



## Original article

## Association Between Child Marriage and Reproductive Health Outcomes and Service Utilization: A Multi-Country Study From South Asia

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Article history: Received July 19, 2012; Accepted January 25, 2013

Keywords: Child marriage; South Asia; Fertility; Contraceptive use; Maternal health care utilization

## A B S T R A C T

**Purpose:** Despite the pervasiveness of child marriage and its potentially adverse consequences on reproductive health outcomes, there is relatively little empirical evidence available on this issue, which has hindered efforts to improve the targeting of adolescent health programs. The purpose of this study was to assess the association of child marriage with fertility, fertility control, and maternal health care use outcomes in four South Asian countries: India, Bangladesh, Nepal, and Pakistan.

**Methods:** Data for the study come from the most recent Demographic and Health Surveys conducted in the study countries; we used a subsample of women aged 20–24 years. Child marriage, defined as first marriage before 18 years of age, is categorized into two groups: first married at ages 15–17 years and first married at age  $\leq 14$  years. We used multivariate logistic regression models.

**Results:** The results of the study suggest that child marriage is significantly associated with a history of rapid repeat childbirth, current modern contraceptive use, female sterilization, not using contraception before first childbirth, pregnancy termination, unintended pregnancy, and inadequate use of maternal health services, although the associations are not always consistent across countries. Furthermore, women who married in early adolescence or childhood show a higher propensity toward most of the negative outcomes, compared with women who married in middle adolescence.

**Conclusions:** Child marriage adds a layer of vulnerability to women that leads to poor fertility control and fertility-related outcomes, and low maternal health care use.

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IMPLICATIONS AND  
CONTRIBUTION

Child brides are a key subgroup requiring improved focus by reproductive health programs. The study provides insight into the associations of child marriage with adverse outcomes in India, Bangladesh, Nepal, and Pakistan. It distinguishes between women who married in middle adolescence from those who married in early adolescence or childhood.

Although substantial progress has been made in reducing the prevalence of child marriage (marriage before the age of 18 years), it remains a pervasive problem in South Asia [1], with females being disproportionately at risk. Child marriage is increasingly recognized as a violation of human rights [2], and previous research has associated child or early marriage with a number of adverse health and social outcomes.

In India, maternal child marriage has been found to be significantly associated with an increased likelihood of stunting and underweight among children born in the past 5 years [3] and

of having a miscarriage or stillbirth [4]; and a lower likelihood of contraceptive use to delay the first pregnancy and institutional delivery among women aged 20–24 years [4]. In separate analyses, Raj et al [5] found a significant association with having three or more births, a repeat childbirth in <24 months, multiple unwanted pregnancies, pregnancy termination, and sterilization. Other researchers have associated child marriage with increased exposure to intimate partner violence, human immunodeficiency virus/acquired immunodeficiency syndrome, cross-generational sex, obstetric fistula, high maternal mortality and morbidity, and depression [4,6–9]. These adverse outcomes have been attributed to a host of factors, including restricted access to education and health information, limited exercise of informed choices, greater power imbalances between spouses, limited

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mobility and social interaction, and limited access to health care among child brides compared with women who marry at older ages [7,10].

Despite the pervasiveness of child marriage and its potentially adverse consequences on reproductive health outcomes, there is relatively little empirical evidence available on this issue, which has hindered efforts to improve the targeting of adolescent health programs. Most studies to date have focused on India, and little is known about the associations between child marriage and health outcomes in other countries. Empowering young adolescent girls is recognized as a key to improving overall reproductive and child health outcomes and accelerating social and economic development in low- and middle-income countries. However, a number of recent descriptive studies suggest that youth-serving reproductive health programs are often not reaching key subgroups that may be most at risk of poor reproductive health outcomes [7,11]. Girls who have married before the legal age constitute one of these subgroups.

