

Intervention fidelity and its determinants of focused antenatal care package implementation, in South Wollo Zone, Northeast Ethiopia.

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Abstract

Background: Studies show home and community-based implementation of intervention packages have significantly reduced neonatal mortality particularly in resource constrained settings. However, due to evidence-practice gap, thousands of neonates are still losing their lives every day mostly from preventable causes. This study aimed to assess focused antenatal care package intervention fidelity and its determinant factors in South Wollo Zone, Northeast Ethiopia.

Methods: A cross-sectional study design was employed and a total of 898 mothers who gave birth in the last six months prior to data collection were included. Also sixteen health extension workers who were working in the health posts (n=10) selected for facility audits were included. Interview and self-administered questionnaires were used to collect data from mothers and health extension workers, respectively. Facility audits were used to assess the availability and functionality of required drugs and supplies for the health posts. Mothers were asked whether or not the required level of care were provided to them. Health extension workers were provided self-administered questionnaires to assess socio-demographic characteristics, reception of trainings, facilitation strategies and ability to classify danger signs. A multilevel linear regression analysis was performed to identify the individual and organizational levels factors influencing focused antenatal care package intervention fidelity.

Results: The overall weighted average focused antenatal care package intervention fidelity was 49.78% (95% CI: 47.73 – 51.83). Of these, 62.02% (95% CI: 59.71 – 64.32) was provided by health extension workers and 56.57% (95% CI: 53.94 – 59.19) by skilled providers (nurses, midwives, health officers or medical doctors). The overall antenatal care coverage was 83.7% (95% CI: 81.28 – 86.12); 34.97% (95% CI: of 31.56 – 38.39) of them received at least four antenatal visits and 6.12% (95% CI: 4.40-7.83) received all the recommended components of focused antenatal care. Previous pregnancy-related medical problems, paternal education, and implementation of supportive/facilitation strategy were found to be significant facilitators of focused antenatal care package intervention fidelity.

Conclusion: Focused antenatal care package intervention fidelity in the study area was low, which may contribute to the stagnation of neonatal mortality reduction. Improving the implementation of facilitation strategies is highly required to produce a positive result in neonatal mortality reduction.

Contribution To The Literature

- This study computes complex public health intervention fidelity as a composite variable (composite indexing) using the concepts of weighting and conditional probability.
- The hierarchical or nested nature of intervention customers from the health institutions or health care providers were treated properly using multilevel statistical technique.
- The effect of facilitation/supporting strategy to the complex public health intervention fidelity was statistically quantified or measured.

Background

Neonatal mortality refers to death of a live-born baby within 28 days of life (1). Globally 2.5 million neonates died in the first month of life in 2017(2–4). If secular trends continue, by 2030 an estimated 28.7 million neonates will die worldwide (3). The majority of these newborn deaths occur in low- and middle-income countries, particularly in Sub-Saharan Africa. Recent projections indicate that the achievement of child-related sustainable development goals may be difficult especially in Sub-Saharan Africa, if the current mortality trend continues(5–7). According to World Data Atlas, Ethiopia records the highest neonatal mortality rate (29 deaths/1000 live births) with a slower rate of decline (41%) (8–10). In Amhara region, the neonatal mortality rate was 47 deaths/1000 live births in 2016, which is the first highest in the country(11).

Evidences shows that public health interventions during the antenatal period are effective to reduce neonatal mortality (10). In all the studies reviewed here, interventions during pregnancy significantly reduce neonatal mortality. Increasing antenatal care frequency has shown to decrease neonatal mortality at Indonesia, Sub-Saharan Africa, Bangladesh, Kenya, and India (12–16). Several studies demonstrated that prenatal iron and folic acid supplementation (17–23), tetanus toxoid vaccination (17,24–27), use of insecticide-impregnated bed nets during pregnancy (10), and syphilis screening and treatment (23) have shown to reduce neonatal mortality. Importantly, randomized control trials and large observational studies showed a significant reduction in neonatal mortality and improvement of maternal and childcare services uptake after implementing these interventions in the form of the package at home-community setting (10,28–36). It is also indicated that the bare number of the antenatal visit could not have a significant effect on neonatal mortality reduction (30).

Ethiopia is implementing focused antenatal care (FANC) package at home-community setting since 2013 to reduce neonatal mortality (37). This package links one to five networks, which includes health development armies, health extension workers (HEWs), and skilled professionals (nurses, midwives, and health officers or medical doctors) working at health centers. It aims to early identification of pregnant women and provision of FANC by linking home-community levels of care to the primary health care unit. However, even after the introduction of this package the neonatal mortality rate in Ethiopia is still among the highest in the world. The main question here is, why millions of neonates are still dying while these effective intervention packages are implemented? We hypothesized that these interventions may not be properly implemented as per guidelines/standard (intervention fidelity), commonly known as evidence-practice gap. To our knowledge, no study thus far assessed whether this FANC package intervention is implemented with fidelity or not, and facilitators and barriers influencing its implementation. Intervention fidelity refers to the degree to which an intervention is implemented as planned in the original implementation document (38).

