Title: The Effect of Antenatal Contraceptive Counseling and IUD Insertion Services on Modern Contraceptive Use and Method Mix in Nepal: Results from a Stepped-Wedge Randomized Controlled Trial

Authors and Affiliations: Sarah Huber-Krum[1], Aayush Khadka[1], Julia Rohr[1], Elina Pradhan[2], Mahesh Puri[3], Dev Maharjan[3], Saugat Joshi[3], Iqbal Shah[1], and David Canning[1]

[1] Global Health and Population, Harvard T.H. Chan School of Public Health, Boston, MA, USA

[2] The World Bank Group, Washington, D.C.

[3] Center for Research on Environment, Health and Population Activities (CREHPA), Kathmandu, Nepal

Abstract

Unmet need for modern contraception in the postpartum period is common. We examined the effects of an antenatal contraceptive counseling and postpartum IUD services intervention in six Nepalese hospitals on modern contraceptive use and long-acting method use at two follow-up points (approximately 12 and 21 months post-delivery). An Intent-to-Treat analysis was used to assess the relationship between the intervention and use of modern contraception and long-acting contraception (i.e., sterilization, IUD, implant) at follow-up. At the first follow-up, women in the intervention group reported a significant increase in modern contraceptive use and long-acting method use, compared to the control group. However, at the second follow-up, differences in modern contraceptive use were negligible, but the intervention group continued to report significantly higher rates of long-acting method use. Institutionalizing antenatal contraceptive counseling and postpartum IUD services at hospitals in Nepal may produce positive, lasting effects on long-acting method use among postpartum women.

Introduction

Although many postpartum women do not want to become pregnant, few use modern contraception (Ross & Winfrey, 2001). Short birth intervals (i.e., pregnancies conceived less than 18 months following a prior birth) are associated with a range of adverse perinatal outcomes, including preterm birth, low birthweight, and small size for gestational age (Conde-Agudelo, Rosas-Bermúdez, & Kafury-Goeta, 2006). Additionally, infants in low- and middle-income countries (LMICs) born within 36 months of a prior birth are at increased risk of undernutrition and death (Rutstein, 2005). Use of modern contraception in the postpartum period may improve health outcomes through longer birth spacing (Cleland, Conde-Agudelo, Peterson, Ross, & Tsui, 2012; Yeakey et al., 2009). Improving access to contraception following a birth is critical to avoiding unintended pregnancy and improving the health and wellbeing of women and their children.

The antenatal period may be an optimal time for contraceptive counseling. In LMICs, women experience substantial access-related barriers to postnatal services, the most common time for family planning counseling and uptake, (Vernon, 2009) and women may prioritize the health of their newborns over seeking family planning services. Antenatal care services (ANC) are advantageous for contraceptive counseling because of wide-coverage, higher attendance, and fewer access-related barriers (Cleland, Shah, & Daniele, 2015). Yet, a systematic review of interventions to improve postpartum contraceptive use in LMICs only identified eight studies – six of which were randomized control trials - involving ANC counseling interventions (Cleland et al., 2015). Cleland et al. (2015) concluded that high-intensity ANC counseling may improve contraceptive uptake. However, the findings of the studies were conflicting, and no study followed women longer than 9 months after delivery. More randomized control trial studies with longer follow-up periods are needed to determine if ANC contraceptive counseling is effective at influencing women to uptake modern contraception after delivery.

Most women do not use contraception in the postpartum period in Nepal. Within 12 months of delivery, only about one-third of women use any method of family planning to avoid pregnancy (Winfrey & Rakesh, 2014). Due to low contraceptive prevalence, short birth intervals are common: almost one in four births occurs within 24 months of the previous birth (Ministry of Health, Nepal, 2017). Further, 12 percent of female deaths are pregnancy-related (Ministry of Health, Nepal, 2017). Short-birth intervals and maternal mortality may be reduced through increased prevalence of modern contraception among postpartum women in Nepal.

The aim of this study was to estimate the effects of an ANC contraceptive counseling intervention, which included postpartum IUD (PPIUD) insertion services, on modern contraceptive use (i.e., sterilization, IUD, subdermal implant, injectable, oral contraception, emergency contraception, lactational amenorrhea method, and standard days method) and use of long-acting contraceptive methods (i.e., sterilization, IUD, and subdermal implant) at two follow-up periods, using panel data from a stepped-wedge randomized controlled trial conducted in Nepal. On average, wave 1 follow-up was conducted 12 months after delivery, and Wave 2 was conducted 21 months after delivery. The contraceptive counseling initiative is explained in detail below.

Postpartum Intrauterine Device Initiative

The Postpartum Intrauterine Device Initiative, supported by The International Federation of Gynecology and Obstetrics (FIGO) in collaboration with its national societies, launched in 2013. The intervention aimed to institutionalize postpartum contraceptive services as a routine part of ANC contraceptive counseling and PPIUD insertion services in six LMICs: Tanzania, Nepal, Sri Lanka, India, Kenya, and Bangladesh. The intervention was designed to train community midwives, nurses, doctors, and delivery unit staff on the provision of ANC contraceptive counseling and PPIUD services. The main activities of the intervention included training providers to improve their technical competence and contraceptive knowledge. Providers were also trained on methods to improve patient knowledge and client-provider interactions, and providers were expected to counsel women on modern contraception during ANC visits. During counseling sessions with clients, providers informed clients about modern contraceptive methods and showed clients how the PPIUD was inserted through counseling aids, such as brochures, wall charts, and videos.

In Nepal, FIGO collaborated with the Nepal Society of Obstetricians and Gynecologists (NESOG) to design the intervention program in adherence with the national health systems and training guidelines. FIGO worked in coordination with the Nepal Ministry of Health and Population to ensure sustainability of future scale-up of the program. Health professionals in the study hospitals who provided obstetric services were trained to provide postpartum contraceptive counseling services during ANC visits, and to perform PPIUD insertions. Each training workshop was three days long with six sessions, which included practice PPIUD insertion sessions in MAMA-U mannequin models for vaginal and intra-caesarian procedures. In the training, providers discussed infection prevention, side-effects of the IUD, complication management, and counseling techniques. Pre-training and mid-training knowledge assessments were conducted along with role plays and group discussions to facilitate the training.