The purpose of the study was to assess the influence of child marriage on reproductive health outcomes and service use in four South Asian countries—India, Bangladesh, Nepal, and Pakistan—after controlling for other individual-, household-, and community-level factors. We selected the South Asia region because of its high prevalence of child marriage [1]. We chose the four countries because they have data available from a recent Demographic and Health Survey (DHS). (Using the United Nations' geographic classification of countries, the other South Asian countries are Afghanistan, Bhutan, Iran, Maldives, and Sri Lanka. Of these, only Maldives, which has a population of fewer than 70,000 individuals, has recent DHS data available [year 2005 or later].) Despite a decline in overall child marriage prevalence since the 1990s, a significant linear decline has been seen only in marriage among females  $\leq 13$  years of age in all four countries, but not among females  $\geq 14$  years of age [12]. Although the legal age at marriage (with or without consent) is 18 years in Bangladesh, India, and Nepal, and 16 years in Pakistan [13], the median age at first marriage among females 25–49 years is 15.0 in Bangladesh [14], 16.8 in India [15], 17.0 in Nepal [16], and 19.1 in Pakistan [17]. The total fertility rate ranges from 2.4 in Bangladesh to 4.0 in Pakistan [1].

## Methodology

### Data

We drew data from the most recent DHS in India (2005–2006), Bangladesh (2007), Nepal (2006), and Pakistan (2006–2007). (For Nepal, we used data from DHS 2006 even though DHS 2011 was available, to keep consistency in period across countries.) These are nationally representative, population-based surveys of women aged 15–49 years. Analyses have been restricted to women 20–24 years of age who were married, divorced, or widowed. Excluded from the analysis were currently married women not living together, never-married women, and women whose *gauna* had not been performed. (*Gauna* is a tradition practiced primarily in the northern states of India in which a young bride lives with her parents until another ceremony is performed, after which time the bride goes to live with her husband.)

### Variables

For the purpose of this study, child marriage is defined as the first marriage when the respondent was  $<18$  years of age. The

indicator of age at first marriage has been categorized as:  $\geq 18$  years (reference group), 15–17 years (to capture marriage in middle adolescence), and  $\leq 14$  years of age (to capture marriage in early adolescence or childhood). Age at marriage is calculated from the century month code of the date of the first marriage or union and the century month code of the respondent's date of birth.

The outcomes of interest were the following:

- **Early fertility** is a binary indicator measuring whether the woman gave birth within the first 12 months of marriage.
- **Current modern contraceptive use** is a binary variable measuring whether the woman is currently using a modern contraceptive method.
- **Female sterilization** is measured with a binary indicator of whether the woman has undergone the procedure.
- **No contraception** before the first childbirth is established if a woman had a living child or children before her first use of contraception, or if a woman has never used contraception.
- **History of rapid repeat childbirth** is operationalized by having had at least one birth within 24 months of a previous childbirth.
- **Pregnancy termination** is a binary indicator of whether a woman reports ever having had a pregnancy that resulted in miscarriage, abortion, or stillbirth.
- **Unintended pregnancy** is measured with a binary indicator of whether the respondent has had at least one child in the past 5 years that was wanted later or not wanted at all.
- **Multiple unintended pregnancies** indicate whether the woman has ever had two or more unwanted pregnancies.
- **Number of antenatal care visits** indicates the number of antenatal visits during the pregnancy associated with her last birth, where the last category has been truncated to denote four or more antenatal visits based on the World Health Organization guidelines of adequate antenatal care.
- **Delivery by skilled personnel** refers to whether the woman's last birth was assisted by a skilled health care worker. Categorization of "skilled personnel" was country specific, based on the description in the country's DHS report [14–17].
- **Institutional delivery** refers to whether the woman delivered her last child in a health care facility (public or private).

A common set of control variables is included in all of the models estimated: the age of the woman, in years; type of place of residence (urban versus rural), household wealth, quintile; the woman's educational attainment; the age gap in years between the woman and her spouse; religion; and geographic area of residence. Duration of marriage is not included in the models because of the high correlation with age at first marriage. The regression models for modern contraceptive use also control for the number of living sons, whereas models for maternal health care use control for birth order.

