Geographical and socioeconomic inequalities in adolescent pregnancy and motherhood in India: a spatial modelling approach to micro-regional analysis

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Background

The Government of India outlawed the teenage marriage with the *Prohibition of Child Marriage Act, 1929*. The updated act in 2006 strictly notified that marriage before the age of 18 years for the girls is illegal and a criminal offence. Still, a substantial proportion of girls, especially in poor rural areas, continue to be married in their adolescent age. Owing to low sexual knowledge, among other factors, most of child marriages result in teenage pregnancy. Hence, unlike developed countries, India's adolescent pregnancy is planned and most of the adolescent mothers are welcomed by family and society (Singh, 1998). The recent report form National Commission for Protection of Child Rights (NCPCR, 2017) reveals as many as 35% of married Indian women gave birth by the age of 18 years in 2016. Among the many negative health consequences that adolescent mothers face, maternal and child undernutrition and increased risk of perinatal mortality are arguably the most critical in developing countries (Nguyen et al., 2019; Sinha et al., 2016).

Although the prevalence of adolescent pregnancy is continuing to reduce in India, the reduction rates differ substantially across the states. This is because the causes of early age pregnancy are complex and varied based on various regional customs and social norms (Kaphagawani & Kalipeni, 2017). Qualitative literature suggests that in a deep rooted patriarchal society, Indian women's low involvement in decision making contributed to adolescent pregnancy as husbands have authority over their conception (McClendon et al., 2018). Studies from India and elsewhere also reported that female literacy, household poverty, family planning programmes, ethnic and religious practices, among others are the common social predictors of adolescent pregnancy and motherhood (Choe, Thapa & Mishra, 2005; Gigante et al., 2004; McClendon et al., 2018).

Despite the evidence of [high prevalence as well as] huge variations in adolescent pregnancy and motherhood at macro level (state) (IIPS and ICF, 2017), to our knowledge no studies have conducted to evaluate the micro level regional inequalities in adolescent pregnancy and motherhood. Therefore, understanding of geographical heterogeneities at the micro level is essential to build policies and programmes that improve adolescent health and wellbeing. Apart from geographical inequalities, there have been limited studies to examine the potential determinants of adolescent pregnancy and motherhood in India. Thus, present study aimed to investigate the extent of adolescent pregnancy and motherhood at district level in relation to various socioeconomic factors, to understand the full extent of geographical and social inequalities. This study also analyzed survey data about maternal

literacy, household poverty, and similar to better understand the social determinants of adolescent pregnancy and motherhood in India.

Data and Methods

Data were accessed from fourth round of National Family and Household Survey (NFHS – 4) of India, 2015-16. NFHS – 4 is the nationwide survey to provide data on adolescent pregnancy and motherhood, was designed to be representative at the district level for all 640 districts of India (IIPS and ICF, 2017). The total survey sample comprises a number of 699686 women aged 15-49 years. However, the analytical sample for this study included 118224 women of age group 15-19 years. Adolescent pregnancies included those women (15-19 years) who have not had a live birth but were pregnant during the interview whereas, adolescent mothers included those women (15-19 years) who have had at least a live birth. In case of missing information in women's age, literacy and their household wealth status, the samples were dropped.

To understand the micro-level geographical inequalities, I estimated the prevalence of adolescent pregnancy (15-19 years) and adolescent motherhood (15-19 years) for all 640 districts in India using Bayesian Geo-spatial model with selected covariates (Kazembe & Namangale, 2007). I preferred Bayesian spatial model due to its one of the great advantages: in Bayesian spatial model, the estimated prevalence incorporates spatial associations between geographically neighbouring districts (Best, Richardson & Thomson, 2005). I fitted Besag, York and Mollie model to predict the posterior probability of adolescent pregnancy and motherhood at the district level (Besag, York & Mollié, 1991). Mean square prediction error and deviance information criterion (DIC) were estimated to evaluate overall model fit.

I also assessed crude and adjusted (multi-variable) associations of adolescent pregnancy and childbearing with selected individual and household level covariates using a mixed-effects model with random intercept at the district level.