Women were counseled on modern contraception, with an emphasis on PPIUD, either during ANC care visits (if women visited the hospital for ANC) or during postnatal care (PNC) in a ward after delivery. If women arrived early for birth and were not in active labor, they were counseled in ANC wards. Women could also be counseled both during ANC and after admission to the hospital for delivery. If a woman chose to have PPIUD inserted, consent for insertion was taken at the point of choice (either at ANC or PNC), and confirmed and noted in maternity records immediately before the insertion process.

Methods

Study Setting and Population

The Postpartum Intrauterine Device (PPIUD) Study was undertaken to evaluate the causal effect of the FIGO initiative on the uptake and subsequent continued use of PPIUD in Nepal, Sri Lanka, and Tanzania. In Nepal, the study took place in six tertiary hospitals: Bharatpur Hospital, Bheri Zonal Hospital, BP Koirala Institute of Health Sciences (BPKIHS), Koshi Zonal Hospital, Lumbini Zonal Hospital and Western Regional Hospital. Nepal is divided into three ecological zones, including Mountain, Hill, and Terai. Four of the study hospitals were in Terai zone, and two (BPKISH and Western Regional Hospital) in Hill zone. Study hospitals were chosen because of high volume of obstetric caseloads, large catchment area, and location outside of the capital city. All women who gave birth in these hospitals in the 18-month period between September 8th, 2015 and March 8th, 2017 were eligible to be enrolled in the baseline survey unless their primary residence was outside of Nepal. Out of a total of 75,897 women eligible for participation in the baseline survey, 75,587 (99.6%) consented to be interviewed. Canning et al. (2016) provides detailed information about study design.

Follow-up selection. All women who had the PPIUD inserted were selected for follow-up. Among women who did not have the PPIUD inserted, follow-up selection was limited to those women who lived within 24 hours walking distance of the hospital at which they delivered. Exactly 33% of women who lived within 24 hours of the hospital were randomly selected to be followed-up for Wave 1 and Wave 2 follow-up surveys. In total, 26,221 women were selected for follow-up for Wave 1 and Wave 2. Of those selected for follow-up, 21,264 (81.1%) responded to the Wave 1 survey and 15,374 (58.6%) responded to the Wave 2 survey. Among women who delivered at a hospital with the intervention, follow-up rates during Wave 1 and Wave 2 were 81.7% and 51.3%, respectively. Similarly, among women who did not deliver in a hospital with the intervention at baseline, Wave 1 and Wave 2 follow-up rates were 79.8% and 69.7%, respectively.

Intervention Study Design

We use a stepped-wedge cluster randomized design. In all hospitals, data collection began prior to the intervention to provide pre-intervention data. The intervention was introduced into the hospitals in two steps. With this design, all the study hospitals received the intervention over the course of the study. The six hospitals were placed in matched pairs and then each pair was randomized into either group 1 (early intervention) or group 2 (late intervention). The three pairs were: (i) Western Regional and BPKIHS, (ii) Lumbini Zonal and Bharatpur, and (iii) Koshi Zonal and Bheri Zonal. Figure 1 displays a map with the location of the hospitals. Pairs were matched by geography (Hill versus Terai), and then by the annual obstetric caseload. The three hospitals in Group 1 (Lumbini Zonal, Koshi Zonal, and Western Regional) were scheduled to start the intervention in the fourth month after three months of pre-intervention data collection, and Group 2 hospitals (BPKIHS, Bharatpur and Bheri Zonal) were scheduled to start the intervention in the tenth month after nine months of pre-intervention data collection.

Data Collection

Baseline. Baseline data collection occurred between September 8th, 2015 and March 8th, 2017 in all study hospitals. The data were recorded electronically on hand-held tablets by trained, Nepalese research assistants. Interviews were conducted after delivery but prior to discharge from the hospital. The study questionnaire included questions about women's sociodemographic background, birth and reproductive history, contraceptive counseling received during ANC or PNC, uptake of contraception, and follow-up contact information.

Follow-up. Wave 1 follow-up data collection occurred between May 30th, 2016 and April 30th, 2018. Wave 2 follow-up data collection occurred between March 17th, 2017 and July 30th, 2018. Research assistants contacted women selected for follow-up to schedule interviews. Research assistants interviewed women in private settings in or near their homes and in the local language. The data were recorded electronically on hand-held tablets. The study questionnaire included questions about women's sociodemographic background, birth and reproductive history, family planning use, and contraceptive use and outcomes.

Measures

Outcomes. Two primary outcomes are of interest: modern contraceptive use and use of long-acting contraceptive methods.

Modern Contraceptive Use. Modern contraceptive use is a binary variable that indicates whether the woman reported use of a modern contraceptive method. Modern contraception is define as male or female sterilization, sub-dermal implant, intrauterine device, oral contraception, emergency

contraception, lactational amenorrhea method, standard days methods, or other modern method (e.g., diaphragm) (Festin et al., 2016).

Long-acting Contraceptive Method Use. Long-acting contraceptive method use is a binary variable that indicates whether the woman reported use of a long-acting contraceptive method. Long-acting contraceptive methods are defined as male or female sterilization, sub-dermal implant, or intrauterine device.

Key exposure. The key treatment variable is a binary variable indicating exposure to the intervention, defined as delivering in a hospital after the start of the intervention.