### Statistical analysis

We carried out both descriptive and multivariate analyses separately for each country. Descriptive statistics include univariate statistics on the predictor and control variables and bivariate associations between age at marriage and the outcome variables. We estimated a series of logistic regression models to examine the association between various outcome variables and age at marriage. Results are presented as odds ratios (ORs) with 95% confidence intervals (CIs). To examine the association

between the number of antenatal visits and age at marriage, we estimated a Poisson regression model. The results from these models are presented as coefficients with 95% CIs. We found no multicollinearity among the predictor and control variables; the highest variance inflation factor was 1.94. All analyses were weighted to account for the survey design using STATA, version 10 (College Station, TX). The final sample sizes were 14,628 for India, 2,129 for Bangladesh, 1,658 for Nepal, and 1,546 for Pakistan. To minimize bias in the models of a history of rapid repeat births, we further restricted the sample to women who had a minimum of two children. This resulted in a much lower sample size.

## Results

### Sample characteristics

Table 1 displays the descriptive statistics for age at first marriage and control variables of interest, by country. The proportion of ever-married women 20–24 years of age who reported having been first married at  $\leq 17$  years of age ranged from 50% in Pakistan to 77% in Bangladesh, and the proportion who reported marrying at  $\leq 14$  years of age ranged from 12% in Nepal to 38% in Bangladesh. There were significant differences between countries in background characteristics of the sample, such as age, type of place of residence, wealth index, women's education,

and spousal age gap (Table 1). More than two thirds of the sample population resided in rural areas in all four countries. The proportion of women with no formal education was 39% in India, 15% in Bangladesh, 41% in Nepal, and 57% in Pakistan. The proportion of sample women who reported having husbands older by 6–9 years was 29% in India, 33% in Bangladesh, 19% in Nepal, and 24% in Pakistan. The proportion who reported having husbands older by  $\geq 10$  years was 14% in India, 41% in Bangladesh, 9% in Nepal, and 19% in Pakistan.

### Bivariate analyses

Table 2 shows differentials in the outcomes of interest by age at first marriage. The prevalence of current modern contraception in Pakistan is one fourth that of Bangladesh. The prevalence of female sterilization is highest in India, at 13%. No contraception before first childbirth ranged from 68% in Bangladesh to 91% in India. Bangladesh showed the lowest prevalence of maternal health care use.

The prevalence of early fertility did not vary significantly by age at first marriage. However, in each country, there were statistically significant differences between the “age at marriage” groups in the following outcomes: no contraception before first childbirth, pregnancy termination, multiple unwanted pregnancies, four or more antenatal visits, delivery by skilled personnel, and institutional delivery. For example, prevalence of

**Table 1**  
Sample characteristics, by country

	India		Bangladesh		Nepal		Pakistan	
	n	%	n	%	n	%	n	%
Marriage categories***								
Married as adults ( $\geq 18$ years of age) <sup>a</sup>	7,018	41.09	535	22.82	604	37.54	769	49.78
Married as middle adolescents (15–17 years of age)	5,478	41.59	848	39.32	837	49.98	561	36.26
Married as young adolescents or children ( $\leq 14$ years of age)	2,132	17.32	746	37.86	217	12.48	216	13.96
Age (years)***								
20 <sup>a</sup>	2,776	20.26	419	21.56	269	16.04	357	22.77
21	2,494	17.30	435	19.93	319	19.23	230	14.32
22	3,163	21.37	452	20.52	382	23.32	348	23.91
23	3,108	20.63	417	19.51	312	18.52	267	16.49
24	3,087	20.44	406	18.48	376	22.89	344	22.51
Type of place of residence***								
Urban <sup>a</sup>	5,653	26.74	802	22.57	434	15.04	532	30.22
Rural	8,975	73.26	1,327	77.43	1,224	84.96	1,014	69.78
Wealth index*								
Poorest <sup>a</sup>	2,135	20.09	319	17.48	353	17.85	311	19.59
Poorer	2,580	21.43	390	19.13	319	19.74	357	22.85
Middle class	3,166	21.95	426	21.29	306	20.58	300	19.91
Richer	3,618	21.16	470	22.31	360	21.33	299	19.19
Richest	3,129	15.36	524	19.79	320	20.5	279	18.46
Women's education***								
None <sup>a</sup>	4,701	39.10	318	15.12	697	41.18	906	57.39
Primary	2,279	15.44	681	31.57	386	23.35	269	18.37
Secondary	6,794	40.85	941	45.65	500	31.53	274	18.91
Higher	854	04.60	188	07.67	75	03.94	97	05.32
Spousal age gap***								
Husband younger/older by $\leq 5$ years <sup>a</sup>	8,048	56.32	527	26.41	1,184	71.91	888	56.29
Husband older by 6–9 years	4,218	29.42	671	32.53	322	19.27	354	24.29
Husband older by $\geq 10$ years	2,130	14.26	884	41.05	136	08.82	281	19.42
Religion <sup>b</sup>								
Hindu <sup>a</sup>	10,907	81.15	N/A	N/A	1,461	86.25	NI	NI
Muslim <sup>a</sup>	2,205	14.82	1,910	90.47	N/A	N/A	NI	NI
Other	1,497	04.03	219	09.53	197	13.75	NI	NI

