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## Age at menarche, education, and child marriage among young wives in rural Maharashtra, India

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### Synopsis

Younger age at menarche—on its own and through interaction with lower education—significantly increases risk of child marriage among girls in rural Maharashtra, India.

### Keywords

Age at menarche; Child marriage; Girls' education; India

India is home to 33% of the 720 million women worldwide who were married before the age of 18 years [1]. Menarche has historically been viewed as an indicator of a girl's readiness to marry [2], but recent research on this issue is limited. The present study examined associations between age at menarche and age at marriage among young wives who were baseline respondents in the CHARM study—a two-armed randomized controlled trial evaluating a male engagement-focused family planning intervention in rural Maharashtra, India.

Between March and December 2012, 1062 wives of men aged 18–30 years provided written consent and survey data on age at marriage ( 15, 16–17, or 18 years), age at menarche (8–12, 12.1–13, 13.1–14, or 14.1–18 years), demographics (age, tribal status, husband's age,

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### Conflict of interest

The authors have no conflicts of interest.

and level of education), and premarital gendered risks (paternal spousal violence against mother and non-consultation in choice of marital partner). Institutional review board approval was granted by the National Institute for Research in Reproductive Health (Mumbai, India) and the University of California, San Diego (San Diego, CA, USA). Multinomial regressions were used to assess the hypothesized association, adjusting for demographics and gendered risks, using SPSS version 22 (IBM, Armonk, NY, USA).  $P < 0.05$  was deemed statistically significant.

Participants were aged 11–27 years at marriage (mean  $18.62 \pm 2.25$  years); 332 (31.2%) married before the age of 18 years. Husbands were aged 11–30 years at marriage (mean  $22.26 \pm 2.87$ ); 34 (3.2%) husbands had married before the age of 18 years. Mean age at menarche was  $13.7 \pm 1.3$  years.

Younger age at menarche was associated with marriage before the age of 18 years (Table 1). Post hoc analysis documented a significant interaction between age at menarche and education ( $P < 0.001$ ), such that there is greatest risk for early marriage in the context of earlier menarche and lower education level (Supplementary Material S1).

The limitations of the present study should be considered. The cross-sectional design precludes assumptions of causality; results are subject to recall and social desirability biases, and have limited generalizability.

In conclusion, the present study has shown that young age at menarche increases the risk of child marriage in Maharashtra. Similar results have been reported for rural Bangladesh [3]. Community education is needed in rural South Asia to communicate that menarche is an indicator of development, not readiness for marriage or healthy childbearing. Significant interaction effects found for age at menarche and education in predicting minor age at marriage also reinforce calls to support girls staying in school beyond menarche as a means of preventing girl child marriage [4]. Menstrual hygiene management programs in schools could be useful for this goal. The present study has also documented that girls from families characterized by paternal spousal violence and non-engagement of girls in spouse selection are most vulnerable to young age at marriage, highlighting the links across these gendered risks. Multigenerational gender-transformative interventions promoting female education and marital choice, and reducing spousal violence could be important to address child marriage in South Asia.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Characteristics by age at marriage and multinomial regression analysis.

