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Impact of child marriage on nutritional status and anaemia of children under 5 years of age: empirical evidence from India

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ABSTRACT

Objective: Despite several international commitments and national policies to eliminate the practice of girl child marriage, it remains pervasive in India. In this study, we aimed to examine the association between child marriage and nutritional status and anaemia in children aged below 5 years.

Study design and methods: We have used the data from the latest round of the Indian National Family Health Survey (NFHS), conducted in 2015–2016. For this study, the sample was limited to 80,539 living children aged below 5 years born to 60,003 ever-married women aged 15–24 years. We have considered children's stunting, wasting, underweight and anaemia as outcomes variables and child marriage (married below 18 years) as the exposure of variables of interest. Pearson's Chi-squared test and binary logistic regressions were applied to assess the associations.

Results: About 58% of sample women were married before 18 years of age. The prevalence of children's stunting, wasting and underweight were 37%, 23% and 36%, respectively. More than half of the sample children (62%) were anaemic. Regression analysis revealed that child marriage (<18 years) was significantly associated with increased likelihood of stunting (adjusted odds ratio [AOR] = 1.06, 95% confidence interval [CI] = 1.02–1.10) and underweight (AOR = 1.04, 95% CI = 1.00–1.08) even after controlling for relevant confounding variables. Child marriage had no significant association with children being wasted and anaemic in crude analyses. However, it is found that child marriage significantly increases the risk of childhood anaemia in adjusted analyses (AOR = 1.08, 95% CI = 1.03–1.13).

Conclusions: The findings of our study suggest that there is a need for effective policies and programmes to end the practice of child marriage and targeted intervention should be made to improve nutritional outcomes of children born to women married in childhood.

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Introduction

Every year, around 12 million girls are married before the age of 18 years worldwide.¹ Despite several international efforts to protect the basic human rights of girls and national policies to increase age at marriage, child marriage remains pervasive in South Asian and sub-Saharan countries. About 30% of girls are married before 18 years in South Asian countries, accounting for 44% of the global burden.¹ In India, although the prevalence of child marriage has declined by 20% over the last decade, a considerable proportion of women are married in their childhood, even today.² As of 2015–16, it is estimated that around 27% of women are married under 18 years of age in India.² Child marriage violates the basic human rights of girls and has social, economic and physiological impacts of the girls affected.³ It curtails their education and employment opportunities.⁴ Many previous studies have indicated that poverty, lower educational attainment and socio-economic inequalities are the main forces behind the practice of child marriage.^{4,5} Some studies refer to religion, gender inequalities and sociocultural norms and discrimination against girls.^{6,7} A number of studies have confirmed that child marriage has serious negative impacts on the health and well-being of women and newborns.^{4,7–10} Marriage at an early age of life leads to early and close spaced pregnancies.^{11,12} Child marriages also increases the risk of adverse pregnancy and birth outcomes, malnutrition and iron deficiency.^{8,9,13,14} Evidence has found that women married in childhood are less likely to use maternal healthcare services,^{15,16} exposes them to the risk of sexually transmitted infections including HIV which further, in turn, increases the risk of high maternal morbidity and mortality.^{17,18} Child marriage is also linked to the health and nutritional status of newborns.^{10,19–21} However, very little evidence has been found on the linkages between child marriage and children's health outcomes.

Child nutrition and anaemia are major public health concerns in lower-middle income countries. In India, the burden of children's stunting and underweight remains widespread despite rapid economic growth over the last two decades.^{22,23} Poor nutrition and iron deficiency among newborn children increases the risk of early childhood morbidity and mortality.^{24,25} Moreover, nutritional status during infancy has a detrimental effect on health and cognitive development in adulthood.²⁶ Children's nutrition and anaemia is determined by several socio-economic, demographic and environmental factors. Among maternal characteristics, age at marriage is a crucial predictor of birth outcomes, nutrition and cognitive development of children.