Results

Descriptive statistics reveals that in India, 2.21% (weighted) women in the age group 15-19 are pregnant with first child while, 5.46% (weighted) women in the same age group have had at least a live birth. Prevalence of adolescent pregnancy and motherhood declined fairly steadily with the rise of female education and household wealth (see Fig. 1).

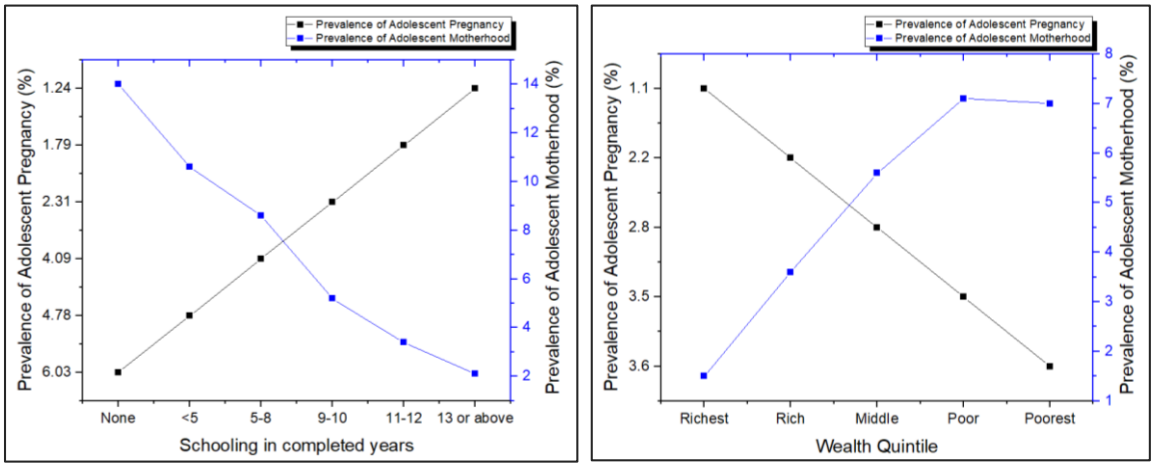

Fig. 1: Adolescent pregnancy and adolescent motherhood by individual's level of schooling (left) and household wealth quintile (right).

With regards to the prevalence (posterior probabilities) of adolescent pregnancy in Indian districts ranged from 0.46% (95% credible interval [CrI]: 0.31~0.69) in Mahe district (Puducherry UT) to 11.37% (95% CrI: 9.40~13.02) in Saharsa district (Bihar state). More than 60% of districts evidenced a higher prevalence of adolescent pregnancy than the national average of 2.37% (posterior prevalence), with burden most heavily concentrated in districts of central and western states. Some of the highest burden states included Madhya Pradesh, Karnataka, Andhra Pradesh, Chhattisgarh, Jharkhand, Uttar Pradesh, Bihar, West Bengal and Tripura (see Fig. 2).

Similarly, the prevalence of adolescent motherhood was ranged from 1.19% (95% CrI: 0.83~2.01) in Idukki district (Kerala state) to 20.08% (95% CrI: 16.33~25.90) in Sheopur district (Madhya Pradesh state). Results showed, overall, a number of 247 districts (nearly 38.6%) where prevalence of adolescent motherhood was greater than the national average of 5.28% (posterior prevalence). Consistent with the results presented above I found high burden districts of adolescent motherhood are mostly concentrated in the central parts of the country. Geographical concentration of both the indicators was more prominent in the rural parts of the country (see Fig. 3).

