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Influence of Maternal Health Education Delivered Through Community Health Referral Project on Antenatal Care Attendance: A Focus on Mirihini and Midoina Communities of Kilifi County, Kenya

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Abstract- Timely delivery of effective, safe, quality and personal services is a key pillar of health system strengthening. A Maternal, Newborn and Child Health (MNeCH) Project was initiated by the Ministry of Health and World Vision Kenya in Bamba Division, Kilifi County. The project's goal was to strengthen health systems at the facility and community levels, including Antenatal Care (ANC). One of the strategies used by the project to achieve its goal was to strengthen community health referral system. The objectives of the study were 1) to determine whether providing maternal health education to pregnant women had any influence on ANC attendance in the intervention and control communities and 2) to determine whether issuing referral advice forms to patients has any influence on ANC attendance in the intervention and control communities. This study adopted the static group control design to assess the influence of community health referral practices on ANC attendance in Mirihini, the intervention community in Bamba and Midoina the control community. Primary data were sourced from 246 mothers of children aged below 2 years, parents of children aged 2 to 4 years, as well as Community Health Volunteers (CHVs). Quantitative analysis yielded descriptive statistics and cross-tabulations with Chi-square (χ^2) tests. Qualitative data were transcribed, described and analyzed systematically to reveal themes and patterns. *Maternal health education:* In Mirihini, there was no significant association between providing maternal health education on the ideal number of ANC visits and women's achievement of optimal ANC attendance (χ^2 = 1.423, df=1 & a ρ-value = 0.233). In Midoina, a significant relationship between the two aspects was obtained (χ^2 = 3.109, df = 1 & ρ-value = 0.078. *Referral documentation:* In Mirihini, issuing referral documents to pregnant women was significantly associated with women's achievement of optimal ANC attendance (χ^2 = 8.308, df =1 & ρ-value = 0.004). In Midoina, there was no significant association between two aspects (χ^2 = 0.823, df = 1 & ρ-value = 0.185). The study recommends the need for: CHVs to deliver more information to support care-seeking behavior change; project officers to strengthen supervisory support to CHVs by engaging with MoH to provide reporting materials and ensure consistency of monthly review meetings.

Index Terms- Maternal Health Education, Community Health Referral, ANC, Kenya

I. Introduction

In Kenya, maternal mortality rate (MMR) reduced marginally from 590 per 100,000 live births in 1990 to 510 per 100,000 live births in 2015 (WHO, 2015). Among the factors associated with the decline in MMR is the increasing access and uptake of Antenatal Care (ANC) services. Upto 96% of pregnant women in Kenya receive at least one ANC contact with medical professionals; while 57.6% make at least four ANC visits (KNBS & ICF Macro, 2010). Achieving the full potential of ANC requires at least four visits for pregnant women to access the full package of Focused Antenatal Care (FANC), which emphasizes on maternal health, preparation for childbirth as well as readiness to deal with obstetric complications (Lincetto et al., 2006).

A Maternal, Newborn and Child Health (MNeCH) Project was initiated in 2011 by the Ministry of Health and World Vision Kenya in Bamba Division, Kilifi County. The project's goal was to strengthen health systems at the facility and community levels, including ANC. One of the strategies used by the project to achieve its goal was to strengthen community health referral system. At the center of a community health referral system is the community health volunteers (CHV), whose mandate involves health promotion and disease prevention in vulnerable communities, administration of basic drugs, issuance of referral advice to needy community members, as well as encouraging the involvement of men to improve maternal health indicators in communities (Bhutta, Lassi, Pariyo & Huicho, 2010). Selected CHVs were identified and trained in various skills, including timed and targeted counselling (ttC) for ANC, skilled birth attendance (SBA) and postnatal care (PNC). Trained CHVs were supported with kits, equipment, information materials, and Income-Generating Activities (IGAs) for economic empowerment.

The CHVs visited households within their areas of operation, to deliver maternal health education, which targeted pregnant women as well as men, who are key decision-makers regarding women's health at the household level. The CHVs also referred couples to health facilities and monitored ANC attendance. The objectives of the study were 1) to determine whether providing maternal health education to pregnant women had any influence on ANC attendance in the intervention and control communities and 2) to determine whether issuing referral advice forms to patients has any influence on ANC attendance in

the intervention and control communities. This study adopted a comparative approach to assess the influence of maternal health education on the frequency of ANC attendance in Mirihini (a project community in Bamba Division) and Midoina (a comparison community in Bahari Division).

