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# Effectiveness of Community Intervention Program to Improve Maternal Healthcare Services Uptake among Young Married Women in Rural India

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## Abstract

**Background:** The uptake of maternal healthcare services by young women in rural India is limited. This study aims to assess the effectiveness of community intervention model to improve the maternal healthcare service uptake of young married couples (15-24 years) in rural India. A three year project was carried out to reach young married women through a multi-pronged community intervention involving sensitizing family members, community mobilization, and capacity building of frontline health functionaries.

**Methods:** The study was conducted among the young married couples aged 15-25 years in states of Uttar Pradesh and Rajasthan of India. A quasi-experimental evaluation design was adopted for this study. Two rounds of cross-sectional surveys at baseline and end line were carried out at both intervention and control sites. Net impact of intervention (Difference-in-Difference and multivariate regression) on key outcomes was assessed adjusting for control variables. Composite maternal healthcare uptake score significantly increased in intervention area compared to control area.

**Results:** Women who were able to discuss about delivery care with family, were five times more likely to go for institutional delivery, also the utilization of maternal health care services was higher among these women (β=1.58). Likelihood of uptake for more than three visits for antenatal care (3+ANC) service indicated three times (OR=3.14, p<0.001), and more than three visits. Postnatal care (3+PNC) service indicated two fold (OR=1.82, p<0.001) increase in intervention area than those in control area. Regression result on composite maternal health care uptake score significantly increased by 2.5 (β=2.23, p<0.001) in intervention area compared to control area.

**Conclusion:** This study demonstrated that the community intervention to foster enabling environment was effective in improving the awareness and uptake of maternal healthcare services.

**Keywords:** Maternal health; Community intervention; Antenatal care; Impact evaluation

## Introduction

Worldwide, one of the major causes of deaths in young girls is complications during pregnancy and childbirth. The stillbirths and new born deaths are 50% relatively higher among infants born to adolescent mothers [1]. Giving birth during adolescence is not only a risk factor for adverse pregnancy outcomes, but it also has a negative impact on the future well-being of the mother and infant [2]. Adverse health outcomes in pregnancies among young girls are more likely in poor, uneducated and rural communities [3]. In many south Asian countries including India, early marriage and thereby adolescent pregnancies are very common [4]. About, 12 million women aged 20-24 years in India have given birth before the age of 18 years in 2010 [5]. In rural settings, newly married women are forced to become pregnant and give birth soon after marriage and co-habitation [6]. National survey revealed that by the time a woman in India completes the period of youth, she already has on average, 1.5 children and youth fertility accounts for more than half of India's total fertility [7]. Early marriage along with poor nutrition followed by early unplanned pregnancy deteriorates the reproductive and sexual health of adolescents [8]. This is further exacerbated by the lack of awareness, inadequate access and lower use of ante-natal care (ANC) service package [9]. The ANC service along with family planning, skilled delivery care and post-natal care services is a key element of the package of services aimed at improving maternal and new born health [10]. Quality ANC as measured by three dimensions: number of visits, timing of initiation of care and inclusion of all recommended components of care can reduce maternal morbidity and mortality and perinatal mortality [11,12]. Attendance at ANC clinics and receiving skilled delivery care has been associated with a reduction in maternal deaths [13]. Less than one-half of the young women were attended the first ANC visit in the first trimester as recommended [7].

Various cultural and structural level barriers impede young married couples to access the quality reproductive health care services [14]. In south-Asian countries such as India, community and family members such as husband, in-laws (mothers, fathers and sisters), community elders and other members play the role of gatekeepers in accessing the pregnancy care and related services [6]. There is dearth of evaluation studies on community based interventions for young married couples. A recent systematic review [6] revealed a pressing need for more research and robust community based intervention programs for better reproductive/maternal health outcomes among young married couples. Hence, the present study aims to assess the effectiveness of

community based intervention model was conducted to improve the health of young married couples, by focusing on improving maternal healthcare services (ANC, postnatal care (PNC) and institutional delivery) uptake before, during and after pregnancy among young married couples (15-25 years) in rural India.

## Methodology

### Study design

A quasi-experimental evaluation design with cross-sectional pre-post surveys was undertaken in experimental and control areas to evaluate the effects of the intervention on the maternal health choices and outcomes among young married women. The study used quantitative method for data collection. A semi-structure questionnaire was used for the quantitative survey to obtain information on contraceptive knowledge and use, couple communication on sexual and reproductive health issues; access to antenatal care, institutional delivery and post-natal care services.