Confounders. Confounders included in the adjusted multivariate regression models include: age, education, parity, ethnicity, ever had an abortion, male child born, and time since delivery. Age is a continuous variable measured in years. Education is a six-level categorical variable (no schooling, some primary, completed primary, some secondary, completed secondary, more than secondary). Parity is a three-level categorical variable (one, two, or three or more children). Ethnicity is a seven-level categorical variable (Hill Brahmin, Chhetri, Janajaati, Madhesi, Dalit, Muslim, Others). Had an abortion before is a binary variable that indicated whether or not the woman had had an abortion before. Male child born is a binary variable that indicated whether or not the woman bore a male child at the index birth. Time since delivery is a continuous variable measure in months. In addition, all multivariate regression models adjusted for hospital and month fixed effects.

Data Analyses

We used Stata 15 to manage and analyze the data. Women who did not live within 24 hours of hospital at which they delivered (n = 8,551) and women who were not married at the time of delivery (n = 66) were excluded from the analysis. We used an intent-to-treat analysis (ITT) to estimate the impact of the intervention on modern contraceptive method use and long-acting contraceptive method use at Wave 1 and Wave 2 follow-up periods. We analyzed these relationships using linear regression explaining the outcomes (whether using modern contraception and whether using long-acting contraception) with exposure to the intervention. We controlled for hospital fixed effects and month fixed effects in all models to adjust for differences between hospitals and any underlying time trend. Additionally, we provide estimates with and without additional controls for women's background characteristics.

While the outcome variables are binary, we have a fully saturated model with discrete explanatory variables where every individual is in one of a finite number of strata; in this case the prediction of the outcome given by the linear probability model is simply the average outcome for

the stratum, and hence is a well specified model for the binary outcomes. We can therefore estimate the intention-to-treat effect using a simple linear regression. The treatment effect is simply the difference in outcomes between the treatment and control groups (Clarke, Palmer, & Windmeijer, 2015).

Outcomes for women who delivered at the same hospital are likely to be correlated with each other due to unobserved hospital level variables. Hence, inference needs to be corrected for the potential correlation in the error term across women in the same hospital. Since we only have six hospitals (i.e., six clusters), the standard cluster robust variance estimator based on a large number of clusters may be invalid (Bertrand, Duflo, & Mullainathan, 2004). We used the wild cluster bootstrap method with six-point bootstrap weight distribution to estimate the statistical significance of the effect size for all models. This approach has been shown to have good properties with six clusters (Cameron, Gelbach, & Miller, 2008).

Women were not equally likely to be sampled for follow-up, given that all women who had PPIUD inserted were selected for follow-up, and unequal sampling fractions were employed. Thus, sampling weights need to be used to ensure that the sample is representative. We used inverse probability weighting (IPW) to remove the sampling bias (Seaman & White, 2013). All estimates show weighted results.

Ethical approval

Ethical approval as exempt was granted by the Harvard T.H. Chan School of Public Health Office of Human Research Administration. The study received approval from the Nepal Health Research Council.

Results

In general, women who were and were not followed-up at Wave 1 and Wave 2 did not differ in sociodemographic characteristics regardless of baseline treatment status. Table 1 shows that follow-up among women who delivered in hospitals after the start of the intervention was weakly correlated with baseline age and PPIUD insertion in Wave 1 and certain ethnicities in both Wave 1 and Wave 2. Similarly, follow-up among women who did not deliver in hospitals after that start of the intervention was weakly correlated with being of Tamang ethnicity in Wave 1 and baseline parity across both waves. Further, the baseline sociodemographic characteristics of women did not significantly differ between Wave 1 and Wave 2 (Table 2).

With regards to modern contraceptive use, 36.7% of women at Wave 1 and 39.9% of women at Wave 2 were using a modern method of contraception. Further, 10.5% of women at

Wave 1 and 12.4% of women at Wave 2 were using a long-acting contraceptive method. Figure 2 shows modern contraceptive prevalence during Wave 1 and Wave 2 among women who delivered at group 1 and group 2 hospitals. Trends in use are similar between the two groups, increasing after the start of the intervention; however, at Wave 2, trend lines are almost equivalent. Similarly, Figure 3 shows long-acting contraceptive prevalence during Wave 1 and Wave 2 among women who delivered at Group 1 and Group 2 hospitals. Long-acting method use increases after the start of the intervention in both groups for both follow-up periods.

At Wave 1 follow-up, women who delivered in a hospital with the intervention experienced a 6.5 percentage point [95% CI: 0.021, 0.132] increase in modern contraceptive use, as compared to women who did not deliver in a hospital with the intervention (Table 3). However, by Wave 2, differences in modern contraceptive use between the treatment and control groups were not significant, $\beta = 0.018$ [95% CI: -0.019, 0.067]. Inclusion of the women level variables had little effect on the intervention effect estimate. Although, use of modern contraception varied significantly across different groups of women (e.g., women with higher parity).

With regards to use of long-acting contraception, we found that the intervention increased long-acting method use at Wave 1 and Wave 2 (Table 4). Women who delivered in a hospital with the intervention, as compared to women who delivered in a hospital without the intervention, experienced a 5.6 percentage point [95% CI: 0.018, 0.079] increase at Wave 1 and a 5.9 percentage point [95% CI: 0.025, 0.097] increase at Wave 2. Again, inclusion of the women level variables had little influence on the intervention effect estimation. Women of high parities were more likely to be using long-acting methods, as compared to women with only one child.

Discussion

We found that the antenatal contraceptive counseling intervention increased the prevalence of modern contraceptive use only in the short-term. However, women's use of specific contraceptive methods (i.e., long-lasting methods) was significantly increased and sustained for a longer period of time following labor and delivery. Women face substantial barriers to postnatal follow-up visits (Vernon, 2009), which are commonly used to counsel women on family planning. Thus, counseling during ANC visits is a more opportune time to counsel women on the benefits of modern contraception and begin contraceptive decision-making.

Our study has limitations that require discussion. Tertiary hospitals with high obstetric caseloads were targeted for the study. Thus, our study excludes women who delivered outside of formal healthcare systems or at small, primary health care centers. However, the findings of our study

provide evidence for possible scale up to other types of health care centers aiming to increasing use of long-acting methods in the postpartum period.