II. RESEARCH ELABORATIONS

S*tatic group comparison* design was applied to guide the research process. The design had two groups (project and comparison), which were not randomly constituted. Application of the static group comparison design requires appropriate measures to control threats to validity, including contamination effect between intervention and comparison groups as well as history effects. In this regard, it was critical to have two groups that were geographically mutually exclusive; but whose residents were near similar in terms of social, cultural and economic indicators. The project group received interventions, including training of CHVs on ttC for MNCH, covering topics such as pregnancy danger signs, safe delivery, ANC attendance, postnatal care and newborn danger signs. CHVs accessed training on community health referral systems and practices, male involvement in maternal health, advocacy and economic empowerment, among others, while the comparison group did not receive similar interventions. Mirihini Community Unit (CU) in Bamba Division was designated the project community, while Midoina CU in Bahari Division was designated the comparison community.

A combination of cluster random (probability) and purposive (non-probability) sampling techniques were applied to select participants in each category. The project cluster had 600 households, while the comparison cluster had 555 households, making a total of 1,155 households. The Fisher's formula for sample size determination was used which yielded a sample size of 259 households, where mothers of children aged less than 2 years were identified and interviewed. The computed sample size was divided proportionately between the two clusters based on the population distribution, hence Mirihini had a sample of 135 households and Midoina had 124 households. The design had two approaches for data collection, processing and analysis, quantitative and qualitative.

Primary data was collected in February 2015, with the support of 10 assistants and a data quality technical person. A research authorization letter was obtained from Kenya Methodist University. Quantitative data processing involved coding open-ended data, entry, cleaning, transformation, analysis, and interpretation. The SPSS program was used to conduct descriptive and inferential analyses.

III. RESULTS OR FINDINGS

Socio-demographic attributes

Respondent's Background Profile: Of the 246 mothers of children aged below 2 years who were successfully interviewed, 109 (44.3%) were residents of Mirihini (project community), while 137 (55.7%) were natives of Midoina (comparison community). The study captured information on the frequency of ANC attendance during the pregnancy that resulted to the most recent birth as well as socio-demographic attributes, including age, educational attainment, marital status, livelihood activities and average income.

Antenatal care attendance attributes: of the 246 respondents, 201 (81.7%) accessed ANC services during the reference pregnancy. They included 104 (95.4%) respondents in Mirihini and 97 (70.8%) in Midoina. The analysis revealed a significant association between ANC attendance and distribution across the communities (χ^2 = 22.979, df = 1 & p-value = 0.000); suggesting up to 99% chance that the two communities varied significantly in terms of the proportion of respondents who accessed ANC services during the reference pregnancy.

Age: Mothers of children aged below 2 years, who accessed ANC services during the reference pregnancy, were aged between 16 and 49 years **(Table 1).** 87 (43.3%) respondents were aged 20 to 29 years while 81 (40.3%) were aged between 30 and 39 years. Cumulatively, 168 (83.6%) respondents were aged 20 and 39 years. However, there was no significant association between respondent's age and the frequency of ANC attendance. However, within the communities, the association between respondents' age and the frequency of ANC attendance was significant in Mirihini (χ^2 = 10.580, df = 3 & ρ-value = 0.014), but not significant in Midoina.

Education: Of the 201 respondents who accessed ANC services during the reference pregnancy, 104(51.7%) did not have formal education. This group consisted of 79(54.9%) respondents who achieved optimal ANC attendance and 25(43.9%) who indicated sub-optimal attendance. Cumulatively, 89(85.6%) respondents indicated incomplete primary education or less. There was no significant association between education level and the frequency of ANC attendance. However, whereas association between the two variables was significant in Mirihini (χ^2 = 8.322, df = 3 and ρ-value = 0.040), in Midoina, it was not.

Marital status: 177(88.1%) respondents, including 131 (91.0%) who reported optimal ANC attendance and 46 (80.7%) who indicated sub-optimal attendance, were married. Results show that there was no significant association between marital status and frequency of ANC attendance. However, in Mirihini, the association between the two variables was significant (χ^2 = 18.689, df = 3 & ρ-value = 0.000), but not in Midoina. In resource-poor communities, women rely on their families, particularly on partners for financial support to enable them access maternal health services, including ANC (Measure Evaluation, 2013). This implies that women in marital unions were better positioned to access ANC services than their widowed or single counterparts, particularly due to financial support provided by their spouses.