### Study settings

The study was conducted in Saharanpur district in the state of Uttar Pradesh and Sri-Ganganagar in the state of Rajasthan of northern India. National Family Health Survey (NFHS-III) data shows high proportion of women bearing child in younger ages, low use of modern contraceptive methods and low access to maternal healthcare services among young married women in these two districts. From each district, two PHCs with a population of 60,000 in the intervention arm and one PHC with a population of 30,000 in the control arm were selected.

### Program design

The project 'Strengthening district health care facilities for improving the sexual and reproductive health choices of young married couples' was implemented for a period of three years (2011-2014) to improve the maternal healthcare services of young married women (15-25 years) two districts of India. The project reached out to young married women through a multi-pronged intervention which included sensitizing family members, community mobilization, and capacity building of frontline health functionaries. This included a continuous counseling process both individually and in-group, with young women, their husbands and other family members. Advocacy meetings were also conducted with the influential community members such as head of the village and local governance and religious group members to foster an enabling environment for improving young married women's access and uptake of maternal healthcare services.

### Sample size

Respondents in the baseline and end line survey included pregnant and lactating women in the age group of 15-25 years from both the study groups. A sample size of 1140 young married women were interviewed from intervention areas and 554 from control areas at the end-line evaluation and proportionately shared from each district across study groups with a non-response rate of 10%. Similar sample was collected at the baseline, a total of 1076 women in intervention and 524 women from control arm. The sample was drawn randomly (systematic) from the selected villages in the intervention and control areas.

## Indicators and Analysis Methods

### Independent variables

Individual characteristics of women and mediating factors were taken as covariates in this evaluation study. Demographic factors like women's age, education, and number of living children, family income and religion were considered for adjusted model. Decision making of women in household/family matters and involvement of community health workers in accessing maternal healthcare services among women was taken as mediating factors on outcomes. Awareness about proper ANC care, delivery care, post-natal and new-born care were independent variables which are described below:

Decision making index was computed using 7 variables of women's role in household decisions and her mobility. Each were coded as on hierarchical order 2 "self-decision", 1 "wife and husband jointly" and 0 "somebody else". The scores of each variables were then summed-up and distribution of score were categorized as "low decision making capacity", "moderate decision making capacity" and "high decision making capacity". Knowledge about ANC care of women about antenatal care was assessed by asking women related to medicated and home based ANC care such as; Women having knowledge of at least 3 ANC by skilled health personnel required during pregnancy, ANC by skilled health personnel, aware of deficiency of blood (anemic) during pregnancy, knowledge of proper dietary intake and care at home. Awareness on delivery care index was based on three indicators i.e. aware about government scheme "Janani Suraksha Yojna", knowing the significance of delivery in hospital or health facility and received advice about benefits of delivery in hospital. Affirmative responses of all the indicators were coded as 1 and 0 otherwise further the scores were summed up to create the index. Further, knowledge of women about PNC within a week of delivery and knowledge of new born care about wrapping a baby immediately after birth to keep the new-born warm were taken. Husband and family support were measured by pre-plan for delivery by women whether she discussed with husband and family to be happen at health facility and family support was considered as a part of program hence whether women discussed about delivery with family and her role in deciding place of delivery (both with husband and family=1, no/with someone else=0). If both were equal to "1" then coded as 1 and 0 otherwise.

### Outcome variables

The key indicators of maternal health are measured and discussed in this paper are: ANC, delivery care, PNC and composite index of maternal care. Care of mother during pregnancy and after delivery is reviewed commitment in almost all the government programs (NRHM). Hence, uptake of recommended minimum of 3 ANC during pregnancy, delivery at health facility and conducted by skilled health professional was the outcome measure. Further, at least 3 PNC care including first PNC within 24 hours was another maternal health outcome as recommended by World health Organization [15]. This study used a composite index of maternal health care utilization considering the mandatory practices recommended for mother during pre and post-delivery. The score was created by summing up the 11 variables. Variables with assigned values were: Number of ANC visits (less than 3=0, 3=1, more than 3=2), consumption of at least 100 IFA tablets (Iron Folic Acid) (No=0, Yes=1), received at least 2 TT (Tetanus Toxoid Injection) (No=0, Yes=1), Institutional delivery (No=0, Yes=1), Delivery by skilled health professional (Doctor, nurse and trained practitioner) (No=0, Yes=1), Immediate rush to health facility within 2