Integrating contraceptive counseling into routine ANC counseling may improve postpartum contraceptive uptake and sustained use of long-acting contraceptive methods. While our study demonstrated that ANC counseling influenced uptake of modern contraception in the short-term (i.e., about one year postpartum), it did produce lasting effects in the long-term (i.e., about two years postpartum). Women often discontinue short-acting and barrier methods while still in need of contraception. A range of women's contraceptive needs (e.g., method switching) should be accommodated in the postpartum period.

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Table 1 Difference in means of follow-up rates among women who were and were not followed-up during Wave 1 and Wave 2 by baseline sociodemographic characteristics, intervention hospital, and PPIUD insertion status and disaggregated by baseline treatment status

	Wave 1 sample		Wave 2 sample	
	Treated	Untreated	Treated	Untreated
Age (years)	-0.7340 [-1.286, -0.0980]	-0.6357 [-1.036, 0.0827]	-0.1526 [-0.9094, 0.8953]	-0.7438 [-1.112, -0.0218]
Any schooling	-0.0091 [-0.0306, 0.0088]	0.0140 [-0.0684, 0.1027]	0.0010 [-0.0726, 0.0584]	0.0033 [-0.0725, 0.0689]
Education				
Less than primary	0.0011 [-0.0039, 0.0089]	0.0003 [-0.0038, 0.0069]	0.0015 [-0.0093, 0.0053]	0.0017 [-0.0017, 0.0051]
Some primary	0.0130 [-0.0038, 0.0300]	0.0062 [-0.0156, 0.0163]	0.0062 [-0.0171, 0.0187]	0.0118 [-0.0009, 0.0187]
Completed primary	0.0141 [-0.0043, 0.0313]	0.0032 [-0.0206, 0.0159]	0.0051 [-0.0077, 0.016]	0.0088 [-0.0216, 0.0269]
Some secondary	0.0293 [-0.0295, 0.0781]	0.0310 [-0.0371, 0.0881]	0.0136 [-0.0557, 0.0676]	0.0283 [-0.0237, 0.0664]
Completed secondary	-0.0032 [-0.0287, 0.0168]	0.0148 [-0.0340, 0.0623]	-0.0052 [-0.0414, 0.0580]	-0.0058 [-0.0353, 0.0288]
More than secondary	-0.0633 [-0.0123, 0.0180]	-0.0415 [-0.1263, 0.0720]	-0.0200 [-0.1158, 0.1001]	-0.0415 [-0.0898, 0.0590]
Total time to hospital				
Less than 2 hours	-0.0256 [-0.1014, 0.0924]	-0.0789 [-0.2078, 0.0484]	-0.0271 [-0.0498, 0.0034]	-0.0552 [-0.1334, 0.0244]
2 to 6 hours	0.0169 [-0.0902, 0.0804]	0.0491 [-0.0567, 0.1646]	0.0262 [-0.0199, 0.1306]	0.0358 [-0.0256, 0.1033]
6 hours or more	0.0077 [-0.0370, 0.0315]	0.0285 [0.0054, 0.0654]	0.0607 [-0.0990, 0.0620]	0.0191 [-0.0001, 0.0397]
Parity				
1	0.0426 [-0.0036, 0.0923]	0.0600 [0.0217, 0.0945]	0.0282 [-0.0047, 0.0443]	0.0588 [0.0306, 0.0779]
2	-0.0369 [-0.0767, 0.0057]	-0.0452 [-0.0983, 0.0039]	-0.0217 [-0.0502, 0.0080]	-0.0514 [-0.0847, -0.0278]
3 or more	-0.0057 [-0.0227, 0.0093]	-0.0148 [-0.0559, 0.0081]	-0.0065 [-0.0394, 0.0402]	-0.0075 [-0.0280, 0.0091]
Ethnicity				
Chhetri	0.0051 [-0.0214, 0.0295]	-0.0080 [-0.0250, 0.0177]	0.0299 [0.0066, 0.0870]	0.0008 [-0.0160, 0.0307]
Hill Brahmin	-0.0348 [-0.0807, 0.0440]	-0.0216 [-0.0864, 0.1103]	-0.0496 [-0.1569, 0.0758]	-0.0214 [-0.0610, 0.0574]
Magar	0.0152 [-0.0007, 0.0346]	0.0020 [-0.0310, 0.0278]	0.0046 [-0.0521, 0.0353]	0.0120 [-0.0060, 0.0315]
Tharu	-0.0286 [-0.0468, -0.0136]	-0.0300 [-0.0945, 0.0160]	0.0241 [-0.0305, 0.1064]	-0.0234 [-0.0813, -0.0004]
Tamang	0.0038 [0.0008, 0.0178]	0.0133 [0.0004, 0.0255]	0.0042 [-0.0059, 0.0284]	0.0121 [-0.0094, 0.0317]
Newar	-0.0084 [-0.0236, 0.0025]	0.0043 [-0.0078, 0.0247]	-0.0049 [-0.0209, 0.0165]	-0.0020 [-0.0157, 0.0194]
Muslim	0.0011 [-0.0085, 0.0244]	-0.0110 [-0.0413, 0.0156]	-0.0014 [-0.0289, 0.0366]	-0.0090 [-0.0329, 0.0096]