The linkages through which child marriage affects children's health and nutrition are manifold. For instance, girls marrying during adolescence increases the risk of complications during pregnancy,⁹ which may lead to adverse birth outcomes such as preterm birth and low birth weight of babies.^{27,28} Preterm birth and low birth weight children are at increased risk of malnourishment and early childhood mortality.^{29,30} In this study, we aimed to investigate whether child marriage has significant associations with nutritional outcomes and anaemia in children aged below 5 years using a nationally representative large-scale database in India.

Methods

Sample design and study sample

We used data from the fourth round of the National Family Health Survey (NFHS), conducted during 2015–2016. This aim of this survey was to collect essential information about family planning, maternal and child health indicators. The 2015–2016 NFHS is a nationally representative cross-sectional sample survey of 601,509 households, 699,686 women aged 15–49 years with a response rate of 97% and 112,122 men aged 15–54 years with a response rate of 92%. The women were asked to provide detailed information about their children born in the past 5 years. The sample was limited to children in the past 5 years born to ever-married women aged 15–24 years ($n = 84,689$ births to $n = 61,926$ mothers). However, the current study used a subsample of 80,539 living children aged below 5 years born to 60,003 mothers aged 15–24 years. The sample was selected using a stratified two-stage sampling design comprising of 28,586 clusters; 8397 in urban, 20,059 in rural, and 130 from slums list provided by Municipal Corporation Offices. In the first stage, clusters were selected using probability-proportional-to-size sampling. In the second stage, 22 households from each cluster were selected with an equal opportunity systematic selection from the household listing. Further details of sampling design, data collection, and data management have been described elsewhere.²

Outcome variables

Nutritional status and anaemia of children aged below 5 years were outcome measures in this study. Nutritional outcomes categorised as failure were based on anthropometric measures such as z-scores of height-for-age (<-2 standard deviation [SD]), weight-for-height (<-2 SD), and weight-for-age (<-2 SD). Prevalence of anaemia was assessed from haemoglobin level in the blood (coded as '1' if the children have haemoglobin level below 11.0 g/dl and '0' otherwise).

Predictor variables

Child marriage is the key predictor variable in this study. To assess the association between child marriage and children's nutritional status and anaemia, age at first marriage of mother is categorised into two groups: married below 18 years (child marriage) and married at 18 years or older (adult marriage).

The socio-economic, demographic and other confounding variables were included and assessed in the multivariate analyses. The selection of these variables is based on earlier studies conducted in this area. These covariates are age of child (0–11, 12–23, 24–35, 36–47 and 48–59 months), sex of child (male and female), place of residence (urban and rural), religion (Hindu, Muslim and other), region (North, Central, East, Northeast, West and South), wealth quintile (poorest, poorer, middle, richest and richer), maternal age (15–19 and 20–24 years), antenatal care (ANC) visits (no and yes), maternal education (no education, primary, secondary and higher), maternal body mass index (BMI) (thin, normal and obese) and maternal anaemia (not anaemic and anaemic).

Statistical analyses

We used both descriptive statistics and multivariate analyses to perform the analysis of data. Associations between child marriage and children's nutritional outcomes and anaemia were estimated by crude and adjusted odds ratio (AOR) with 95% confidence interval (CI) using binary logistic regression models. Adjusted analyses controlled for a range of socio-economic, demographic and other confounding variables. Sample weight has been used to perform the analysis. All the

analyses were conducted using STATA, version 12.1 (Stata-Corp LP, College Station, TX).

Results

Participant's characteristics

Among children in the past 5 years born to ever-married women aged 15–24 years ($n = 84,689$), 80,539 of them were

Table 1 – Socio-economic and demographic characteristics of living children in the past 5 years born to ever-married women aged 15–24 years by age at first marriage of women in India, 2015–16 ($n = 80,539$).