hours of labor pain started (after 2 hours=0, within 2 hours=1), Fisrt PNC within 24 hours (No PNC=0, after 24 hours=1, within 24 hours=2), kept new-born warm immediate after birth (No=0, Yes=1), Immediate breast feeding (No=0, Yes=1). The composite index value ranges from 2 to 18 on ratio scale.

## Analytical method

The imperative comparison is made between women from intervention area and from comparison area; and also to measure the net changes from baseline to end line. One-way Analysis of Variance (ANOVA) was conducted to assess the change between intervention and comparison groups from baseline to end line. And Difference-in-Differences (DID) analysis was done to examine the impact of the intervention on key health outcomes. Logic regression for the first three outcomes and liner regression for composite index for maternal care was carried out accordingly to analyze the adjusted impact of intervention program. The analysis was performed in STATA version 12.

# Results

## Socio-demographic profile of respondents

The data suggests that young married women of four target population were equally distributed (about 25% each) at baseline and end line. Demographic characteristics of women were found to be similar across intervention and comparison area. Around one fourth of the total respondents were in the younger age group of 15-20 years and remaining (75%) were in the elder age group of 21-25 years in both the study group of each state. One in ten of the respondent was married before attaining age of 18 and one in four were not educated. About half (43-50%) of the young married women were educated beyond primary school both in intervention and comparison group. Three fourth of the respondents were Hindu and 50-60% belong to SC/ST castes. In the intervention area, 37% women belonged to low income family (less than 5000 rupees monthly family income), while in the comparison villages, 25% women had low income. About 60% women had one child in both the study arm (Table 1).

| Control variables | | Control area (N=1078) | | Intervention area (N=2216) | |
|---|---|---|---|---|---|
| **Demographic** | **Category** | **%** | **N** | **%** | **N** |
| Age | 15-20 years | 27.5 | 296 | 26.3 | 582 |
| | 21-25 years | 72.5 | 782 | 73.7 | 1634 |
| Age at marriage | Below 18 years | 12.1 | 130 | 10 | 222 |
| | 18-20 years | 68.9 | 743 | 70.9 | 1570 |
| | 21 and above | 19 | 205 | 19.1 | 424 |
| Education | No education | 22.5 | 242 | 22.3 | 494 |
| | Primary school | 26.7 | 287 | 20.9 | 463 |
| | High school | 35.1 | 378 | 38.2 | 846 |
| | Senior High School or higher | 15.8 | 170 | 18.6 | 413 |
| Religion | Hindu | 70.8 | 763 | | 1848 |
| | Muslim | 22.8 | 246 | 12.8 | 284 |
| | Others | 6.4 | 69 | 3.8 | 84 |
| Caste | SC/ST^ | 50.4 | 543 | 60.2 | 1335 |
| | OBC^^ | 30.1 | 324 | 25.8 | 572 |
| | Others | 19.6 | 211 | 13.9 | 309 |
| Family income (Rupees) | <5000 | 24.3 | 262 | 36.8 | 814 |
| | >5001 | 75.7 | 815 | 63.3 | 1401 |
| Number of children | One | 62.4 | 394 | 60.1 | 695 |
| | Two or more | 37.6 | 237 | 39.9 | 461 |
| Type of family | Nuclear | 14.4 | 155 | 16 | 355 |
| | Joint | 85.6 | 923 | 84 | 1861 |

**Table 1:** Socio-demographic characteristics of respondents [^: Schedule caste/schedule tribe; ^^: Other backward castes].

### Impact of intervention on safe maternal care practices

In the intervention area, 63% women received three or more antenatal care during their last pregnancy at baseline and its uptake significantly reached to 75% ($p<0.001$) at the end line. However, it remained same about 50% in control area with no significant improvement from baseline to end line. The net improvement of 9.4% (DID, $p<0.001$) in the intervention area with respect to changes in control area was significant. To ensure a complete care of ANC received by young women was measured through full ANC composite index (uptake of at least two TT injections, consumption of 100 IFA tablets and at least 3 ANC received by skilled health professionals).