Other	0.0329 [0.0185, 0.0482]	0.0428 [-0.0040, 0.0895]	0.0329 [0.0185, 0.0482]	0.0428 [-0.0040, 0.0895]
Had an abortion before	0.0137 [-0.0791, 0.0827]	0.0082 [-0.0777, 0.0773]	-0.0236 [-0.1520, 0.0535]	0.0008 [-0.0769, 0.0428]
Male child born	0.0027 [-0.0069, 0.0184]	-0.0098 [-0.0168, 0.0089]	0.0024 [-0.0119, 0.0204]	-0.0093 [-0.0166, 0.0057]
Contraceptive counseling received	-0.0208 [-0.0721, 0.0004]	-0.0111 [-0.0473, 0.0327]	0.0015 [-0.0175, 0.0242]	0.0017 [-0.0100, 0.0274]
Postpartum IUD inserted	-0.0419 [-0.0620, -0.0068]	-0.0004 [-0.0023, 0.0005]	0.0044 [-0.0165, 0.0303]	-0.0002 [-0.0010, 0.0004]
Hospital of delivery				
Bharatpur	-0.0038 [-0.0423, 0.0291]	0.1115 [-0.0483, 0.2645]	0.0231 [-0.0864, 0.1534]	0.0815 [-0.0765, 0.1832]
Bheri Zonal	-0.0025 [-0.0425, 0.0394]	-0.1056 [-0.4690, 0.2025]	0.1106 [-0.1220, 0.5692]	-0.0808 [-0.3223, 0.0878]
BP Koirala Institute of Health Sciences (BPKIHS)	-0.0185 [-0.1158, 0.0301]	0.0889 [-0.0694, 0.2337]	0.1115 [-0.1317, 0.6226]	-0.0102 [-0.0720, 0.1341]
Koshi Zonal	-0.0710 [-0.2443, 0.0768]	-0.0430 [-0.2172, 0.0895]	-0.1279 [-0.4491, 0.0654]	-0.0485 [-0.2571, 0.0430]
Lumbini Zonal	-0.0251 [-0.0863, 0.0727]	-0.0272 [-0.1164, 0.0838]	0.0031 [-0.2722, 0.1050]	0.0037 [-0.0320, 0.0713]
Western Regional	0.1209 [-0.0353, 0.1999]	-0.0246 [-0.0982, 0.0832]	-0.1204 [-0.3262, 0.1274]	0.0541 [-0.0271, 0.2953]

Note: 95% confidence intervals of mean differences included within brackets. Confidence intervals were estimated using Wild Bootstrap, 1000 replications, and Webb weights.

Table 2. Selected characteristics of women in the Wave 1 and Wave 2 follow-up samples who lived within 24 hours of the hospital at which they delivered and were married, at baseline and follow-up

	Wave 1 sample	Wave 2 sample
Baseline Characteristics		
Mean age in years	24.1	24.1
Education		
No schooling	1.0	0.9
Some primary	4.9	4.7
Completed primary	4.7	4.5
Some secondary	30.3	29.7
Completed secondary	18.8	19.3
More than secondary	40.3	41.0
Parity		
1	56.6	55.8
2	34.8	35.6
3 or more	8.7	8.6
Ethnicity		
Hill Brahmin	25.2	26.1
Chhetri	15.6	14.9
Janajaati	36.4	36.0
Madhesi	5.9	6.0
Dalit	13.3	13.4
Muslim	1.9	1.8
Others	1.8	1.8
Had abortion(s) before	4.8	4.8
Male child born	54.8	54.6
Delivered in hospital with the intervention	61.7	53.4
Follow-up Characteristics		
Currently using modern contraception	36.7	39.9
Currently using long-acting contraception	10.5	12.4
Total Women	19276	13674

Note: Numbers are percentages unless otherwise stated

Table 3. Intent-to-Treat Effect of the Intervention on use of Modern Contraception at Wave 1 and Wave 2 follow-up

	Wave 1 sample				Wave 2 sample			
	Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Post-Treatment (Ref: Pre-Treatment)	0. 065**	[0.025, 0.119]	0.065**	[0.021, 0.132]	0.022	[-0.014, 0.073]	0.018	[-0.019, 0.067]
Age (in years)			-0.005*	[-0.008, -0.001]			-0.006***	[-0.009, -0.003]
Education (Ref: No schooling)								
Some primary			0.032	[-0.105, 0.169]			-0.025	[-0.140, 0.091]
Completed primary			0.059	[-0.081, 0.199]			-0.044	[-0.167, 0.077]
Some secondary			0.054	[-0.091, 0.199]			-0.034	[-0.132, 0.064]
Completed secondary			0.050	[-0.121, 0.220]			-0.050	[-0.140, 0.039]
More than secondary			0.027	[-0.128, 0.178]			-0.062	[-0.168, 0.045]
Parity (Ref: 1)								
2			0.087***	[0.065, 0.109]			0.137***	[0.100, 0.176]
3 or more			0.151***	[0.118, 0.184]			0.229***	[0.181, 0.277]
Ethnicity (Ref: Hill Brahmin)								
Chhetri			0.009	[-0.024, 0.042]			0.010	[-0.021, 0.041]
Janajaati			0.033	[-0.021, 0.087]			0.054*	[-0.008, 0.120]
Madhesi			-0.002	[-0.082, 0.079]			0.026	[-0.052, 0.105]
Dalit			0.013	[-0.024, 0.050]			0.008	[-0.037, 0.053]
Muslim			-0.030	[-0.159, 0.099]			-0.074	[-0.201, 0.054]
Others			0.030	[-0.009, 0.068]			-0.017	[-0.114, 0.080]
Had an abortion before			0.034**	[0.014, 0.064]			0.018	[-0.040, 0.076]
Male child born			0.002	[-0.030, 0.033]			0.026**	[0.004, 0.049]
Time since delivery (in months)			-0.004	[-0.012, 0.003]			-0.006*	[-0.012, 0.000]
Constant	0.300***	[0.248, 0.353]	0.354**	[0.068, 0.639]	0.359***	[0.296, 0.422]	0.562***	[0.279, 0.845]
Observations	19276		19276		13674		13674	
R-squared	0.014		0.026		0.487		0.480	

*** p<0.01, ** p<0.05, * p<0.1

All regression models adjusted for hospital and month fixed effects.

