from i^{th} parity to $(i+1)^{th}$ parity, where i = 1, 2,3,….12 and p_1, p_2, … are not affected by any change in marital status of woman in the study sample.

With the convergence of Henry's formula [1], TFR could be calculated from the PPRs as:

$$TFR_p = p_0 + p_0p_1 + p_0p_1p_2 + \ldots \quad (1)$$

Where p_0 represents the proportion of ever married in the study sample who ever have a first birth and the term p_0p_1 is the proportion of all ever-married women who ever have a second birth and so on. This approach of estimating TFR is called multiplicative components approach that showed the contribution of each birth order in calculation of TFR. Each component in the right-hand side of equation (1), is a non-negative proper fraction and is greater than or equal to the components for any birth of higher order. This approach is slightly different from the approach used by Henry; he assumed all the progression within the same marriage of woman [1, 2].

3. Results

This study focused on ever married women aged 15-49 years and lived in the state of Uttar Pradesh, India. Around 9,273 women were included in the study in which 23.74% lived in urban areas and 76.26% lived in rural areas. Majority (62.77%) of women in the state were illiterate, it was 60% in rural areas (69.15%) and 42.27% in urban areas, belonged low income households with 60.14% in rural areas and 11.92% in urban areas. Around

72.70% women were exposed to mass media regularly in urban areas as against to only 38.75% of women in rural areas who were exposed to mass media regularly. In the state 55.47% women had heard family planning messages on mass media with 75.34% in urban and 49.29% in rural areas.

Table-1: Number and Percentage Distribution of the Ever-Married Women per the selected background characteristics by the place of residence in Uttar Pradesh, India, NFHS-3, 2005-06.

Background Variables	All [N=9,273, %=100]	Urban [N= 2,201, %=23.74]	Rural [N= 7,072, %=76.26]
Education			
No education	5821(62.77)	930 (42.27)	4890 (69.15)
<10	2195(23.67)	594 (27.00)	1601 (22.62)
≥ 10	1257 (13.56)	676 (30.73)	580 (8.22)
Religion			
Hindu	7580(81.74)	1607 (72.99)	5973 (84.47)
Muslim	1611(17.37)	564 (25.61)	1047 (14.80)
Others	82 (0.89)	31 (1.40)	52 (0.73)
Caste			
SC	2167 (23.37)	450 (20.43)	1718 (24.29)
ST	86 (0.93)	8 (0.35)	79 (1.11)
OBC	4639 (50.03)	904 (41.06)	3735 (52.82)
Others	2380 (25.67)	840 (38.18)	1540 (21.78)
Standard of Living			
Lower	4515 (48.69)	262 (11.92)	4253 (60.14)
Medium	1849 (19.95)	327 (14.88)	1522 (21.52)
High	2908 (31.36)	1611 (73.20)	1297 (18.34)
Exposure to Mass Media			
No	4933 (53.20)	601 (27.30)	4332 (61.25)
Yes	4340 (46.80)	1600 (72.70)	2740 (38.75)
Exposure to FP messages			
No	4129 (44.53)	543 (24.66)	3586 (50.71)
Yes	5144 (55.47)	1658 (75.34)	3486 (49.29)

Figure1 reveals that the mean age at first marriage was slightly greater in urban areas as compared to rural areas in the state of Uttar Pradesh. Ever married women from rural areas had experienced births at early ages till 3rd parity in comparison to ever married women lived in urban areas in Uttar Pradesh; whereas the age distribution was same in urban and rural areas from parity 4th -8th order.

Figure 2 showed the distribution of closed birth interval (in months) at each parity transition for ever-married women by the place of residence in Uttar Pradesh. It was quite clear from the figure 2 that ever married women in urban areas progressed early to first birth after their first marriage than ever married women in rural areas. It was observed that ever married women lived in urban areas had shorter closed interval in comparison of ever married women lived in rural areas in Uttar Pradesh for all parity transition except for first to second parity transition.

Fig.1: Mean Age distribution of ever-married women 15-49 years by place of residence in Uttar Pradesh, India, NFHS-3, 2005-06.