Economically: 101 (58.4%), of the respondents reported incomes ranging between Kenya Shillings (KShs) 1,000 and 4,999. This included 73 (60.3%) who achieved optimal ANC attendance and 28 (53.8%) who did not. In Mirihini, the respondents reported a mean income of KShs. 4,335 compared to KShs. 4,861 for Midoina residents. Analysis revealed no significant variation between the two communities regarding

mean monthly household income (ρ-value = 0.238). There was no significant association between average income and the frequency of ANC attendance in Mirihini as well as in Midoina.

Table 1: Socio-Demographic Data of Mothers of Children Aged <2 years

Attributes	Mirihini			Midoina			Aggregate		
	Optimal	S/Optimal	Total	Optimal	S/Optimal	Total	Optimal	S/Optimal	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Age									
<20 yrs	10(11.8)	5(26.3)	15(14.4)	4(6.8)	1(2.6)	5(5.2)	14(9.7)	6(10.5)	20(10.0)
20-29 yrs	42(49.4)	3(15.8)	45(43.3)	23(39.0)	19(50.0)	42(43.3)	65(45.1)	22(38.6)	87(43.3)
30-39 yrs	27(31.7)	11(57.9)	38(36.5)	28(47.5)	15(39.5)	43(44.3)	55(38.3)	26(45.6)	81(40.3)
40-49 yrs	6(7.1)	0(0.0)	6(5.8)	4(6.7)	3(7.9)	7(7.2)	10(6.9)	3(5.3)	13(6.4)
Total	**85(100.0)**	**19(100.0)**	**104(100.0)**	**59(100.0)**	**38(100.0)**	**97(100.0)**	**144(100.0)**	**57(100.0)**	**201(100.0)**
Education level									
No formal education	46(54.1)	8(42.1)	54(51.9)	33(55.9)	17(44.7)	50(51.5)	79(54.9)	25(43.9)	104(51.7)
Primary incomplete	29(34.1)	6(31.6)	35(33.7)	17(28.8)	16(42.1)	33(34.0)	46(31.9)	22(38.6)	68(33.8)
Primary complete	5(5.9)	5(26.3)	10(9.6)	8(13.6)	4(10.5)	12(12.4)	13(9.0)	9(15.6)	22(10.9)
Secondary	5(5.9)	0(0.0)	5(4.8)	1(1.7)	1(2.7)	2(2.1)	6(4.2)	1(1.7)	7(3.6)
Total	**85(100.0)**	**19(100.0)**	**104(100.0)**	**59(100.0)**	**38(100.0)**	**97(100.0)**	**144(100.0)**	**57(100.0)**	**201(100.0)**
Marital status									
Single	4(4.7)	4(21.1)	8(7.7)	4(6.8)	2(5.3)	6(6.2)	8(5.6)	6(10.5)	14(7.0)
Married	78(91.8)	10(52.6)	88(84.6)	53(89.8)	36(94.7)	89(91.8)	131(91.0)	46(80.7)	177(88.1)
Separated	0(0.0)	0(0.0)	0(0.0)	1(1.7)	0(0.0)	1(1.0)	1(0.7)	0(0.0)	1(0.5)
Widowed	3(3.5)	5(26.3)	8(7.7)	1(1.7)	0(0.0)	1(1.0)	4(2.7)	5(8.8)	9(4.4)
Total	**85(100.0)**	**19(100.0)**	**104(100.0)**	**59(100.0)**	**38(100.0)**	**97(100.0)**	**144(100.0)**	**57(100.0)**	**201(100.0)**
Monthly income									
<KES 1,000	2(2.9)	0(0.0)	2(2.4)	0(0.0)	0(0.0)	0(0.0)	2(1.7)	0(0.0)	2(1.2)
KES 1,000-4,999	40(57.1)	9(60.0)	49(57.6)	33(64.7)	19(51.4)	52(59.1)	73(60.3)	28(53.8)	101(58.4)
KES 5,000-9,999	24(34.3)	5(33.3)	29(34.1)	13(25.5)	14(37.8)	27(30.7)	37(30.6)	19(36.5)	56(32.4)
KES 10,000 +	4(5.7)	1(6.7)	5(5.9)	5(9.8)	4(10.8)	9(10.2)	9(7.4)	5(9.7)	14(8.0)
Total	**70(100.0)**	**15(100.0)**	**85(100.0)**	**51(100.0)**	**37(100.0)**	**88(100.0)**	**121(100.0)**	**52(100.0)**	**173(100.0)**

Maternal Health Education and Frequency of ANC Attendance

The uptake of health services depends on an individual's knowledge and beliefs about such services, which in turn, are shaped by people within an individual's social network, including CHWs, peers and role models (Andersen & Newman, 2005). As noted by Matsuoka et al. (2009), CHWs influence community knowledge and beliefs about the benefits of health services by providing health education, which enables community members to understand the importance of service utilization, as well as the consequences of non-utilization.