% = weighted percentage; NA = not applicable; NI = no information; n = unweighted frequency.

\* Indicates design-based F-test across countries significant at  $p < .05$ ; \*\*\*  $p < .0005$ .

<sup>a</sup> Reference category.

<sup>b</sup> The reference category different for Bangladesh and Nepal, so this characteristic was not tested for significant variation across countries.

**Table 2**  
Sample of women with selected health outcomes, by age at first marriage

	Age at marriage ≤ 14 years (%)	Age at marriage 15–17 years (%)	Age at marriage ≥ 18 years (%)	Total (%)	N
<b>Early fertility</b>					
India	19.63	20.75	19.08	19.88	14,628
Bangladesh	19.68	18.90	18.76	19.15	2,129
Nepal	12.18	15.77	18.99	16.53	1,658
Pakistan	14.54	20.41	18.66	18.72	1,546
<b>History of rapid repeat childbirth<sup>a</sup></b>					
India***	47.45	46.07	54.19	48.01	6,466
Bangladesh	31.86	33.48	33.30	32.53	975
Nepal	39.42	39.50	44.26	40.23	815
Pakistan	64.29	66.63	68.60	66.48	707
<b>Current modern contraception</b>					
India***	35.45	28.35	19.40	25.90	14,628
Bangladesh**	50.82	46.72	39.09	46.54	2,129
Nepal**	36.62	27.83	24.37	27.62	1,658
Pakistan	12.18	12.22	8.80	10.50	1,546
<b>Female sterilization</b>					
India***	27.08	16.40	4.60	13.40	14,628
Bangladesh	.87	.31	.00	.45	2,129
Nepal***	10.98	5.12	1.04	4.31	1,658
Pakistan***	4.37	.77	.00	.89	1,546
<b>No contraception before first birth</b>					
India***	95.21	92.33	87.47	90.83	14,628
Bangladesh***	75.20	66.10	57.76	67.64	2,129
Nepal***	91.59	89.56	70.75	82.75	1,658
<b>Pregnancy termination</b>					
India***	18.01	16.69	12.73	15.29	14,627
Bangladesh***	17.97	15.56	6.52	14.41	2,126
Nepal**	15.63	16.09	8.76	13.28	1,658
Pakistan**	23.68	21.48	13.11	17.64	1,543
<b>Unintended pregnancy</b>					
India***	16.51	17.84	11.95	15.19	14,628
Bangladesh	20.63	20.63	17.05	19.81	2,129
Nepal*	30.37	25.55	19.82	24.00	1,658
Pakistan***	17.34	21.15	7.73	13.94	1,546
<b>Multiple unintended pregnancies</b>					
India***	4.27	4.09	1.68	3.12	14,628
Bangladesh*	2.14	2.01	.39	1.69	2,129
Nepal**	7.05	3.06	1.73	3.06	1,658
Pakistan***	8.67	6.76	.62	3.97	1,546
<b>Antenatal visits (≥4 visits)</b>					
India***	23.98	35.62	53.41	39.66	11,041
Bangladesh***	17.88	22.31	37.98	23.74	1,597
Nepal***	27.42	31.97	50.51	37.42	1,387
Pakistan***	16.97	23.83	37.09	28.12	1,120
<b>Delivery by skilled personnel</b>					
India***	35.83	48.64	68.60	53.21	11,138
Bangladesh***	11.86	21.41	39.94	21.49	1,600
Nepal***	11.96	16.28	36.35	22.24	1,388
Pakistan***	35.05	36.01	56.94	44.41	1,131
<b>Institutional delivery</b>					
India***	26.08	38.62	59.91	43.70	11,123
Bangladesh***	9.76	17.10	34.04	17.67	1,597
Nepal***	10.88	14.73	34.91	20.77	1,364
Pakistan***	28.83	32.96	51.17	39.75	1,130

% = weighted percentage; N = total sample.