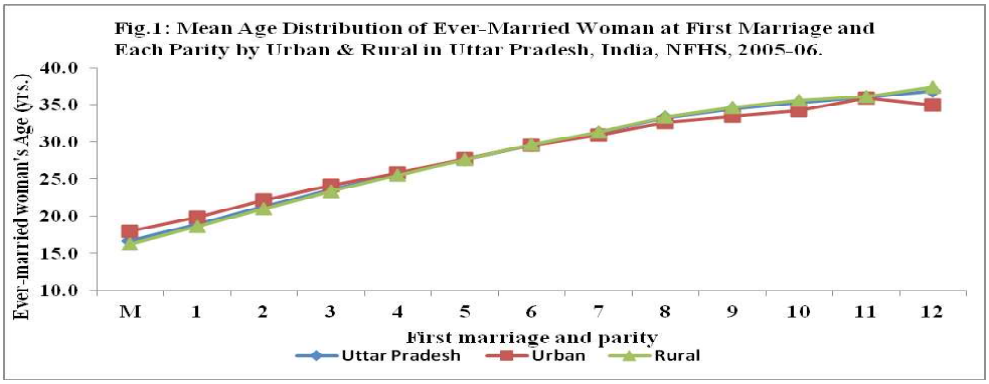

Figure-2: Closed Birth Interval of Ever-married women at each parity transition

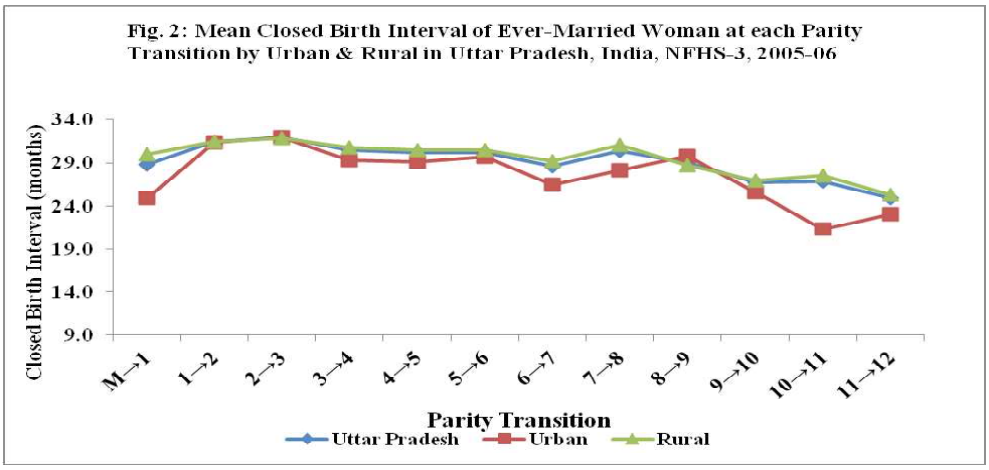

Table 2 presents the parity progression ratios for ever married women aged 15-49 years of the state of Uttar Pradesh. As described earlier, PPRs are estimated by using life table technique based detailed birth history of nationally representative survey data up-to parity 12 by the place of residence in Uttar Pradesh. There have been variations in PPRs by urban and rural in Uttar Pradesh. The PPR was consistently greater in rural areas than urban areas from first marriage to first birth to up-to eighth order birth. For higher birth order (≥ 9), the PPRs were higher among ever-married women lived in urban areas than ever-married women lived in rural areas. In urban areas, around 99% ever married women experienced first birth after their first marriage and around 97% progressed from first birth to second birth. The PPRs decreased from 0.818 at parity 3 to 0.358 at parity ≥ 9.

In rural areas, 99% ever-married women progressed to first birth after their first marriage, whereas, 98.8% progressed to second birth after experiencing first birth and 95.7% progressed from second birth to third birth. The PPRs decreased from 0.879 at parity 4 to 0.252 at parity 12, but pace is slower than urban areas. The TFR based on PPRs for Uttar Pradesh was 4.8 and varies from 5.4 for rural areas to 4.1 for urban areas.

Table-2: Parity Progression Ratios and Total Fertility Rate, according to the place of residence in the state of Uttar Pradesh, India, NFHS-3, 2005-2006.

Parity	All	Urban	Rural
P_m	0.989	0.987	0.990
p_1	0.980	0.967	0.988
p_2	0.902	0.818	0.957
p_3	0.829	0.748	0.879
p_4	0.795	0.728	0.832
p_5	0.754	0.686	0.787
p_6	0.697	0.661	0.714
p_7	0.680	0.655	0.694
p_8	0.609	0.615	0.608
p_9	0.519	0.543	0.507
p_{10}	0.598	0.698	0.551
p_{11}	0.484	0.367	0.563
p_{12}	0.285	0.348	0.252
TFR	4.8	4.1	5.4