Characteristic	Total children ($n = 80,539$)		Children born to women married under 18 years ($n = 42,233$)		Children born to women married at 18 years or older ($n = 37,073$)	
	n	Weighted %	n	Weighted %	n	Weighted %
Age of child in months						
0–11	23,231	28.4	9580	22.5	13,340	35.4
12–23	19,972	24.8	9592	22.6	10,140	27.5
24–35	16,094	20.1	8711	20.6	7118	19.3
36–47	12,724	16.0	8024	19.0	4478	12.3
48–59	8518	10.9	6326	15.2	1997	5.5
Sex of child						
Male	41,435	51.5	21,642	51.1	19,188	51.9
Female	39,104	48.5	20,591	48.9	17,885	48.1
Place of residence						
Urban	16,764	24.7	7422	21.0	9172	29.5
Rural	63,775	75.3	34,811	79.1	27,901	70.5
Religion						
Hindu	61,505	79.9	32,823	80.3	27,930	79.6
Muslim	11,870	16.0	6290	16.3	5352	15.6
Other	7164	4.1	3120	3.5	3791	4.9
Region						
North	14,227	12.2	6810	11.4	7341	13.3
Central	22,930	23.4	11,816	22.3	10,968	25.1
East	18,373	27.6	11,329	32.4	6938	22.3
Northeast	9628	3.4	4839	3.5	4283	2.9
West	6480	13.8	3499	14.0	2834	13.5
South	8901	19.6	3940	16.4	4709	23.0
Wealth quintile						
Poorest	19,786	22.3	12,890	27.8	6452	15.5
Poorer	21,186	25.0	12,284	28.0	8501	21.2
Middle	17,926	23.2	8990	22.9	8668	23.5
Richer	13,562	19.1	5630	15.3	7839	24.0
Richest	8079	10.4	2439	6.0	5613	15.9
Maternal age in years						
15–19	6216	8.0	5612	13.6	505	1.4
20–24	74,323	92.0	36,621	86.4	36,568	98.6
Antenatal care visits						
No	9086	13.5	5535	16.4	3316	10.1
Yes	50,381	86.5	23,986	83.6	25,785	89.9
Maternal education						
No education	18,212	20.9	11,954	25.7	5773	14.5
Primary	12,375	15.0	7451	17.6	4646	11.7
Secondary	44,822	57.1	21,699	54.0	22,673	61.4
Higher	5130	7.1	1129	2.8	3981	12.3
Maternal body mass index						
Thin	22,884	29.4	12,877	31.2	9681	27.2
Normal	49,890	61.0	25,720	60.1	23,377	62.1
Obese	6751	9.6	3100	8.8	3572	10.8
Maternal anaemia						
Not anaemic	33,524	41.7	17,142	40.9	15,862	42.6
Anaemic	45,711	58.3	24,392	59.1	20,644	57.4

alive with a mean age of 23.9 months. The living children born to mothers aged 15–24 years lived mostly in rural areas, belonged to Hindu religion and from east and central region of the country. The majority of women reported that they have had ANC for their last child. A significantly higher proportion of women were in the 20–24 years age group, have had no or low level of education and were economically poor. About 29% of the women had a BMI <18.5 kg/m², and more than half of them were anaemic (Table 1).

More than half of the ever-married women aged 15–24 years (53%) were married before 18 years of age. Women married during adolescence had older children (mean age of child = 27 months, SD = 16.7) compared with those married as adults (mean age of child = 20 months, SD = 14.6). Child married women were less likely than the women married during adulthood to have ANC (84% vs 90%). Women married during adolescence were more likely to be younger, reside in rural areas and have had no formal education, live in poverty, have a low BMI and have anaemia compared with those married during adulthood (Table 1).

Nutritional outcomes and anaemia in children

Among living children aged below 5 years, more than one in three children were stunted (37%) and underweight (36%). Around one in four children (23%) had wasting, and 62% were anaemic (Table 2).

Nutritional status and anaemia in children by age of marriage of the mothers

The prevalence of stunting was significantly higher in children born to mothers married in childhood (41%) compared with mothers who married in adulthood (33%). Similarly, children born to child married women were more likely to be underweight (38%) than those born to adult married women (32%). However, no significant differences were found between mothers married in childhood and wasting and anaemia in their children (Table 3).