<sup>a</sup> The sample was restricted to women with a minimum of two children.

\* Indicates design-based F-test (comparing outcomes in the three categories of age at marriage) significant at  $p < .05$ ; \*\*  $p < .005$ ; \*\*\*  $p < .0005$ .

delivery by skilled personnel among Bangladeshi women married at age  $\geq 18$  (39.94) was 3.4 times higher than those who first married at age  $\leq 14$  (11.86) and 1.9 times higher than those who first married at ages 15–17 years (21.41).

### Fertility and fertility control

Table 3 presents multivariate logistic regression results on the association between child marriage and various fertility and fertility control indicators. (The full model results are available from the authors upon request.) Compared with women who were married as adults, women married at 15–17 years of age and women married at  $\leq 14$  years of age were significantly more likely not to have used contraception before first childbirth, to have had a pregnancy termination, and to have had an unintended pregnancy (both single and multiple pregnancies). For example, in Bangladesh, women who first married at age 15–17 years were 3.38 times (95% CI, 2.18–5.26) more likely and those who first married at age  $\leq 14$  were 4.45 times (95% CI, 2.64–7.48) more likely to have had a pregnancy termination compared with women who first married at age  $\geq 18$  years. However, women first married before 18 years of age were not more likely to have given childbirth within the first year of marriage (early fertility) or a history of rapid repeat childbirths than were women married as adults.

In India and Nepal, age at marriage is significantly associated with female sterilization. Compared with women who were married as adults, women married as middle adolescents and those married as young adolescents and children are more likely to report having been sterilized in the two countries; the odds were much higher in the latter category. We did not estimate models for Pakistan and Bangladesh because of the low levels of female sterilization for those countries.

Finally, for current modern contraceptive use, the one indicator that is not a lifetime indicator, we estimated two sequential models. The first model adjusted for the common set of control variables; the second model additionally adjusted for number of living sons. The findings suggest that age at marriage is significantly associated with current modern contraceptive use in all four countries (results not shown). However, these results were partly mediated by the number of living sons. When the number of living sons is included in the model, the association between age at first marriage and use of a modern contraceptive method remained statistically significant only in India for women who first married at age 15–17 years (OR, 1.94; 95% CI, 1.70–2.23), for women who were married at age  $\leq 14$  years (OR, 2.62; 95% CI, 2.20–3.12), and Bangladesh (for women who first married at age  $\leq 14$  years (OR, 1.51; 95% CI, 1.11–2.05).

For all of these models, we also investigated whether the odds of various outcomes among women married at  $\leq 14$  years of age were significantly different from the odds among women married at ages 15–17 years. The estimates were significantly different between the two categories of age at marriage in the four countries for all outcomes except current modern contraception and female sterilization in India, unintended pregnancy in Bangladesh, and multiple unintended pregnancies in Nepal.

### Maternity care

Table 4 presents the multivariate results for the association between age of marriage and maternal health care use. The

**Table 3**

Odds ratios with 95% confidence intervals for multivariate logistic regression models for fertility and fertility control indicators