Table-3 presents adjusted hazard ratios for estimated effects of selected predictors on parity transition to next parity, by parity for ever-married women in Uttar Pradesh. For progression M→1, the likelihood of adjusted hazard of progression to next parity was significantly increased by 5% in urban [Adjusted HR=1.05, p<0.001] as well as rural areas [Adjusted HR=1.05, p<0.001] with one year increase in age. Educated ever married women, less than 10 years or more than 10 years, were less likely to progress to next birth [<10 years: Adjusted HR=0.96, >=10: Adjusted HR=0.95] compared to uneducated ever married women at parity transition pm1 in urban areas. Similarly, in rural areas, ever married women who had education less than 10 years were significantly less likely to progress to next birth immediately after first marriage in comparison to uneducated ever married women [<10 years: Adjusted HR=0.91, p<0.05]. Ever married women who practiced Islam religion were around 16% and 14%, respectively, more likely to progress to next birth immediately after first marriage compared to women who practiced Hindu religion in urban and rural areas. The adjusted hazard ratio of progression was 9% and 8% higher for ever married women who belonged to scheduled caste and OBC, respectively, as compared to women from others castes in urban areas [SC: Adjusted HR=1.09; OBC: Adjusted HR=1.08]. In urban areas, ever married women who lived in lower standard of households were 8% more likely to progress from first marriage to first birth as compared to ever married women who lived in higher standard households. However, in rural areas ever married women who lived in lower and medium households had respectively 10% and 12% lower adjusted hazards of progression to next parity. Ever married women in urban areas and exposed to family planning messages were more likely to progress to next parity compared to the reference category [Adjusted HR=1.09]. However, in rural areas, ever married women exposed to family planning messages had around 4% lower hazard of progression to next parity as compared to the reference category.

At parity transition 3→4, educated ever married women in urban and rural areas were significantly less likely to progress to next order birth as compared to uneducated ever married women (Table 3). Ever married women from Hindu household were less prone to progress to next parity as compared to ever married women from Islam religion who followed Hindu religion at the both places but difference narrows if adjusted for the socioeconomic variables. Ever married women from schedule caste were had higher adjusted hazard of progression from 3→4 as compared to the reference category at the both places of residence. Ever married women from other backward class were less likely to

progress to next parity as compared to the reference category in urban areas, however, in rural areas ever married women from OBC category had higher hazard of progression from 3→4 as compared to the ever married women from the reference category. Ever married women's standard of living had negative effect on their progression to next parity irrespective of the place of residence. Ever married women lived in medium and lower standards households had higher adjusted hazard of progression to next parity compared to women lived in higher standard households at the both places. Results from this study showed that ever married women who had exposure to mass media were at lower risk of transition to next parity than ever married women who didn't have exposure to mass media at both the places. The ever married women in urban and rural areas who had heard family planning messages were had significantly lower hazards of progressions to next parity at parity 3.

At parity transition 4→5, ever married women who were educated, followed Islam religion, belonged to SC, OBC castes, lived in lower and medium standard level households had higher adjusted hazards of progression to next parity compared to their respective reference category. Mass media had shown urban and rural differentials; urban ever married women who exposed mass media regularly had higher adjusted hazards of progression to next parity as compared to their reference category. However, in rural areas, ever married women who exposed to mass media regularly were less likely to progress to next parity as compared to the reference category. While, ever married women who had exposure of family planning messages were less likely to had next birth compared to ever married women who didn't had exposure of family planning messages at both the place of residence.

Table-3: Adjusted Hazard Ratios (and standard errors) from Cox Proportional Hazards Regression models of associations between selected measures and progression to next parity per parity by place of residence in Uttar Pradesh, India, NFHS-3, 2005-06

Measure	Adjusted pm1 (SE)		Adjusted p_{34} (SE)		Adjusted p_{45} (SE)	
	Urban	Rural	Urban	Rural	Urban	Rural
Age[yrs]	1.052[0.009] *	1.057[0.008] *	0.934[0.01] *	0.943[0.006] *	0.96[0.011] *	0.942[0.006] *
Education (yrs.)						
No Education [ref]	1.00	1.00	1.00	1.00	1.00	1.00
<10	0.961[0.083]	0.915[0.036] **	0.73[0.069] *	0.778[0.049] *	0.68[0.096] *	0.844[0.065] **

>=10	0.954[0.094]	0.901[0.062]	0.387[0.06] *	0.703[0.085] *	0.39[0.093] *	0.488[0.108]*
Religion						
Hindu[ref]	1.00	1.00	1.00	1.00	1.00	1.00
Islam	1.158[0.092]	1.143[0.065] **	1.463[0.135] *	1.313[0.078] *	1.246[0.151]	1.257[0.093] *
Others	0.891[0.166]	0.997[0.383]	0.564[0.468]	0.927[0.152]	0.788[0.423]	1.23[0.2]
Caste						
SC	1.091[0.098]	1.033[0.056]	1.092[0.133]	1.096[0.077]	1.22[0.197]	1.117[0.091]
ST#	—	—	—	—	—	—
OBC	1.081[0.057]	0.975[0.046]	0.924[0.081]	1.06[0.065]	1.045[0.117]	0.959[0.068]
Others [ref]	1.00	1.00	1.00	1.00	1.00	1.00
Standard of Living						
Higher[ref]	1.00	1.00	1.00	1.00	1.00	1.00
Medium	0.964[0.075]	0.886[0.045] **	1.157[0.123]	1.01[0.076]	1.086[0.115]	1.196[0.105] **
Lower	1.088[0.100]	0.904[0.044] **	1.043[0.118]	1.201[0.089] **	1.184[0.147]	1.291[0.112] *
Exposure to Mass Media						
Yes	0.943[0.053]	1.004[0.041]	0.972[0.091]	0.979[0.047]	1.046[0.093]	0.949[0.058]
No[ref]	1.00	1.00	1.00	1.00	1.00	1.00
Exposure to FP$ Messages						
Yes	1.091[0.066]	0.967[0.034]	0.992[0.09]	0.906[0.041] **	0.9[0.074]	0.916[0.049]
No[ref]	1.00	1.00	1.00	1.00	1.00	1.00