In the intervention area, significant improvement was observed over complete ANC care during pregnancy. Only few women at baseline (2-5%), irrespective of the study groups reported that complete ANC care done during their last pregnancy. The findings from end line survey showed that in the intervention area, 17% improvement ($p<0.001$) was found while only 4% improvement ($p<0.05$) among women from the control area.

The DID analysis revealed a net improvement of 13% ($p<0.001$) in the intervention area over the control area (Table 2).

| Maternal care outcomes | Control | | | Intervention | | |
|---|---|---|---|---|---|---|
| | Baseline (N=524) | End line (N=554) | % point Change | Baseline (N=1076) | End line (N=1140) | % point change |
| 3+ ANC | 50.2 | 52.8 | 2.6 | 63.3 | 75.6 | 12.3 |
| Full ANC | 2 | 6.6 | 4.6 | 4.6 | 21.4 | 16.8 |
| Institutional delivery | 82.3 | 80.7 | -1.6 | 73.3 | 87.8 | 14.5 |
| First PNC within a week of delivery | 40.4 | 43.4 | 3 | 57.3 | 77 | 19.7 |
| 3+PNC | 13.9 | 18 | 4.1 | 16.5 | 29.7 | 13.2 |
| Immediate breastfeeding | 86 | 88.7 | 2.7 | 83.1 | 90.4 | 7.3 |
| Composite maternal care (mean) | 12.9 | 12.8 | 0 | 12.9 | 15.1 | 2.2 |

**Table 2:** Changes in maternal care outcomes over the timeline across study arms (%).

The proportion of women who delivered at the health facility, increased significantly in the intervention area while it remained at same level in control arm. For instance, in the intervention area, the institutional delivery increased from 73% at baseline to 88% at the end line while it remained unchanged (82 to 81%) in control area hence the net improvement in the institutional delivery in the intervention area was 15% point (DID, $p<0.001$) over the control area. A net improvement of 16% (DID, $P<0.001$) was observed in the intervention areas for post natal checkup within a week of delivery by new mothers (57% in baseline to 77% during end line). The corresponding figures in the control area remained mostly unchanged (40% to 43%) (Figure 1).

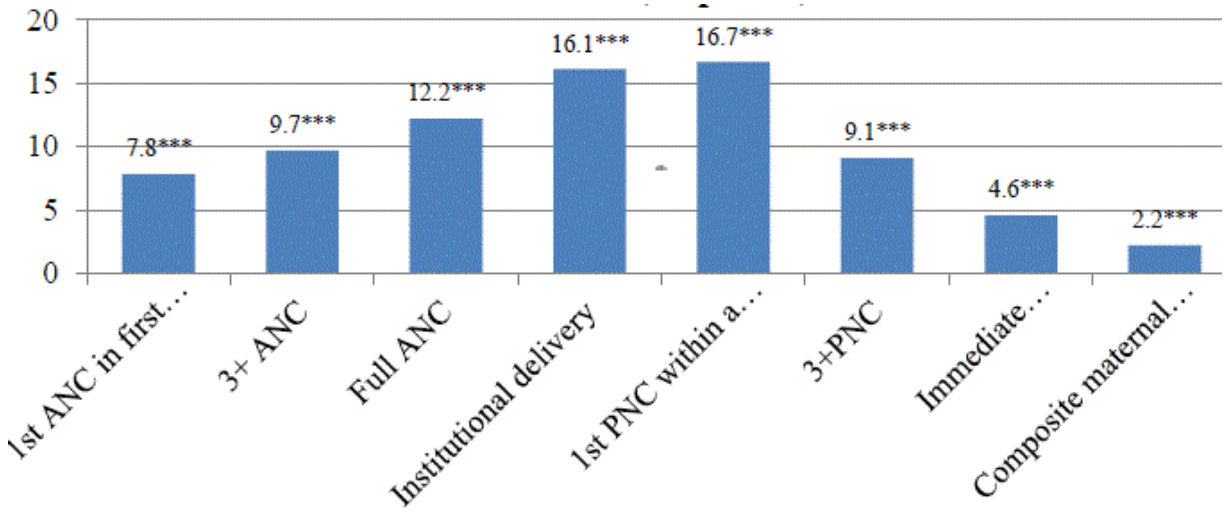


**Figure1:** Net changes in uptake outcomes in intervention area at end line (% points) [Note: Estimates based on DID method for evaluation at end line, ***$p<0.001$].