	Age at marriage ≤ 14 years <sup>a</sup>	Age at marriage 15–17 years <sup>a</sup>	N
	OR (95% CI)	OR (95% CI)	
Early fertility			
India	.85 (.72–1.00)	1.04 (.93–1.17)	14,377
Bangladesh	.96 (.66–1.39)	.93 (.67–1.29)	2,081
Nepal	.57 (.31–1.07)	.78 (.55–1.12)	1,642
History of rapid repeat childbirth <sup>c</sup>			
India	.68** (.56–.83)	.67** (.57–.79)	6,376
Bangladesh	.86 (.45–1.64)	.97 (.52–1.79)	966
Nepal	.59 (.33–1.05)	.62* (.39–.99)	809
Pakistan	.76 (.44–1.31)	.94 (.59–1.49)	697
Current modern contraception <sup>b</sup>			
India	2.62** (2.20–3.12)	1.94** (1.70–2.23)	14,377
Bangladesh	1.51* (1.11–2.05)	1.33 (.99–1.78)	2,081
Nepal	1.45 (.92–2.27)	1.11 (.78–1.57)	1,642
Pakistan	1.22 (.53–2.82)	1.52 (.84–2.75)	1,523
Female sterilization			
India	10.36** (8.19–13.12)	5.37** (4.38–6.59)	14,377
Nepal	9.11** (3.40–24.43)	4.73** (1.82–12.28)	1,570
No contraception before first birth			
India	1.72** (1.30–2.28)	1.34** (1.13–1.58)	14,377
Bangladesh	1.47* (1.04–2.08)	1.12 (.83–1.50)	2,081
Nepal	2.23* (1.02–4.90)	2.53** (1.52–4.20)	1,642
Pregnancy termination			
India	1.60** (1.34–1.92)	1.39** (1.21–1.60)	14,376
Bangladesh	4.45** (2.64–7.48)	3.38** (2.18–5.26)	2,078
Nepal	2.27* (1.22–4.24)	2.33** (1.53–3.55)	1,642
Pakistan	2.23** (1.33–3.73)	1.90** (1.33–2.71)	1,520
Unintended pregnancy			
India	1.62** (1.34–1.96)	1.66** (1.45–1.91)	14,377
Bangladesh	1.14 (.80–1.62)	1.17 (.83–1.65)	2,081
Nepal	1.92* (1.21–3.05)	1.45* (1.00–2.10)	1,642
Pakistan	2.92** (1.64–5.19)	3.82** (2.47–5.90)	1,523
Multiple unintended pregnancies			
India	2.47** (1.71–3.56)	2.31** (1.70–3.13)	14,377
Bangladesh	4.70* (1.39–15.87)	4.09* (1.19–14.08)	2,081
Nepal	3.71* (1.42–9.69)	1.63 (.68–3.88)	1,642
Pakistan	24.21** (7.44–78.84)	18.17** (5.77–57.28)	1,523

All models controlled for age, urban/rural, household wealth quintile, woman's educational attainment, age gap in years between spouses, religion, and geographic area of residence.

CI = confidence interval; OR = odds ratio.

<sup>a</sup> The reference category is ≥18 years.

<sup>b</sup> The model also controls for the number of living sons.

<sup>c</sup> The sample was restricted to women with a minimum of two children.

\* Significant at  $p < .05$ ; \*\*  $p < .005$ .

number of antenatal visits was not significantly associated with age at marriage in India and Pakistan. In Bangladesh, the expected number of antenatal visits made by women married at ≤14 years of age was estimated to be 14.5% lower than for women married at ≥18 years, all other things being equal. In Nepal, the expected number of antenatal visits made by women married at ages 15–17 years was estimated to be 7.8% lower than for women married as adults.

We estimated two models of delivery care : assistance by a skilled health worker and institutional delivery. The odds of delivery assistance by a skilled health care worker during the last birth were significantly lower for women married at 15–17 years

**Table 4**

Odds ratios with 95% confidence intervals for multivariate logistic regression models for maternal health care use indicators

	Age at marriage ≤ 14 years <sup>a</sup>	Age at marriage 15–17 years <sup>a</sup>	Sample size
	OR (95% CI)	OR (95% CI)	
Antenatal visits <sup>b</sup>			
India	-.02 (–.06 to .02)	.01 (–.01 to .04)	10,901
Bangladesh	-.16* (–.31 to –.00)	-.08 (–.20 to .04)	1,573
Nepal	-.07 (–.19 to .06)	-.08* (–.15 to –.01)	1,377
Pakistan	-.11 (–.58 to .36)	-.03 (–.17 to .11)	1,104
Delivery by skilled personnel			
India	.84 (.69–1.02)	.89 (.78–1.03)	10,998
Bangladesh	.53* (.33–.84)	.66* (.43–1.01)	1,576
Nepal	.54 (.26–1.15)	.56* (.37–.86)	1,378
Pakistan	.87 (.52–1.48)	.55** (.37–.83)	1,114
Institutional delivery			
India	.79* (.64–.97)	.88 (.76–1.00)	10,985
Bangladesh	.60* (.37–.99)	.70 (.44–1.10)	1,573
Nepal	.58 (.26–1.26)	.55* (.36–.85)	1,354
Pakistan	.92 (.53–1.62)	.64* (.43–.96)	1,113

All models controlled for age, urban/rural, household wealth quintile, woman's educational attainment, age gap in years between spouses, religion, geographic area of residence and birth order.