The results show that all the 149 (100%) respondents who attended clinic and were also visited by CHWs during the pregnancy that resulted to the most recent birth, received information on maternal health, which covered various aspects related to ANC attendance. More specifically, out of 149 participants, 125 (83.9%) respondents, including 82 (91.6%) in Mirihini and 44 (74.7%) in Midoina, mentioned *pregnancy danger signs*. Those who cited *importance of ANC attendance* were 103 (69.0%) respondents, including 73 (81.1%) in Mirihini and 32 (54.4%) in Midoina. The *ideal onset of ANC attendance* was cited by 80 (54.0%) respondents, which included 60 (66.3%) in Mirihini and 23 (39.2%) in Midoina; while those who stated the *ideal number of ANC attendance* were 55 (36.8%) respondents, and they included 45 (49.5%) in Mirihini and 13 (21.5%) in Midoina.

In view of the above, respondents were requested to demonstrate knowledge of the ANC aspects, which was cross-tabulated with the frequency of ANC attendance during the pregnancy that resulted to the most recent birth. The results presented in Table 6 below show that up to 109 (73.2%) respondents stated at least one correct *pregnancy-related danger sign*. Among those who achieved optimal ANC attendance, the majority, 101 (80.2%) stated provided a correct response; while among those who reported sub-optimal attendance, up to 15 (65.2%) did not state a correct response. In Mirihini, 84 (93.3%) respondents compared to 25 (42.4%) in Midoina, provided at least one correct response. The results suggest that a higher proportion of respondents in Mirihini [84 (93.3%)] than in Midoina [25 (42.4%)] were knowledgeable about the subject. Based on this, the analysis revealed a significant association between knowledge of *pregnancy-related danger signs* and the frequency of ANC attendance (χ^2 = 8.847, df = 1 & ρ-value = 0.011). The two variables were also significantly associated in Mirihini (ρ-value = 0.029) and Midoina (ρ-value = 0.020). The results imply that health education about *pregnancy danger signs* had significantly influenced the frequency of ANC attendance in both communities.

Those who stated at least one correct *importance of ANC attendance* were 105 (70.5%) respondents and they included 94 (74.6%) who achieved optimal ANC attendance and 11 (47.8%)

who reported sub-optimal attendance. Notably, majority of respondents who achieved optimal ANC attendance [101 (80.2%)], were those who correctly stated at least one importance of ANC attendance; while more than two-thirds [15 (65.2%)] of those who reported sub-optimal attendance consisted of those who did not state a correct response. Within the communities, the results suggest that the proportion of community members knowledgeable about importance of ANC attendance was higher in Mirihini [76 (84.4%)] than in Midoina [29 (49.2%)]. The analysis revealed a significant association between knowledge of the importance of ANC attendance and the frequency of ANC attendance (χ^2 = 5.476, df = 1 & ρ-value = 0.039). Besides, relationship between the two variables was also significant in Mirihini (ρ-value = 0.026), and in Midoina (ρ-value = 0.022); implying that educating community members about the *importance of ANC attendance* had significantly influenced the frequency of ANC attendance in both communities.