## Knowledge on maternal and new born care

More than two third women had correct knowledge of at least three ANC check-ups required during pregnancy in both the study groups at baseline. At end line, awareness level increased (98%) in the intervention area by 11% (p<0.001). However, it remained unchanged in the control area (70%). The DID analyses suggest a net percentage change of 13% in the intervention area with respect to the control area (DID, p<0.001).

On the other hand, higher percentage of women (46%) had knowledge of required medicated ANC care during pregnancy in intervention area; this figure was much lower in the control area (25%) at the end line. The knowledge associated with home based care during pregnancy increased significantly from baseline to end line in the intervention area (56-70%) than in the control area (59-56%, p<0.001). For the postnatal care, the women were asked if they were aware of benefits of delivery at facility and whether they pre-planned for delivery at the facility immediately after delivery.

In the intervention area, the awareness about benefits of delivery at health facility increased from 34% in the baseline to 44% during the end line, the pre-decision to deliver at facility (68-83%) significantly improved from baseline to end line (p<0.001). During baseline, about 80% women knew PNC was required within a week in both the study groups, which improved significantly to 91% (p<0.001) during end line in the intervention area while it didn't change much in the control area. Similarly, the awareness about complication during pregnancy and post-delivery complication also increased in the intervention areas.

During the baseline the 77% of women were able to tell minimum 5 pregnancy complications, that improved to 88% during the end line, like wise awareness on post-delivery complications, 60% of women in the baseline reported so which increased to 75% during the end line survey in intervention area while it remained same in control area over the timeline (Table 3).

| Awareness | Control (%) | | Intervention (%) | |
|---|---|---|---|---|
| | Baseline | End line | Baseline | End line |
| | (N=524) | (N=554) | (N=1076) | (N=1140) |
| At least 3ANC required | 71 | 69.3 | 87.6[a] | 98.8[b] |
| ANC safe action require | | | | |
| Standard medicated care@ | 13 | 24.7 | 35.3[a] | 46.1[b] |
| Home based care© | 58.9 | 55.4 | 55.8[a] | 69.6[b] |
| Aware of benefits of institutional delivery | 44.6 | 45.6 | 33.9[a] | 41.6 |
| Pre-Planned for institutional delivery | 43 | 55.3 | 67.9[a] | 83.4[b] |
| Aware to take PNC within a week | 78.6 | 79.9 | 83.5[a] | 91.2[b] |
| Aware to keep the baby warm after birth | 85.4 | 79.1 | 84.8 | 85.3 |
| Aware of pregnancy complication (at least 5) | 70.8 | 76.9 | 76.7[a] | 88.0[b] |
| Aware of post-delivery complication (at least 5) | 59.4 | 60.2 | 61.6[a] | 74.5[b] |

**Table 3:** Awareness and perception of women about safe-maternal care during pre and post-delivery [Note: @: Regular ANC check-up by trained health personnel/provider, TT vaccination and Iron tablets; ©: More nutritious diet, more than 3 meals per day, rest in daytime and no heavy weight lifting; a. Significant difference between baseline and end line estimates in intervention, p<0.001; b. Significant difference between end line estimates of intervention and control site, p<0.01]..

## Involvement of family including husband and community health workers during pre-post-delivery care

Married women were asked if their husband or other family members accompanied her during pre or post natal care and if any community health worker such as ANM, ASHA or AWW met them or women during pregnancy. At the end line, 12% change (DID, P<0.001) was observed, i.e. compared to baseline, number of women reported that their family member including husband accompanied her during pre and post-delivery care.

The involvement of community health worker during ANC visits or during delivery remained same from baseline to end line both in intervention and control sites. During the end line, 53% women from the intervention area reported that community health worker accompanied them during ANC visits and 75% of women said that they were accompanied by health worker during delivery.