CI = confidence interval; OR = odds ratio.

<sup>a</sup> The reference category is ≥18 years.

<sup>b</sup> Poisson regression was done, so given values are coefficients with adjusted 95% CIs.

\* Significant at  $p \leq .05$ ; \*\*  $p < .005$ .

of age in Bangladesh, Nepal, and Pakistan, and for women married at ≤14 years of age in Bangladesh compared with those married at age ≥18 years. In Pakistan, for example, women who first married at age 15–17 years were .55 times as likely as those marrying in adulthood to have had delivery assistance by a skilled health care worker during last birth (95% CI, .37–.83). For place of delivery, Nepali and Pakistani women who married at 15–17 years of age had lower odds of delivering in a health care facility, whereas Indian and Bangladeshi women married at ≤14 years of age had significantly lower odds compared with their counterparts who married as adults.

## Discussion

The study results suggest that in the South Asian context, child marriage is significantly associated with poor fertility outcomes, lower contraceptive use early in the marriage, and inadequate maternal health care use. We investigated fertility control using various types of indicators, including fertility control before first birth, spacing between pregnancies, and current contraceptive use. Women married as children were less likely to have used fertility control before the first birth. Low fertility control may account for negative fertility outcomes, such as pregnancy termination and unwanted pregnancy.

A number of mechanisms may be at play in the relationships between child marriage, fertility control, and fertility, including limited knowledge about temporary modern contraceptives, social norms for childbearing, longer duration of marriage, and women's limited decision-making power and access to resources [5,8,10,18–20]. The vulnerable position of young women who married at age ≤17 years is corroborated by our findings that



child marriage is significantly associated with unwanted pregnancies.

Interestingly, the association between early fertility and child marriage was not significant in the countries we studied, except for a borderline negative association among respondents married at age  $\leq 14$  in India. However, the negative association between age at marriage and history of rapid repeat childbirths is significant among Indian and Nepalese women first married at 15–17 years, who had at least two births. The negative association can possibly be explained by low fecundity at very young ages, low coital frequency, or both [21]. Factors that may explain low coital frequency are arranged marriage, delayed consummation, and extended family living arrangements [21].

Our findings that women 20–24 years of age in India and Nepal who were married as children are more likely to be sterilized most likely reflects the fact that they have completed their desired family size and composition because of early fertility and rapid pregnancies. Longer duration of marriage may also be a mediating factor in this association. In addition, as pointed out by Raj et al [5], the increased risk of sterilization may also result from inadequate fertility control, as indicated by the increased risk of unintended pregnancies among women married as children, but our study did not investigate this explanation. Although sterilization is an effective and permanent family planning method that would seem to be a rational choice for women with early and rapid fertility, previous research suggests that early sterilization may be a pathway to increased risk of human immunodeficiency virus infection and other sexually transmitted diseases because of unprotected intercourse as a result of the reduced perceived need to use condoms [5,7,9,22].

Another indicator of fertility control investigated in the study is current modern contraceptive use, which measures fertility control at the time of the survey as opposed to the indicator of contraceptive use early in the marriage discussed above. The association of current modern contraception use with child marriage is positive and significant after controlling for other factors. This may be because women who were married as children had already achieved their desired family size and composition, an argument that is consistent with our finding of a weakened association of current use of modern contraception with age at marriage after controlling for number of living sons, which indicate that sex preference is important in the study countries. Furthermore, in India, where contraception is often considered synonymous with sterilization, the association of current modern contraceptive use with age at marriage becomes insignificant when current use of any method is replaced by current use of a temporary method (results not shown).