Note: Difference from zero effect tested using wild cluster bootstrap method

Table 4. Intent-to-Treat Effect of the Intervention on use of Long-Acting Contraception at Wave 1 and Wave 2 follow-up

	Wave 1 sample				Wave 2 sample			
	Est.	95% CI	Est.	95% CI	Est.	95% CI	Est.	95% CI
Post-Treatment (Ref: Pre-Treatment)	0.056***	[0.024, 0.072]	0.056***	[0.018, 0.079]	0.063***	[0.028, 0.103]	0.059***	[0.025, 0.097]
Age (in years)			0.000	[-0.002, 0.002]			-0.000	[-0.002, 0.001]
Education (Ref: No schooling)								
Some primary			0.041	[-0.019, 0.100]			-0.012	[-0.082, 0.059]
Completed primary			0.044	[-0.012, 0.071]			-0.022	[-0.095, 0.052]
Some secondary			0.030	[-0.012, 0.071]			-0.030	[-0.084, 0.024]
Completed secondary			0.023	[-0.016, 0.063]			-0.042	[-0.103, 0.019]
More than secondary			0.028	[-0.016, 0.071]			-0.036	[-0.109, 0.036]
Parity (Ref: 1)								
2			0.104***	[0.078, 0.129]			0.118***	[0.079, 0.157]
3 or more			0.165***	[0.105, 0.225]			0.183***	[0.087, 0.279]
Ethnicity (Ref: Hill Brahmin)								
Chhetri			-0.005	[-0.028, 0.017]			-0.005	[-0.015, 0.005]
Janajaati			0.007	[-0.010, 0.024]			0.005	[-0.023, 0.032]
Madhesi			-0.000	[-0.036, 0.035]			0.003	[-0.041, 0.046]
Dalit			-0.007	[-0.030, 0.016]			-0.019	[-0.049, 0.012]
Muslim			-0.044	[-0.094, 0.005]			-0.056**	[-0.111, 0.004]
Others			-0.002	[-0.062, 0.058]			0.002	[-0.051, 0.056]
Had an abortion before			0.013	[-0.018, 0.043]			-0.006	[-0.037, 0.023]
Male child born			0.007	[-0.008, 0.022]			0.020	[-0.007, 0.048]
Time since delivery (in months)			-0.006**	[-0.010, -0.001]			-0.006**	[-0.010, -0.002]
Constant	0.040***	[0.033, 0.048]	0.008	[-0.076, 0.092]	0.076***	[0.045, 0.107]	0.171*	[-0.011, 0.352]
Observations	19276		19276		13674		13674	
R-squared	0.297		0.291		0.331		0.323	

*** p<0.01, ** p<0.05, * p<0.1

All regression models adjusted for hospital and month fixed effects.

Note: Difference from zero effect tested using wild cluster bootstrap method

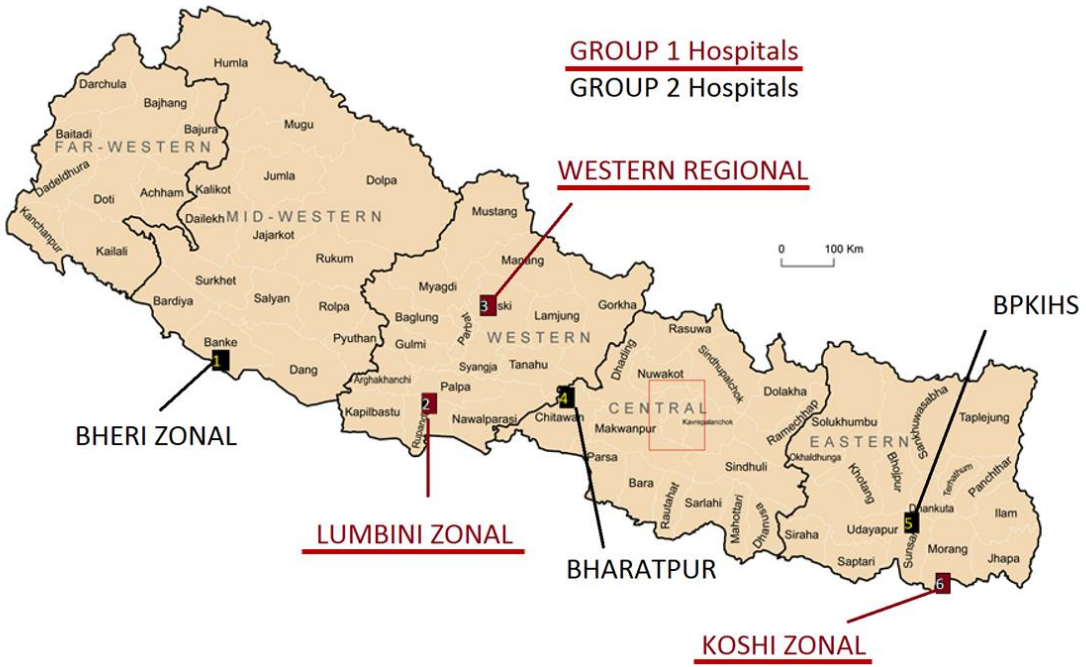

Figure 1. Location of Study Hospitals.

Note: Matched pairs were: (i) Western Regional and BPKIHS, (ii) Lumbini Zonal and Bharatpur, and (iii) Koshi Zonal and Bheri Zonal.