Table 2: Knowledge of ANC Aspects and Frequency of ANC Attendance

Knowledge of ANC aspects	Mirihini			Midoina			Aggregate		
	Opt	S/Opt	Total	Opt	S/Opt	Total	Opt	S/Opt	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Able to state a correct pregnancy danger sign									
Yes	78(95.1)	6(75.0)	84(93.3)	23(52.3)	2(13.3)	25(42.4)	101(80.2)	8(34.8)	109(73.2)
No	4(4.9)	2(25.0)	6(6.7)	21(47.7)	13(86.7)	34(57.6)	25(19.8)	15(65.2)	40(26.8)
Total	**82(100.0)**	**8(100.0)**	**90(100.0)**	**44(100.0)**	**15(100.0)**	**59(100.0)**	**126(100.0)**	**23(100.0)**	**149(100.0)**
Able to state one correct importance of ANC attendance									
Yes	71(86.6)	5(62.5)	76(84.4)	23(52.3)	6(40.0)	29(49.2)	94(74.6)	11(47.8)	105(70.5)
No	11(13.4)	3(37.5)	14(15.6)	21(47.7)	9(60.0)	30(50.8)	32(25.4)	12(52.2)	44(29.5)
Total	**82(100.0)**	**8(100.0)**	**90(100.0)**	**44(100.0)**	**15(100.0)**	**59(100.0)**	**126(100.0)**	**23(100.0)**	**149(100.0)**
Able to state ideal onset of ANC attendance									
Yes	74(90.2)	5(62.5)	79(87.8)	17(38.6)	2(13.3)	19(32.2)	91(72.2)	7(30.4)	98(65.8)
No	8(9.8)	3(37.5)	11(12.2)	27(61.4)	13(86.7)	40(67.8)	35(27.8)	16(69.6)	51(34.2)
Total	**82(100.0)**	**8(100.0)**	**90(100.0)**	**44(100.0)**	**15(100.0)**	**59(100.0)**	**126(100.0)**	**23(100.0)**	**149(100.0)**
Able to state the ideal no. of ANC attendances									
Yes	77(93.9)	5(62.5)	82(91.1)	10(22.7)	5(33.3)	15(25.4)	87(69.0)	10(43.5)	97(65.1)
No	5(6.1)	3(37.2)	8(8.9)	34(77.3)	10(66.7)	44(74.6)	39(31.0)	13(56.5)	52(34.9)
Total	**82(100.0)**	**8(100.0)**	**90(100.0)**	**44(100.0)**	**15(100.0)**	**59(100.0)**	**126(100.0)**	**23(100.0)**	**149(100.0)**

Summary of Cross Tabulation Statistics

		Mirihini	Midoina	Aggregate
Able to state a correct pregnancy danger sign	χ^2	4.743	5.443	**8.847**
	df	1	1	**1**
	ρ-value	0.029**	0.020**	**0.011****
Able to state one correct importance of ANC attendance	χ^2	4.939	5.230	**5.476**
	df	1	1	**1**
	ρ-value	0.026**	0.022**	**0.039****
Able to state ideal onset of ANC attendance	χ^2	7.678	1.674	**7.287**
	df	1	1	**1**
	ρ-value	0.006***	0.412	**0.025****
Able to state the ideal no. of ANC attendances	χ^2	4.875	1.609	**5.597**
	df	1	1	**1**
	ρ-value	0.028**	0.318	**0.034***

*, **, *** show significance at ρ<0.1, ρ<0.05 and ρ<0.01 error margins, respectively

Furthermore, 98 (65.8%) respondents demonstrated knowledge of the *ideal onset of ANC attendance*, by providing the correct response about the subject. Of this group, 91(72.2%) achieved optimal ANC attendance, while 7 (30.4%) did not. Those who did not provide the correct response about the subject were 51(34.2%) and majority of them 16(69.6%), reported sub-optimal ANC attendance. Notably, the proportion of respondents who were knowledgeable about the *ideal onset of ANC attendance* was higher in Mirihini 79(87.8%) than in Midoina 19(32.2%). Based on this, the analysis revealed a significant relationship between knowledge of the *ideal onset of ANC attendance* and frequency of ANC attendance (χ^2 = 7.287, df = 1 & ρ-value = 0.025). Similarly, relationship between the two variables was significant in Mirihini (ρ-value = 0.006), but not in Midoina (ρ-value = 0.412). The results imply that educating community members on the *ideal onset of ANC attendance* had influenced the frequency of ANC attendance in Mirihini; while in Midoina, the initiative was yet to cause a significant influence on the aspect.