Similar proportion of women reported at control sites too. Result from end line in Table 4 suggests that during the baseline 28% of women received advice on family planning during delivery in intervention area which increased to around 47% during end line. In the control sites, the corresponding changes were much less (30.5-38.6%). Table 4 Predictors of recommended maternal health practices.

| Role of family | Control (%) | | Intervention (%) | |
|---|---|---|---|---|
| | Baseline (N=524) | End line (N=554) | Baseline (N=1076) | End line (N=1140) |
| Accompanied by (during ANC) | | | | |
| Family members (husband/in-laws) | 33 | 40.6 | 32.1[a] | 44.7[b] |
| Community Health worker | 56.7 | 52.8 | 50.5 | 53.4[b] |
| Discussed about delivery with family | 63.1 | 66 | 73.4[a] | 90.4[b] |
| Accompanied by (for delivery) | | | | |
| Family members (husband/in-laws) | 25.7 | 26.8 | 21.8 | 24.2 |
| Community Health worker | 73.2 | 71.1 | 70 | 74.8 |
| Advised on family planning | 30.5 | 38.6 | 28.1[a] | 46.8[b] |

**Table 4:** Involvement of family and community health worker during their pre and post-delivery [Note: a: Significant difference between baseline and end line estimates in intervention, p<0.001; b: Significant difference between end line estimates of intervention and control site, p<0.01].

Four models of multivariate regression analyses were carried out to find out the factors that significantly influence women's correct practice of maternal health seeking behaviors at the end line. The results given in Table 4 suggests that women who had more than two children were less likely to utilize recommended healthcare services particularly adequate ANC care and institutional delivery (P<0.01) and they were also less likely to avail the maternal health care services as indicated by composite index of maternal health care utilization. The composite index on maternal health care utilization also improved significantly. As compared to women living in a nuclear family, women living in a joint family had significantly higher odds of going for 3 or more ANC (OR 1.55), institutional delivery (OR 3.04) and going for at least 3 ANC (OR 2.23). The maternal health care utilization score also improved significantly among women living with joint family. Women who belonged to non-marginalized ethnic group had significantly higher likelihood of going for institutional delivery (OR 3.5 or Other Backward Castes and OR 7.5 for general caste categories) compared to marginalized group such as Scheduled Caste/Scheduled Tribes.

The maternal health care utilization was also significantly higher among non-marginalized women (β=0.43 and 1.24). Women who were able to discuss about delivery care with family, were five times more likely to go institutional delivery compared to women who did not discuss and also the utilization of maternal health care services was also higher among such women (β=1.58). Women who were able to make decision about her mobility, the likelihood of going for at least 3 PNC ranged from 26% to 49%. Awareness on maternal care and role of community health workers significantly determined the outcome indicator Women who were aware of at least 3 ANC during pregnancy were more likely to go for 3 or more ANC (OR=5.64, p<0.001) and had higher chance of utilizing maternal health care services than others (β=1.28 to 1.45). Similarly, women who were aware of benefits of delivery at health facility and PNC care were significantly three times more likely to deliver at hospital and had 8 fold chances to go for least 3 PNC than women who were not awarded. Women who were aware of delivery, PNC and new born care also had better chance of utilizing maternal healthcare services (β=1.22, 1.58 and 1.56 respectively).

In the intervention area, likelihood of uptake for 3+ANC increased to more than 3 times (OR=3.14, p<0.001), institutional delivery rose to 30% (OR=1.3, p<0.001) and 3+PNC indicated two fold (OR=1.82, p<0.001) increase in utilization of services than women who belonged to the control area. When these women were reached by community health workers, the pre and post delivery service utilization improved by many folds. The likelihood of 3+ANC was more than 70%, the odds of institutional delivery was 17 times higher than women who were not reached by community health workers and they were almost 70% more likely to go for at least 3 PNC services. Regression result on composite maternal health care utilization score significantly increased by 2.5 (β=2.23, p<0.001) in intervention area compared to control area (Table 5).