The results of the multivariate models of maternal health care use (antenatal visits, delivery by skilled personnel, and institutional delivery) showed a negative association with child marriage in the study countries. The highly significant bivariate association mostly disappeared once background characteristics were controlled. In all models, higher wealth and education were important positive predictors for maternal health care use in all study countries. On the other hand, higher birth order and residing in rural areas were frequently negative predictors of health care use. However, although age at marriage remains significantly associated with maternal health care use after controlling for background characteristics, it may result from the limited empowerment of women who were married as children and a corresponding lack of decision-making power and access to resources [19,23].

For the most part, the association of age at marriage with various outcomes was consistent across countries. For the outcomes current modern contraception and maternal health care use, in which significant bivariate associations disappeared after controlling for background characteristics, the inconsistencies across countries can be explained to some extent by varying distribution of important predictors in study sample across countries (Table 1). However, further research is needed to investigate this issue.

These findings are consistent with those of previous studies [4,5,8,23,24]. For example, Raj et al [5] showed the significant association of child marriage with fertility and fertility control outcomes in India. In a separate analysis, Raj [24] found an increasing association of negative outcomes of reproductive health care and fertility control with reducing age at marriage in India. Moore et al [23] demonstrated similar evidence of an association of child marriage with contraceptive use, early childbearing, and unwanted pregnancy in India. Santhya et al [4] showed similar associations of child marriage with early childbearing, institutional delivery, and pregnancy loss. Mathur et al [8] threw light on the negative consequences of early childbearing and unwanted pregnancies of child marriage in developing countries.

The study has a number of limitations. First, the age and outcomes are self-reported, and hence may be prone to bias owing to social desirability and recall. The age of the respondent and age at marriage may be misreported, and unintended pregnancy may be underreported or subject to post facto rationalization. Second, owing to cross-sectional data, the analysis assesses associations, and causality cannot be assumed. Third, in some models, high ORs and wide CIs may indicate small cell sizes or small probabilities of the outcome among the sample. Fourth, available data do not allow us to distinguish between natural and induced pregnancy termination, both of which can be associated with child marriage, albeit for different reasons. Fifth, because no data on maternal health care are available for women whose first births did not occur in the past 5 years, instead of analyzing service use associated with first birth, we analyzed last births after controlling for birth order. Finally, other important factors such as women's empowerment and control over fertility and maternal health care use decisions are not included as explanatory factors in the models, because of their potential endogeneity.

Overall, the study results provide important insights into the association of child marriage with various fertility, fertility-related, and maternal health care use outcomes. To our knowledge, this study is the first multi-country study of the association of child marriage with fertility and fertility control outcomes, and also the first that analyzes the association of child marriage with maternal health care use. All of these outcomes have been previously associated with a variety of factors, including urban/rural region of residence, education, and poverty. However, study findings reveal that child marriage adds yet another layer of vulnerability over and above these background characteristics [25,26]. Furthermore, the study distinguishes between women who married in middle adolescence and those who married in early adolescence or childhood. Our results suggest that although both of these groups of women appear to be disadvantaged, women who married at  $\leq 14$  years of age show a significantly higher propensity toward negative reproductive health behaviors. Therefore, strict reinforcement of laws is required to curb this social custom.

Of particular concern is the limited scope for such girls and young women to achieve better reproductive and maternal health because of reduced educational and income-generating opportunities [4] and restricted mobility, which makes them a hard-to-reach population for reproductive health programs. Although a number of programmatic strategies are being used, most of them focus on preventing child marriage [13,18,27]. This study stresses the importance of targeting women who were married at early ages, and their families. The wide selection of outcomes and the age categories used in the study give in-depth insight into the effect of child marriage on various dimensions of reproductive health, and provide interesting information to those responsible for the design and management of such programs. Thus, the results can be used in application of finely nuanced strategies in achieving better reproductive health in this hard-to-reach population.

### Acknowledgments

This report was made possible with financial support from the United States Government's Agency for International Development under the MEASURE Evaluation PRH Award (Cooperative Agreement Associate Award GPO-A-00-09-00003-00). The paper was presented at the 2011 International Conference on Family Planning in Dakar, Senegal, and at the 2012 Asia Population Association Conference in Bangkok, Thailand.

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