	Total (n=1062) <sup>a</sup>	Age at marriage, y <sup>d</sup>			15 y at marriage <sup>b</sup>			16–17 y at marriage <sup>b</sup>		
		15 (n=60)	16–17 (n=272)	18 (n=732)	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)		
Age, y <sup>c</sup>	22.49 ± 2.48 (17–30)	22.13 ± 2.3 3(18–27)	21.77 ± 2.4 3(17–28)	22.79 ± 2.45 (18–30)	0.89 (0.80– 1.00) <sup>d</sup>	0.74 (0.62– 0.88) <sup>e</sup>	0.84 (0.79– 0.89) <sup>e</sup>	0.76 (0.69– 0.83) <sup>e</sup>		
Husband's age, y <sup>c</sup>	26.12 ± 2.67 (18–30)	25.85 ± 2.6 9(20–30)	25.52 ± 2.7 4(20–30)	26.36 ± 2.60 (18–30)	0.93 (0.84– 1.03)	1.21 (1.03– 1.42) <sup>d</sup>	0.89 (0.84– 0.94) <sup>f</sup>	1.12 (1.03– 1.22) <sup>f</sup>		
Tribal population										
Yes	724 (68.2)	49 (81.7)	221 (81.3)	454 (62.2)	2.71 (1.39– 5.30) <sup>f</sup>	1.18 (0.55– 2.56)	2.63 (1.30– 3.24) <sup>e</sup>	1.38 (0.93– 2.04)		
No	338 (31.8)	11 (18.3)	51 (18.7)	276 (37.8)	Ref.	Ref.	Ref.	Ref.		
Education										
None	201 (18.9)	30 (50.0)	83 (30.5)	88 (12.1)	47.39 (11.10– 45.27) <sup>e</sup>	56.02 (12.08– 259.76) <sup>e</sup>	9.36 (5.73– 15.30) <sup>e</sup>	10.24 (5.89– 17.79) <sup>e</sup>		
Some	553 (52.1)	28 (46.7)	161 (59.2)	364 (49.9)	10.69 (2.53– 45.27) <sup>e</sup>	9.12 (2.05– 40.57) <sup>f</sup>	4.39 (2.86– 6.76) <sup>e</sup>	3.97 (2.48– 6.35) <sup>e</sup>		
Completed secondary or higher	29.0 (308)	2 (3.3)	28 (10.3)	278 (38.1)	Ref.	Ref.	Ref.	Ref.		
Age at menarche, y										
8–12	172 (16.2)	31.7 (19)	50 (18.4)	103 (14.1)	5.56 (2.27– 13.65) <sup>e</sup>	4.36 (1.68– 11.32) <sup>f</sup>	2.05 (1.30– 3.24) <sup>f</sup>	1.51 (0.92– 2.48)		
12.1–13	311 (29.3)	45.0 (27)	87 (32.0)	197 (27.0)	4.13 (1.76– 9.70) <sup>e</sup>	4.00 (1.63– 9.82) <sup>f</sup>	1.86 (1.25– 2.78) <sup>f</sup>	1.58 (1.03– 2.42) <sup>d</sup>		
13.1–14	311 (29.3)	11.7 (7)	85 (31.3)	219 (30.0)	0.96 (0.33– 2.79)	0.88 (0.29– 2.66)	1.64 (1.10– 2.44) <sup>d</sup>	1.49 (0.97– 2.29)		
14.1	268 (25.2)	11.7 (7)	50 (18.4)	211 (28.9)	Ref.	Ref.	Ref.	Ref.		
Parental interpersonal violence										
Yes	168 (15.8)	17 (28.3)	45 (16.5)	106 (14.5)	2.33 (1.28– 4.23) <sup>f</sup>	2.40 (1.25– 4.63) <sup>f</sup>	1.17 (0.80– 1.71)	1.06 (0.70– 1.60)		
No	894 (84.2)	43 (71.7)	227 (83.5)	624 (85.5)	Ref.	Ref.	Ref.	Ref.		
Not consulted in mate										

	Total (n=1062) <sup>d</sup>	Age at marriage, y <sup>e</sup>		15 y at marriage <sup>b</sup>		16–17 y at marriage <sup>b</sup>		
		15 (n=60)	16–17 (n=272)	18 (n=732)	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
selection								
Yes	50 (4.7)	6 (10.0)	14 (5.1)	30 (4.1)	2.59 (1.03– 6.50) <sup>d</sup>	2.87 (1.01– 8.15) <sup>d</sup>	1.27 (0.66– 2.43)	1.29 (0.64– 2.60)
No	1012 (95.3)	54 (90.0)	258 (94.9)	700 (95.9)	Ref.	Ref.	Ref.	Ref.

Abbreviations: OR, odds ratio; CI, confidence interval; AOR, adjusted odds ratio.

<sup>a</sup> Values are given as mean ± SD (range) or number (percentage).

<sup>b</sup> Age 18 years used as a reference relative to the minor age at marriage category in multinomial analyses (e.g. participants who were not consulted in mate selection, relative to those who were consulted, were more likely to marry at <15 years rather than at 18 years).

<sup>c</sup> Age variables are presented as means descriptively, but were used as continuous variables in regression.

<sup>d</sup>  $P < 0.05$ .

<sup>e</sup>  $P < 0.0001$ .

<sup>f</sup>  $P < 0.01$ .