| Covariates | | At least 3 ANC | Institutional Delivery | At least 3 PNC[#] | Composite Index of Maternal care |
|---|---|---|---|---|---|
| **Demographic Factors** | | **OR (SE)** | **OR (SE)** | **OR (SE)** | **β (SE)** |
| Number of children: One-Two children® | More than 2 children | 0.65* (0.15) | 0.68** (0.17) | 0.95 (0.19) | -0.48** (0.16) |
| Type of family: Nuclear® | Joint | 1.55* (0.34) | 3.04** (1.07) | 2.23** (0.63) | 0.77** (0.24) |
| Castes: SC/ST® | OBC | 1.08 (0.17) | 3.52*** (1.13) | 1.35 (0.26) | 0.43* (0.18) |
| | General | 1.52 (0.42) | 7.50*** (2.01) | 1.18 (0.41) | 1.24*** (0.36) |

| | | | | | |
|---|---|---|---|---|---|
| Women Decisions in household purchase and her mobility: Low ® | Moderate | 1.05 (0.27) | 1.09 (0.28) | 1.26* (0.41) | 0.19 (0.17) |
| | High | 1.58* (0.52) | 1.39 (0.68) | 1.49* (0.27) | 0.37 (0.30) |
| Discussion about delivery care with family and husband: Not discussed with family® | Discussed about delivery at facility | - | 5.23*** (0.89) | - | 1.58*** (0.33) |
| Awareness: No. ANC required® | 3 ANC | 5.64*** (1.42) | - | - | 1.28*** (0.29) |
| | More than 3 | 6.68*** (1.74) | - | - | 1.45*** (0.31) |
| Aware of delivery care: No® | Yes | - | 3.07*** (0.83) | - | 1.22*** (0.18) |
| Aware of PNC care: No® | Yes | - | - | 7.60*** (3.30) | 1.58*** (0.21) |
| Aware of new born care: No® | Yes | - | - | - | 1.56*** (0.23) |
| Outreach of community health worker@: No® | Yes | 1.71***(-0.11) | 17.57*** (5.96) | 1.73** (0.47) | 0.24*** (0.06) |
| Control area® | Intervention area | 3.14***(-0.45) | 1.30* (0.38) | 1.82** (0.36) | 2.23*** (0.28) |
| Constant | | 0.128***(-0.253) | 1.390 (2.853) | 0.006** (-0.008) | 9.672*** (-1.505) |
| R-Square | | 0.25 | 0.38 | 0.18 | 0.36 |

**Table 5:** Effect of intervention program on recommended maternal health practices at the end line (Odds and Regression coefficients) [@Outreach of health worker for ANC outcome was computed (score) based on availability, frequency and visit of community health worker in first trimester and for other outcomes, only their accompany during service was taken. # Given that first PNC within first 24 hours of delivery; *Reference Category; Note: *p<0.05; **p<0.01; ***p<0.001; Regression co-efficient are controlled for other factors like age, education, parity, family income and religion].

## Discussion

The intervention adopted a multi-pronged approach to directly reach married young women, their spouses, family members and other community stakeholders with information on sexual maternal health issues to create an enabling environment for young married couples to improve choices and health service uptake. In this study, knowledge and uptake of ANC increased remarkably in the intervention sites with respect to at least three ANC visit, provision of all recommended components for ANC and awareness pertaining to ANC. Similar findings were reported by First Time Parent (FTP) project in India [16], and ACQUIRE project in Nepal [17] in improving ANC service uptake. The number of ANC check-ups received by first time mothers increased substantially from baseline to end line in FTP [16] and in ACQUIRE [17] (Baseline: 29%, End line: 50%). A randomized trial in Pakistan [18], demonstrated more women in the intervention clusters than control reported attendance for antenatal care in facilities, although results were not significant. The possible increase in ANC check-ups can be attributed to involvement of community health workers and support group meetings with young married women to increase their knowledge on importance of the uptake of ANC services.

Our results also demonstrated the significant increase in awareness of young married women about the benefits of institutional delivery and pre-decision to deliver at facility and the percentage of women delivered at health center in the intervention sites at the end line. ACQUIRE project [17] in Nepal also reported significant increase in the proportion of couples, who discussed where to give birth (Baseline: 24%, End line: 40%). In other studies [16,19], an improvement in birth preparedness was reported however there was no significant increase in the institutional delivery. The reason could be that many young women go to their natal homes for delivery. An increased proportion of young married women going for institutional delivery in the intervention area can be attributed to information provided by outreach workers to young mothers about the monetary help, individual and group counseling to husbands on health benefits of institutional delivery and mobilizing community health workers to regularly visit pregnant women until their delivery.