Those who correctly stated the *ideal number of ANC attendances* were 97(65.1%) respondents, and they included 87(69.0%) who achieved optimal ANC attendance and 10(43.5%) who failed to achieve optimal ANC attendance. Contrastingly, more than one-half, 13(56.5%) of those who reported sub-optimal attendance did not provide the correct response regarding the subject. The results suggest that the proportion of respondents who were knowledgeable about the subject was higher in Mirihini 82(91.1%) than in Midoina 15(25.4%). In view of this, the analysis revealed that health education about the *ideal number of ANC attendances* and the frequency of ANC attendance were significantly associated (χ^2 = 5.597, df = 1 & ρ-value = 0.034). Relationship between the two variables was also significant in Mirihini (ρ-value = 0.028), but not significant in Midoina (ρ-value = 0.318). The implication is that health education had significantly influenced the frequency of ANC attendance in Mirihini, but not in Midoina. The analysis further revealed that although women and men in both communities were educated on various aspects related to ANC attendance, there was a lag in care-seeking behavior due to negative influences of Traditional Birth Attendants (TBAs), traditional healers and mothers-in-law, who for a long time, had been the main authorities regarding maternal health in both communities.

Influence of Maternal Health Education on the Frequency of ANC Attendance

Bivariate results in the preceding sub-sections revealed that the frequency of ANC attendance significantly associated with all the maternal health education indicators, including knowledge of: *pregnancy-related danger signs (PGDsigns), importance of ANC attendance (IANattendance), the ideal onset of ANC attendance (IOAattendance),* as well as *the ideal number of ANC attendances (INAattendance).* Binary logistic regression models were used to determine the influence of maternal health education indicators (independent variables) on the frequency of ANC attendance (dependent variable), using the 'Forward LR' method.

Interrelationship between independent variables were tested for Collinearity indicators. Using the default outlier value of 2.0, standard errors (S.E.) associated with regression coefficients (β) were examined. In this regard, standard errors larger than 2.0 would indicate the existence of Collinearity effects. However, in this study, none of the independent variables showed signs of

Collinearity with other independent variables. Consequently, none was omitted from the regression analysis process.

Odds ratios (OR) is the probability of variation in a dependent variable in response to a unit change in an independent variable. In this study, OR was obtained by exponentiating partial regression co-efficients, also known as beta co-efficients (β). Table 3 shows OR in the Exp(β) column. The results in Model 1 suggest that respondents who correctly stated a pregnancy-related danger sign had about 2.6 times the odds of achieving optimal ANC attendance as those who did not provide a correct response (β = 0.946, ρ-value = 0.011, OR = 2.575, C.I. = 1.299-5.104). Model 2 shows that in Mirihini, respondents who correctly stated a pregnancy-related danger sign was about 2.1 times as likely to achieve optimal ANC attendance as their colleagues who did not provide a correct response (β = 0.747, OR = 2.111, ρ-value = 0.042, C.I. = 1.198-3.719). In Midoina, respondents who stated a correct response had about 1.8 times the odds of achieving optimal ANC attendance as those who failed to do so (β = 0.613, ρ-value = 0.053, OR = 1.846, C.I. = 1.048-3.253). The results suggest that maternal health education on pregnancy danger signs had influenced the frequency of ANC attendance in both Mirihini and Midoina communities. However, in Mirihini, the results show up to 95% chance that the initiative had influenced the frequency of ANC attendance; while in Midoina, the initiative had caused a significant influence on ANC attendance frequency at 90% confidence level. Consequently, a respondent in Mirihini, who provided a correct pregnancy-related danger sign was relatively more likely to achieve optimal ANC attendance than a similar respondent in Midoina.

Table 3: Summary Results of Binary Logistic Regression Models

Model	Covariates	β	SE	Wald	df	ρ-value	Exp (β)	95% C.I. for Exp(β)	
								Lower	*Upper*
1-Aggregate	*PGDsign*			10.255	1.000	0.008***			
	Yes	0.946	0.349	7.347	1.000	0.011**	2.575	1.299	5.104
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	IANattendance			17.744	1.000	0.000***			
	Yes	1.197	0.298	16.135	1.000	0.003***	3.310	1.846	5.936
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	IOAattendance			18.246	1.000	0.000***			
	Yes	0.969	0.253	14.669	1.000	0.005***	2.635	1.605	4.327
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	INAattendance			28.564	1.000	0.000***			
	Yes	1.510	0.296	26.024	1.000	0.000***	4.527	2.534	8.086
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Constant	1.766	0.280	39.780	1.000	0.000***	5.847		
2-Mirihini	*PGDsign*			9.887	1.000	0.010**			
	Yes	0.747	0.289	6.681	1.000	0.042**	2.111	1.198	3.719
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	IANattendance			11.417	1.000	0.005***			