Table 2 – Prevalence of nutritional status (stunting, wasting underweight) and anaemia of living children in the past 5 years born to ever-married women aged 15–24 years in India, 2015–16 (n = 80,539).

Variables	Number (n)	Weighted %
Stunting		
No	45,059	62.6
Yes	27,604	37.4
Wasting		
No	56,376	77.3
Yes	16,287	22.7
Underweight		
No	47,123	64.4
Yes	25,540	35.6
Anaemia		
No	24,467	38.3
Yes	39,569	61.7

Association between child marriage and nutritional status and anaemia of children

Regression analyses revealed that children born to women married during adolescence compared with children born to adult married mothers were significantly more likely to have had stunted growth (odds ratio [OR] = 1.40, 95% confidence interval [CI] = 1.36–1.45) and be underweight (OR = 1.38; 95% CI = 1.34–1.42). The higher likelihood of being stunted (adjusted odds ratio [AOR] = 1.06, 95% CI = 1.02–1.08), underweight (AOR = 1.04, 95% CI = 1.00–1.08) remained significant even after controlling for relevant child and maternal demographics. Wasting and anaemia of children had no significant associations with child marriage in the crude analysis. Moreover, even after controlling for child and maternal demographics, the association between child marriage and wasting was not significant (AOR = 0.96, 95% CI = 0.92–1.01). However, childhood anaemia had significant positive association with child marriage (AOR = 1.08, 95% CI = 1.03–1.13) in adjusted analyses (Table 4).

Discussion

The findings of our study indicate that children born to women who married before the age of 18 years had significantly higher likelihood of being stunted and underweight compared with those whose mother married at later ages. Lower educational attainment, poverty and living in rural setting are significantly associated with higher likelihood of girl child marriage.⁵ However, the availability of healthcare facilities and higher educational opportunities in urban settings may positively influence children's nutritional status. Child marriage is closely linked to the early childbearing of women.¹² Some studies reported that early childbearing affects children's physical growth, which may be the result of young mother's physiological immaturity and inadequacy of nutrient uptake for growth of foetus.^{31,32} Other studies found very weak linkages between early childbearing and children's health.²⁰ The findings of previous studies mirror findings in the current study.^{19–21} For instance, a study of young married women in India reported that children's stunting, wasting and underweight was significantly higher among the births of child married mothers compared with the births of adult married women.²¹ Furthermore, early married women are often controlled by their husbands and mothers-in-law,³³ which often leads to restriction on decision-making regarding their own health as well as their children's health care.³⁴ Although Raj et al.'s study has found a significant association between maternal child marriage and wasting of children,²¹ we did not find any significant relationship between these two. Even after controlling for socio-economic and demographic factors in multivariate analyses, no association was found between child marriages and wasting. This is may be possible because of inclusion of greater number of control variables in adjusted analyses.

Furthermore, the present study also examined the association between maternal child marriage and childhood anaemia. Evidence has found that pregnant women and children are at higher risk of having iron deficiency.³⁵ A number of studies have examined the association of maternal

Table 3 – Prevalence of nutritional status and anaemia of living children in the past 5 years born to ever-married women aged 15–24 years by age at marriage of mother in India, 2015–16.

Variables	Children born to women married under 18 years (n = 42,233)	Children born to women married at 18 years or older (n = 37,073)
	n (weighted %)	n (weighted %)
Stunting^a		
No	22,285 (59.1)	22,217 (67.0)
Yes	15,886 (40.9)	11,274 (33.0)
Wasting		
No	29,675 (78.0)	25,919 (76.6)
Yes	8496 (22.0)	7572 (23.4)
Underweight^a		
No	23,467 (61.6)	23,031 (67.9)
Yes	14,704 (38.4)	10,460 (32.1)
Anaemia		
No	13,377 (38.5)	10,692 (37.8)
Yes	21,603 (61.5)	17,423 (62.2)

^a Pearson's Chi-squared test significant at P < 0.001.