A significant increase on the knowledge and uptake of PNC was observed in the intervention sites at the end line in the present study. Access to first PNC (within a week) as recommended by the national guidelines [15], increased significantly by 20% points in the intervention sites at the end line compared to comparison area. The result of different intervention studies on postnatal care varied from 10-39% [6]. It was found that proportion of young married women accessing at least 3 PNC services was low in both control and intervention sites at the baseline, although a significant shift was reported in the intervention sites ate end line with access to PNC services.

There is a need to integrate and roll out of three PNC visit model more vigorously by district health system to motivate women and their families for postnatal care. Two other projects [16,17] also found increase in the proportion of young mothers in accessing routine PNC check-up. In the present study, the proportion of women with awareness about PNC increased significantly in the intervention site. PNC uptake could be attributed to community outreach workers and regular interaction of community health care workers with young married women that improved outreach referrals for PNC services to health facility through regular group meetings on PNC sessions.

Awareness about complications during pre-postnatal care adequately increased in the intervention areas than control area. More

than 75% women in intervention area were able to articulate at least five pregnancy complications and post-delivery complications at the end line than its counterparts. The interventions, which were shown to be effective in reaching young married couples to educate and motivate them for positive healthcare seeking behaviors include formation of women groups, involving them in group-counseling sessions, home visits by frontline functionaries/outreach workers. There is substantial evidence that community based interventions have the potential to improve maternal and new born health outcomes [16,17,19]. In the present study areas, it was seen that women were dependent on their husband/ mother in law for seeking healthcare services during pregnancy, delivery and post-natal period. Low decision making by young women in household was significantly associated with low ANC and PNC visits.

This study intervention also emphasized on the importance of engaging directly with the community in general and pregnant women in particular through community outreach activities. Our results also reflected, a significant change in role of family members (husbands/in-laws) was observed. Involvement of family members in accompanying pregnant women during ANC visit and pre-discussion about delivery with family increased significantly in the intervention sites. In our study, community health workers role in accompanying women in ANC increased significantly in the intervention areas. A study conducted among married adolescents reported that CHW's visits have a significant influence on the uptake of full antenatal care and postnatal care services among rural adolescent women [20].

When adjusting for other correlates at the end line, results showed that women having more living children were significantly less probable to seek maternal care services which were similar to other studies [11,21]. Recent findings from a systematic review [6] showed that a combination of community-based interventions targeting young married couples, influential family members, community members and health systems were effective in improving access and uptake of maternal healthcare services in resource-constrained settings of low and middle-income countries. Similarly in the present study, a remarked improvement in uptake maternal healthcare services (at least 3 ANC, institutional delivery, at least 3 PNC visits and composite maternal care) was reported which is significantly attributed to effect of rigorous intervention strategies adopted after controlling the other covariates.

## Conclusion

The study showed that the community based integrated intervention approach can be effective in promoting the awareness and uptake of maternal healthcare services among young married couple. Women household decision making behavior had weaker association with maternal care outcomes however, engaging family members with women decision and key community stakeholders strengthened the program. Linking community health care workers have been pivotal for the effective outcomes, as they are the important pillar in the referral system. Further, this strategy is in line with recent peer and system led approach of National Adolescent Health Program [22] known as RKSK (Rashtriya Kishor Swasthya Karyakram) and India's Reproductive, Maternal, New born, Child, and Adolescent Health (RMNCH+A) Strategy [23] to improve the reproductive health of adolescents and young married women. It was also demonstrated that well-planned and intensive intervention involving engagement with young married couples and communities could improve maternal health outcomes while broader community activities may be a cost-effective alternative for large-scale intervention programs when resources are limited.

## Ethical Considerations

Ethical approval was obtained for this study from the Institutional Ethics and Review Board. This study was conducted within the provisions of research with human knowledge and behavior. Participants were counseled and informed about the purpose of the study in their local language. A written informed consent was obtained from all participants involved in the study. No incentive was provided for participating in the study. Privacy and confidentiality were maintained throughout the study.

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## Competing Interests

The authors declare that they have no competing interests.

## Authors' Contribution

PS carried out the literature review, interpretation of the data, and majorly contributed in drafting of manuscript and revising it. RP was involved in statistical analysis and contributed in interpretation of the data. SM and JB made substantial contributions to the design and conceptualization of the study. JB and SD were involved in implementation of intervention, tool development and data acquisition. RP, JB and SD also contributed in drafting of the manuscript. All authors read and approved the final manuscript.

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