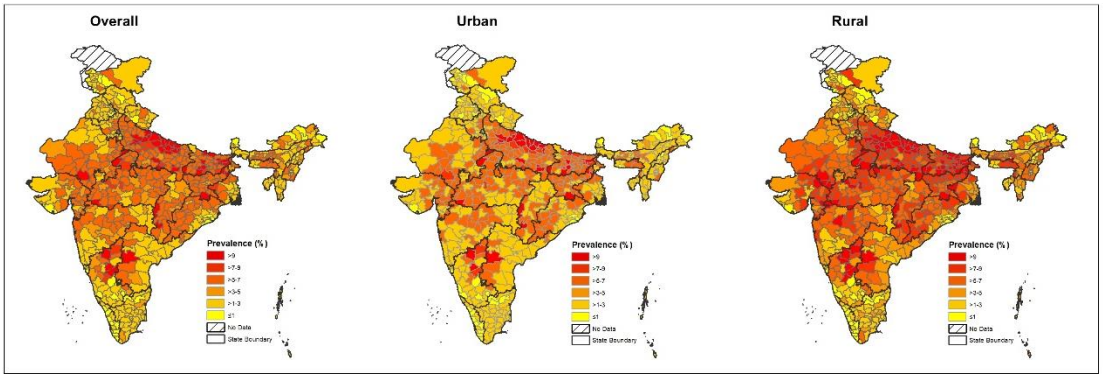

Fig. 2: Posterior prevalence of adolescent pregnancy from a Bayesian spatial model, India, 2015-16.

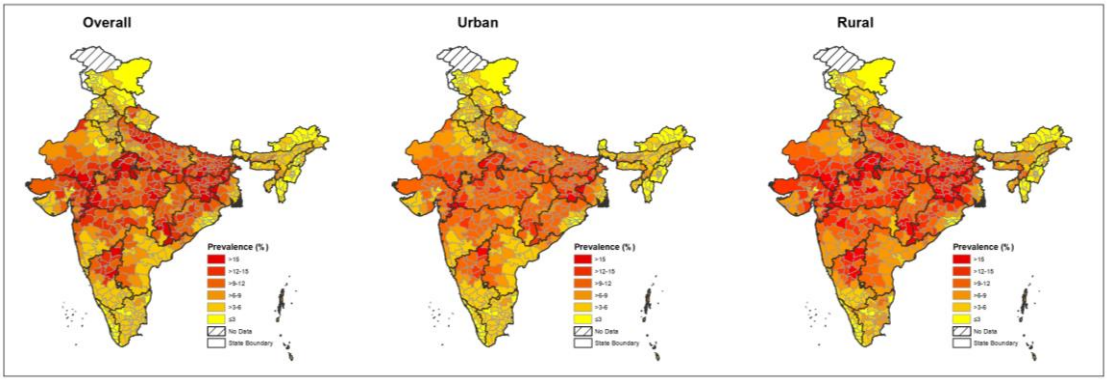

Fig. 3: Posterior prevalence of adolescent motherhood from a Bayesian spatial model, India, 2015-16.

Regarding the geographical inequalities in critical determinants of adolescent pregnancy and motherhood, the prevalence of illiteracy in women aged 15-19 ranged from less than 2% (95% CrI: 1.24~3.07) to more than 35% (95% CrI: 28.01~41.34). Illiteracy among adolescent women was highest in the districts of Madhya Pradesh, Chhattisgarh, Bihar, Andhra Pradesh, West Bengal (see Fig. 4). Poverty was widespread across the Indian states, with more than 45% of adolescent women residing in the two poorest wealth quintiles. In 232 districts, more than 60% of households where adolescent women reside were in these

impoverished quintiles. Overall, households in the districts of southern states were wealthiest compared to the districts in northern and central Indian states (see Fig. 5).