#No estimates due to less frequency; $Family Planning; ref- reference; *p<0.001; **p<0.05

Discussion

In the state of Uttar Pradesh urban-rural differential existed in the mean age of marriage among ever married women. The mean age of marriage was relatively low among of rural woman as compared to urban women. As a result ever married women in rural areas experienced births at early ages and had shorter first birth interval in comparison to ever married women who lived in urban areas in the state. It was mainly due to greater proportion of urban ever married women to have higher age at marriage, higher education levels and higher living standard as compared to rural women.

Rural-Urban differentials also existed in the parity progression ratios and in the pace of progression to next birth. Though the PPR from marriage to first birth did not show much difference, there was substantial difference in the level of PPR for subsequent parities ranging from 10% to 30%. The parity progression ratios were consistently greater up to eighth parity for ever married women in rural

areas compared to ever married women in urban areas. The pace of reduction in PPRs was sharp particularly for the first four parities for ever married women lived in urban areas than ever married women lived in rural areas. TFR estimated using PPRs was quite higher for rural areas (5.4) than urban areas (4.1).

The multivariate analysis clearly showed that age, education, religion, castes, living standard and exposure to mass media and family planning messages had effect on progression to next parity.

The ever married women who belonged to non-Hindu, and schedule caste, had greater hazard of transition to next parity as compared to their reference category for M→1, 3→4, and 4→5 transitions in both urban and rural areas but narrowed when adjusted for socioeconomic factors viz. standard of living index of the ever married women's households where they lived.

Exposure to mass media and family planning messages showed mix effect on progression to next parity in rural and urban areas for M→1 and 4→5 transitions. In rural areas, ever married woman who exposed mass media regularly was slightly more likely to had next birth as compared ever married woman who did not expose mass media for M→1 transition; whereas, in urban areas, ever married woman who exposed to mass media was less likely to had next birth. For 4→5 transition, ever married woman who lived in urban areas and exposed to mass media regularly had 5% higher adjusted hazard of transition to next parity as compared to the reference category woman; however, in rural areas, ever married woman who exposed mass media regularly was 5% less prone to progress from fourth order birth to next fifth order birth in this study. In case of family planning messages exposure, ever married woman who lived in urban areas and exposed to family planning messages had 9% higher adjusted hazard of transition to next parity as compared to ever married woman who did not heard family planning messages for M→1 transition. However, in rural areas, ever married woman who ever heard family planning messages was less likely to move to her first birth.

Conclusions

It is evident from this study that without drastically reduction in values of PPRs at parities 2, 3, and 4, fertility reduction in the state of Uttar Pradesh to an applicable degree, could not be achieved in near future. There is urgent need to address the excess fertility in rural areas through wide coverage of information, education and communication of family planning benefits and by enhancing woman's education, standard of living and access to modern family planning methods.

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A Probability Model For Estimating The Unobserved Pregnancy Among Married Females

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Abstract

In India, only marriage allows reproduction and family formation as reproduction without wedlock is not acceptable in the Indian society. And it is assumed that at the time of marriage, a female may be either biologically mature or fecund, and hence susceptible to conception; or may be biologically immature, i.e., not exposed to the risk of conception for a temporary period of time or may be primary sterile.

The time interval between establishment of menarche and the attainment of biological maturity to conceive is called the period of adolescent sterility. In recognition of these facts Pathak and Prasad (1977) developed a probability model, on the basis of which, the proportion of adolescent sterile female in a cohort can be estimated. Model given by Pathak and Prasad (1977) is based on the assumption of homogeneity of risk of conception and risk of ovulation among females.

The aim of this paper is to modify the model given by Pathak and Prasad (1977) by assuming that some proportion of females are pregnant at the time of marriage but they claim that they become pregnant within short interval after marriage. The proposed model describes reasonably well with the data used on the duration of first conception in the context of premarital conceptions.

1 Introduction

The study of first birth interval, i.e., the interval from marriage to first birth, is of immense importance as it is the first visible outcome of the fertility process and first birth marks a female's transition into motherhood. It signifies female's fertility at early stage of

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