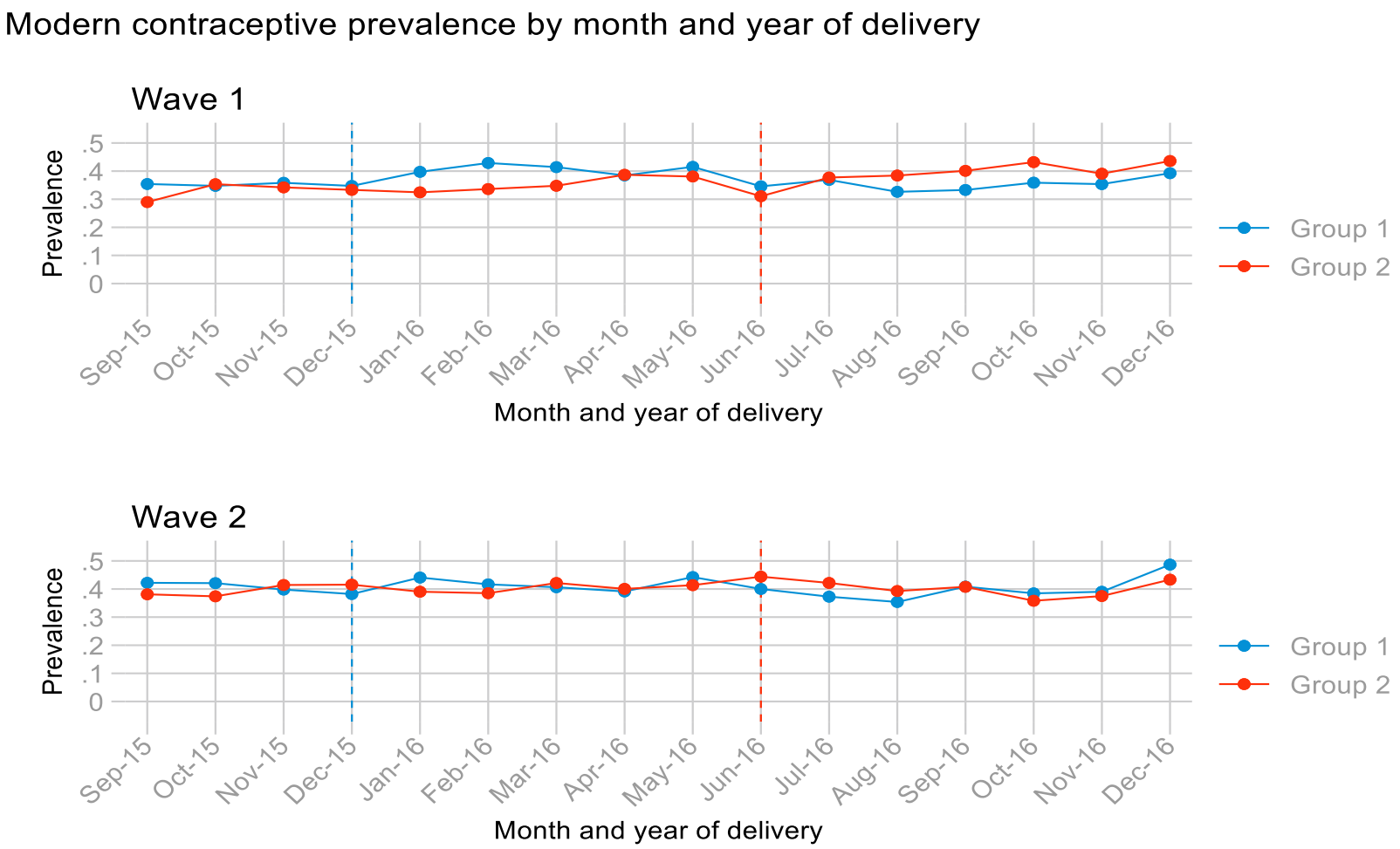

Figure 2. Modern contraceptive prevalence during Wave 1 and Wave 2 among women who delivered at Group 1 and Group 2 hospitals. The dashed, blue vertical line and the dashed, red vertical line represent the approximate intervention start dates in Group 1 and Group 2 hospitals, respectively.