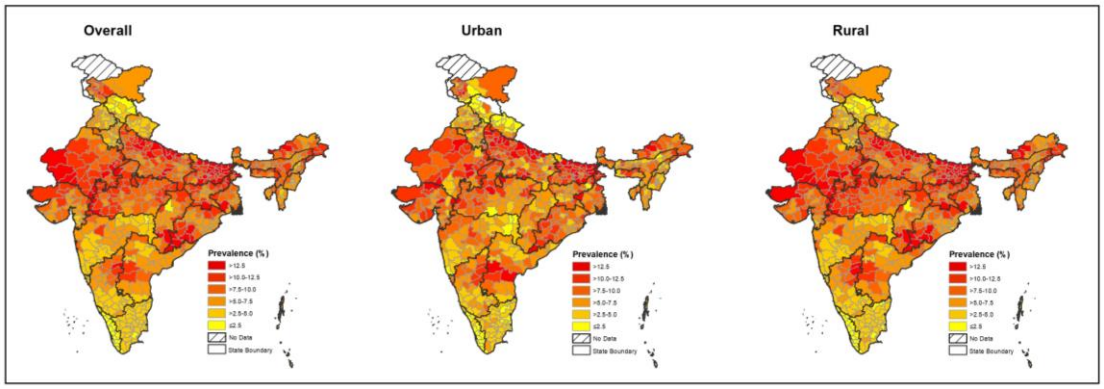

Fig. 4: Posterior prevalence of adolescent illiteracy (percentage of adolescent women illiterate) from a Bayesian spatial model, India, 2015-16.

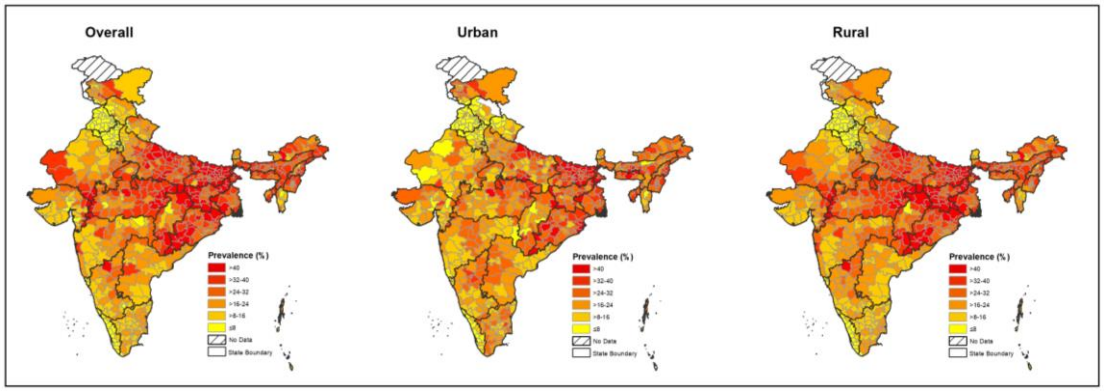

Fig. 5: Posterior prevalence of household poverty (percentage of households within two poorest wealth quintiles) from a Bayesian spatial model, India, 2015-16.

In multivariable-adjusted analyses, two highest wealth quintiles (richer and richest) were significantly negatively associated with the adolescent pregnancy and motherhood. Schooling higher than 8 years has a strong negative impact on adolescent pregnancy and motherhood. Urban adolescent girls had less probability of early age pregnancy and motherhood in both bivariate (crude) and multivariable analyses. Crude result shows socially backward categories (scheduled castes [SCs] and scheduled tribes [STs]) had greater probability of adolescent pregnancy and motherhood; the associations disappeared for pregnancy after adjustment. Result also shows religious belief has a strong association on adolescent motherhood. For example, compared with Hindu women, adolescent motherhood was more pronounced among Muslims; the associations were stronger even after controlling for covariates.

Concluding Remarks

The current study estimated the micro-level geographical inequalities in adolescent pregnancy and motherhood across the Indian districts, and further investigated some associated determinants. The findings suggest that (Results showed) geographical inequalities in adolescent pregnancy and adolescent motherhood among the districts and subpopulations in India are widespread. Both adolescent pregnancy and motherhood found to be highly concentrated in the districts of central and western states in India. Results also showed spatial concentration of both the component is much prominent in the rural India compared to the urban counterpart. High prevalence of adolescent pregnancy and

motherhood is noticed in some of the central and western districts where prevalence of illiterate women and poorer wealth group is maximum. The individual level results confirmed the close links between adolescent pregnancy and motherhood and female literacy, religious practices, caste norms and household wealth. Overall, the findings from the present study underscore the need for local-level policy actions and implementation focussed on addressing critical determinants district-by-district to reduce inequalities and prevalence of adolescent pregnancy and child bearing in India.

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