	Yes	0.497	0.172	8.349	1.000	0.028**	1.644	1.173	2.303
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	IOAattendance			16.656	1.000	0.000***			
	Yes	0.769	0.221	12.108	1.000	0.003***	2.158	1.399	3.327
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	INAattendance			20.655	1.000	0.000***			
	Yes	1.310	0.359	13.315	1.000	0.002***	3.706	1.834	7.491
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	Constant	1.213	0.210	33.364	1.000	0.000***	3.364		
	PGDsign			8.126	1.000	0.030**			
	Yes	0.613	0.289	4.499	1.000	0.053*	1.846	1.048	3.253
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	IANattendance			5.306	1.000	0.049**			
	Yes	0.447	0.272	2.701	1.000	0.067*	1.564	0.917	2.665
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
3-Midoina	*IOAattendance*			2.182	1.000	0.151			
	Yes	0.269	0.193	1.943	1.000	0.162	1.309	0.896	1.910
	No (RC)	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	INAattendance			1.838	1.000	0.183			
	Yes	0.401	0.300	1.787	1.000	0.194	1.493	0.829	2.689
	No (RC)	1.000	1.000	1.000	1.000		1.000	1.000	1.000
	Constant	0.666	0.210	10.058	1.000	0.009***	1.946		

Note: RC – Reference Category *, **, *** show significance at 0.1, 0.05 and 0.01 error margins, respectively

Model 1 further shows that respondents who correctly stated an importance of ANC attendance had about 3.3 times the odds of achieving optimal ANC attendance as their colleagues who did not provide a correct response (β = 1.197, ρ-value = 0.003, OR = 3.310, C.I. = 1.846-5.936). Model 2 shows that in Mirihini, respondents who provided a correct response were about 1.6 times as likely to achieve optimal ANC attendance as those who did not provide a correct response (β = 0.497, ρ-value = 0.028, OR = 1.644, C.I. = 1.173-2.303). On the same note, Model 3 shows that in Midoina, respondents who provided a correct response had about 1.6 times the odds of achieving optimal ANC attendance as those who did not provide a correct response (β = 0.447, ρ-value = 0.067, OR = 1.564, C.I. = 0.917-2.665). Even though respondents who provided correct responses in both communities had approximately the same odds of achieving optimal ANC attendance, in Mirihini, the

intervention's influence was significant at 95% confidence level, while in Midoina, the influence was significant at 90% confidence level. Consequently, a respondent in Mirihini who stated a correct response was relatively more likely to achieve optimal ANC attendance than a counterpart in Midoina. This implies that the intervention contributed to the achievement of optimal ANC attendance in Mirihini by enabling community members to understand the importance of ANC attendance.

The results in Model 1 show that respondents who correctly stated the ideal onset of ANC attendance were about 2.6 times as likely to achieve optimal ANC attendance as their colleagues who did not provide the correct response ($\beta = 0.969$, ρ-value = 0.005, OR = 2.635, C.I. = 1.605-4.327). Besides, Model 2 shows that in Mirihini, respondents who correctly stated the ideal onset of ANC attendance had about 2.2 times the odds of achieving optimal ANC attendance as their counterparts who did not provide the correct response ($\beta = 0.769$, ρ-value = 0.003, OR = 2.158, C.I. = 1.399-3.327). On the same note, Model 3 shows that in Midoina, those who stated the correct ideal onset of ANC attendance were about 1.3 times as likely to achieve optimal ANC attendance as their colleagues who did not provide the correct response ($\beta = 0.269$, ρ-value = 0.162, OR = 1.309, C.I. = 0.896-1.910). The results suggest that maternal health education regarding the ideal onset of ANC attendance had significantly influenced the frequency of ANC attendance in Mirihini; and the intervention's influence was significant at 99% confidence level. However, in Midoina, educating community members on the ideal onset of ANC attendance had not caused a significant influence on the frequency of ANC attendance. The variation may be attributed to the project interventions, including training and facilitation of CHWs for consistency in home visits.