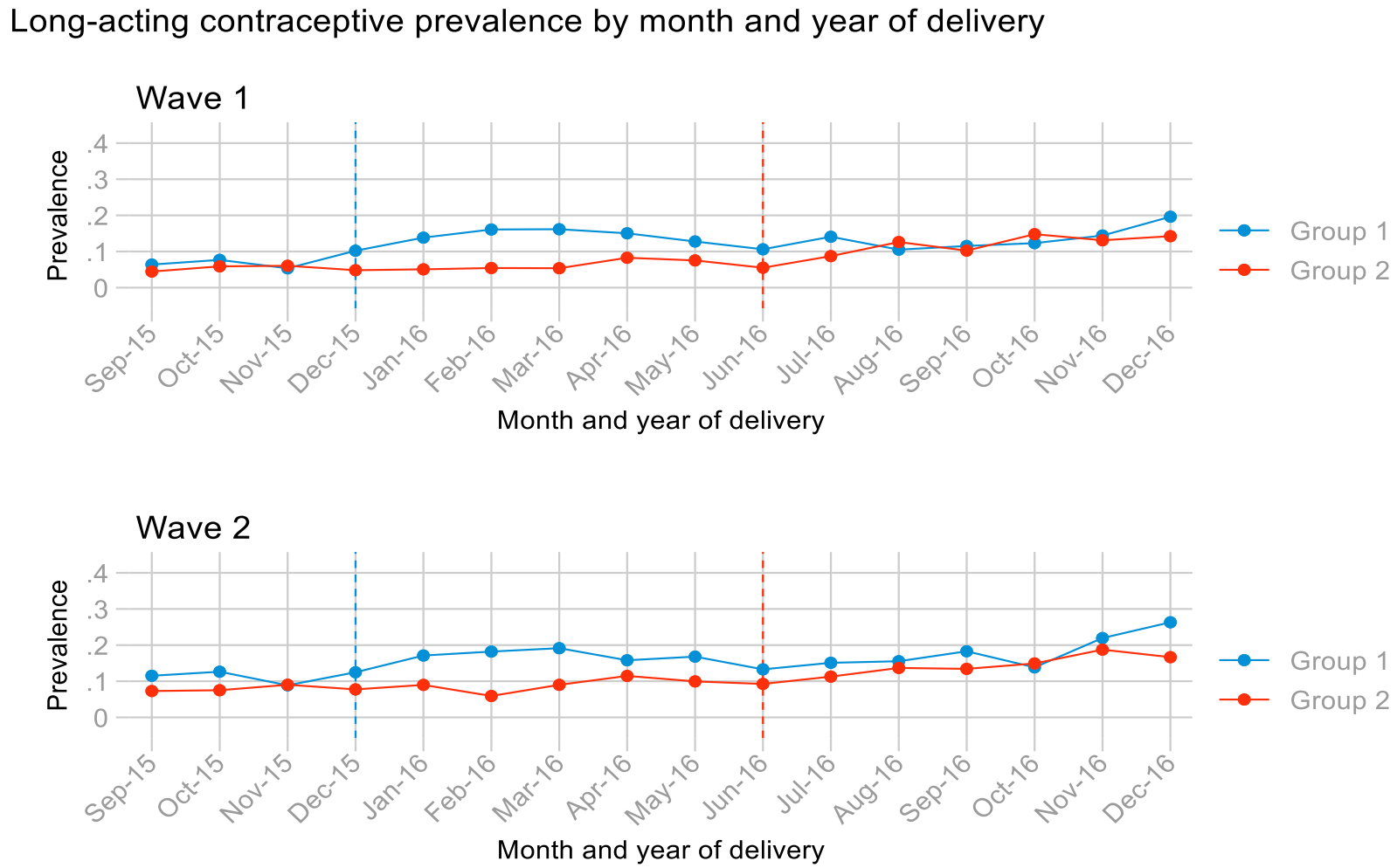

Figure 3. Long-acting contraceptive prevalence during Wave 1 and Wave 2 among women who delivered at Group 1 and Group 2 hospitals. The dashed, blue vertical line and the dashed, red vertical line represent the approximate intervention start dates in Group 1 and Group 2 hospitals, respectively.

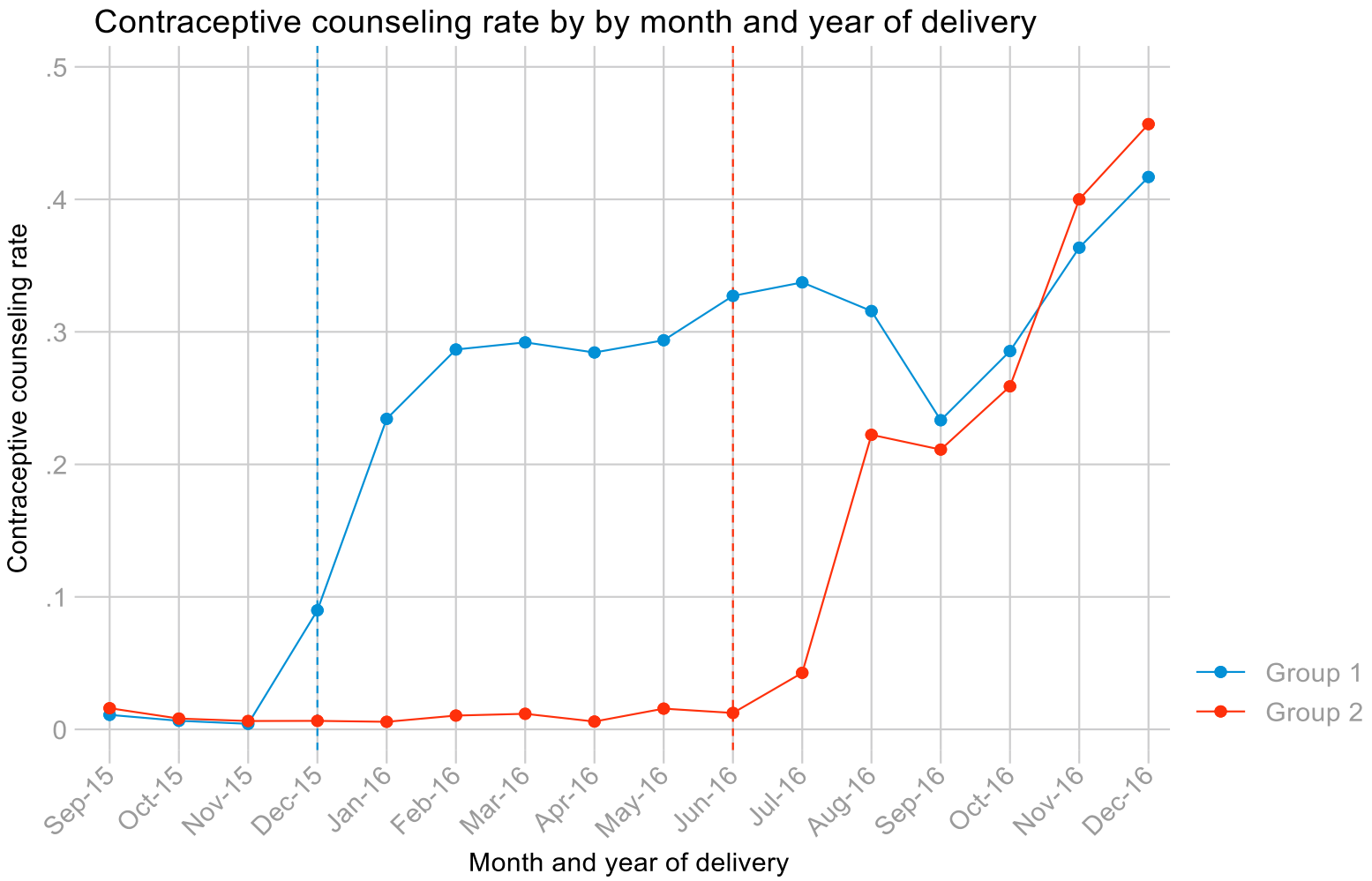

Figure 4. Contraceptive counseling rate at baseline among women who delivered in Group 1 and Group 2 hospitals. The dashed, blue vertical line and the dashed, red vertical line represent the approximate intervention start dates in Group 1 and Group 2 hospitals, respectively.