Table 4 – Associations between child marriage and nutritional status and anaemia of living children in the past 5 years born to ever-married women aged 15–24 years in India, 2015–16.

Variables	Odds ratio (95% CI)	Adjusted odds ratio (95% CI)
Stunting		
No ®	1.00	1.00
Yes	1.40 (1.36–1.45)**	1.06 (1.02–1.10)**
Number of observations (n)	71,662	52,451
Log likelihood	–47,312.37	–31,933.77
Pseudo R ²	0.005	0.059
Wasting		
No ®	1.00	1.00
Yes	0.98 (0.95–1.02)	0.96 (0.92–1.01)*
Number of observations (n)	71,662	52,462
Log likelihood	–38,137.63	–28,274.29
Pseudo R ²	0.000	0.023
Underweight		
No ®	1.00	1.00
Yes	1.38 (1.34–1.42)**	1.04 (1.00–1.08)*
Number of observations (n)	71,662	52,451
Log likelihood	–46,239.34	–31,422.56
Pseudo R ²	0.005	0.061
Anaemia		
No ®	1.00	1.00
Yes	0.99 (0.96–1.02)	1.08 (1.03–1.13)**
Number of observations (n)	63,095	43,924
Log likelihood	–41,944.17	–26,731.91
Pseudo R ²	0.000	0.067

CI, confidence interval; BMI, body mass index; ANC, antenatal care.
*P < 0.1, **P < 0.05; ® reference category of the variable.
Adjusted analyses controlled for age of child, sex of child, place of residence, religion, region, wealth index, maternal age, ANC visits, maternal education, maternal BMI and maternal anaemia.

anaemia with adverse birth outcomes such as preterm delivery and low birth weight.^{36,37} There is also evidence that iron deficiency in children significantly affects their cognitive and motor development.³⁸ From an extensive literature search, this is probably the first study in which we explored the links between maternal child marriage and childhood anaemia. The results of this current study demonstrated that after controlling for a range of relevant child and mothers

demographics, children born to child-marriage women were more likely to have childhood anaemia compared with children born to adult married women. Prior studies have indicated that early marriage and adolescent pregnancy leads to depletion of body mass and iron deficiency of women.^{11,14} Moreover, infants born to mothers with reduced iron stores had an increased risk of preterm births and low birth weight.³⁷ Premature babies and low birth weight infants are highly

susceptible to poor nutritional growth and anaemia which may substantially increase the likelihood of childhood morbidity and mortality.

This study has a few limitations. The information on age at marriage is not available for all the respondents. A few cases of age at marriage are missing or inconsistent. The data are mostly self-reported and therefore subject to recall and social desirability. Furthermore, we could not assess the cause-effect relationship between child marriage and children's nutritional status and anaemia because of the cross-sectional nature of the data. Longitudinal study is needed to understand the temporal association and possible causal links between child marriage and children's health outcomes. Furthermore, we did not include environmental factors in the multivariate analysis, which may have significant influence on children's nutritional status and anaemia.

Conclusion

Our study documents that child marriage significantly increases the risk of stunting, underweight, and anaemia in children born to young married women aged 15–24 years. The evidence highlights the need for programmes to support young married women. Efforts should be made to increase age at marriage of girls by increasing opportunities for girls education and providing financial incentives to the poor families.⁵ The role of family and community engagement is highly important to ensure the success of efforts such as support for girls' education and removing the barriers of sociocultural norms, which could reduce the incidence of girl child marriage.^{6,39} Furthermore, there is a need to provide affordable and quality healthcare facilities to young married adolescent girls as they are highly vulnerable to adverse health outcomes. Apart from these, the autonomy of women is likely to be an important determinant of access to health centres for their own health and their children's health care, which could help to reduce the risk of poor nutrition and anaemia among the children of early married women. Furthermore, targeted intervention is needed for the children of young married women, especially among poor and rural residents, to address malnutrition among them.

Author statements

Ethical approval

This study used secondary data which are available in public domain. Therefore, no ethical approval is required for this study.

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Competing interest

The authors have no competing interests to declare.

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