Lastly, Model 1 shows that respondents who correctly stated the ideal number of ANC attendance had about 4.5 times the odds of achieving optimal ANC attendance as their counterparts who did not provide the correct response ($\beta = 1.510$, ρ-value = 0.000, OR = 4.527, C.I. = 2.534-8.086). Model 2 shows that in Mirihini, respondents who stated the correct response regarding the subject were about 3.7 times as likely to achieve optimal ANC attendance as those who did not provide the correct response ($\beta = 1.310$, ρ-value = 0.002, OR = 3.706, C.I. = 1.834-7.491). Model 3 further shows that in Midoina, respondents who correctly stated the ideal number of ANC attendance had about 1.5 times the odds of achieving optimal ANC attendance as their counterparts who failed to state the correct response ($\beta = 0.401$, ρ-value = 0.194, OR = 1.493, C.I. = 0.829-2.689). The results show that in Mirihini educating community members had caused a positive influence on the frequency of ANC attendance; which was significant at 99% confidence level. However, in Midoina educating community members on the ideal number of ANC attendance had not significantly influenced the frequency of ANC attendance. This implies that a respondent in Mirihini who stated the correct response was relatively more likely to achieve optimal ANC attendance than a counterpart in Midoina. This further implies that the intervention had contributed to the improvement of the achievement of optimal ANC attendance in the project community.

I. DISCUSSION

Community health volunteers improve the effectiveness of community referral systems through maternal health education. Thus, the effectiveness of such systems depends on how often CHVs are facilitated and supported to visit households and disseminate appropriate health information. Arguably, the higher the frequency of home visits, the better the odds of community members becoming more knowledgeable about ANC services; and the more the community becomes responsive to referral advices provided by CHVs. Similar findings were reported by John Snow Inc. (2011) in Nepal, where it was noted that up to 84% of women who were visited by CHVs during pregnancy were able to correctly state at least three danger signs associated with pregnancy.

The study sought to find out knowledge of ideal number of clinic visits and ANC attendance. In Midoina, the results show a significant relationship between access to health education on the ideal number of clinic visits before delivery and the achievement of optimal ANC attendance. Similar findings were reported by Albrecht and De Brouwere (2010) in Sierra Leone, where it was noted that the proportion of pregnant women achieving optimal ANC attendance increased among those who had accessed maternal health education from community health volunteers. In Nepal, a study conducted by John Snow Inc. (2011) found a significant relationship between access to maternal health education and the achievement of optimal ANC attendance.

Influence of referral documentation on ANC attendance found that, through referral request forms, CHVs formalize referral processes, which in turn, assure community members of quality care at the facilities. In this regard, Nxumalo and Goudge (2013) noted that women issued with referral forms were less anxious and more motivated to seek care than those not issued with such documents. Among the 32 respondents who failed to honor referral advices, 28 (87.5%) cited lack of money for transport as the key constraint. Similarly, Panajyan and Baghdasarova (2009) reported instances where lack of funds for transport prevented patients from complying with referral advices. The challenge of lack of resources for transport to health facilities was also highlighted by Albrecht and De Brouwere (2010) as a key factor influencing decisions for compliance or non-compliance with referral advices.

Participants pointed out that due to the fear of harassment by service providers, some women chose not to honor referral advices, while others did not complete scheduled ANC visits. Similar findings were reported by a study conducted in Uganda by Peterson et al. (2013), which noted that providers' rudeness and cruelty prevented more than one-half of women from honoring revisit appointments. More still, Bhutta et al. (2010) also reported a similar finding, where they noted that pregnant women avoided ANC services due to perceptions of negative attitude among service providers towards care-seekers.

II. CONCLUSION

In Mirihini, providing maternal health education to pregnant women had no significant influence on ANC attendance. However in Midoina, the results show up to 90% chance that providing maternal health education to pregnant

women had a significant influence on ANC attendance. In Mirihini, the proportion of respondents achieving optimal ANC attendance was high regardless of whether one received information on ANC attendance or not. This suggests that most community members were highly informed about the importance of ANC attendance well before the pregnancy of reference (the pregnancy that resulted to the most recent birth). This further shows that women in the intervention community were more informed about ANC attendance than their colleagues in the control community; leading to better levels of ANC service utilization. In Mirihini, the study revealed up to 99% chance that issuing referral documents to women during the pregnancy that resulted to the most recent birth had a significant influence on ANC attendance. However, in Midoina, issuing referral documents to pregnant women during the reference period had no significant influence on ANC attendance. This implies that members of the intervention community were more responsive to ANC services when issued with referral documents than members of the control community. The study recommends that 1) project officers to strengthen supervisory support to CHVs by engaging with Ministry of Health to provide reporting materials and ensure consistency of monthly review forums and 2) project officers to engage with county assembly health committee to consider more budgetary allocation for the production of referral and counter referral forms.

APPENDIX

Appendixes, if needed, appear before the acknowledgment.

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