This study aimed to assess focused antenatal care package intervention fidelity and its determinant factors in South Wollo Zone, Northeast Ethiopia.

Methods

Design: Cross-sectional study design was used for evaluating the intervention fidelity of focused antenatal care package designed for the reduction of neonatal mortality.

Context: FANC package is a combined effective and efficient public health intervention provided at home-community settings. The main implementers are HEWs, health development armies, and skilled health providers working at the health centers, and supported by families. HEWs, who are young females and 10th grade completed, have been trained and certified to provide family health services at the community level, including FANC, diseases prevention and control, hygiene and environmental sanitation, health education, and communication (39–41). HEWs work at the health posts (the first level of health facility) under the supervision and support of health centers(42).

Targeted sites and populations: The study was conducted in South Wollo Zone of the Amhara region, which is 400 kms far from the north of Addis Ababa, capital of Ethiopia. There were 900 rural and 150 urban HEWs, and 499 health posts, 126 health centers, and 9 hospitals in the Zone. All mothers who gave birth in the last six months of data collection, HEWs, and health posts in the selected kebeles' were included in the study. In Ethiopia, Kebele is the smallest administrative unit.

Intervention description: FANC requires a continuum of care provided at the household - health post - health center levels (Home-Community platform). The main goal of the intervention package is to transform evidence into action for reducing newborn mortality by increasing the reach to every pregnant mother and every newborn in the community. The services under this intervention package include the provision of four antenatal visits, and counseling on nutrition, bed net use, pregnancy danger signs, and mother to child transmission of HIV. It includes birth preparedness and complication readiness planning, treatment of diagnosed sexually transmitted infections (STI), blood pressure, height and weight measurement in addition to identification of maternal danger signs and referral, provision of 2 doses of tetanus toxoid vaccination, promotion of institutional delivery, iron, and folate supplementation and detection and management of complications. Health center staff are expected to conduct weekly supervision and support to health posts (or HEWs) (37).

Subgroup (Sampling): Kebeles from South Wollo Zone were selected randomly using computer-generated random numbers. All mothers who gave birth in the last six months (for individual-level variables and fidelity assessment), all HEWs, and all health posts in the selected kebeles (for cluster-level variables) were included. Mothers were interviewed at their home while HEWs completed the questionnaires by themselves when conducting the facility audit.

Outcomes: The primary outcome of this study, FANC package intervention fidelity, was computed by the weighted average of program reach (contact coverage), adherence to content, and frequency. Program reach was measured by the proportion of mothers who visit or visited at least once by any health care providers at any health care delivery setting for recent pregnancy. The number of antenatal visits and

components provided for the mothers, who were contacted, was considered as frequency and content respectively.

Sample Size Determination: Considering 52% of pregnant mothers who receive 4+ antenatal care and all components of antenatal care (43), 95% confidence level, 5% margin of error with 10% non-response rate, 422 participants were required. However, due to cluster sampling of kebeles, we collected data from 898 mothers. In addition, sixteen HEWs were included, and ten health posts were audited.

Statistical Analysis: Antenatal care coverage, frequency, and content were computed by considering the recommended amount of care as a reference. Antenatal care coverage was determined as the proportion of mothers who have contacted health care providers during the recent pregnancy. Since the recommended number of focused antenatal care visits is at least four, getting antenatal care frequency less than four was weighed by considering \geq four as one (reference). For antenatal care contents, taking the total 17 antenatal care contents as maximum, mothers who received less than the recommended contents during the recent pregnancy were weighted accordingly. As there was no previous study that assessed intervention fidelity, equal weights were given for coverage, component, and frequency to compute fidelity (44–46). FANC package intervention fidelity was calculated by taking the mean of the weighted product of antenatal care coverage, frequency, and contents. Maternal (service recipient) and health post (service provider) data were considered as facilitators and barriers for FANC package intervention fidelity. Because mothers are nested from the health post and the sampling method was cluster (by kebeles) multilevel model was considered. Exploratory data analysis was performed using SPSS version 20 and statistical modeling was conducted by R statistical software. This study used standards for reporting implementation science guidelines (38).

Results

Socio-demographic characteristics

The mean age of mothers' at the time of interview was 30.96 ± 7.215 years. Fifty percent of mothers were between 25 and 36 years of age. Six hundred thirty eight (71.4%) of mothers did not attend any formal education, 768 (85.5%) were married and 662 (74%) of them were housewives.

The HEWs' average age was 26 ± 3.67 years and 13 (81.3%) of them were married and they walked an average of around 3 hours (95% CI: 1:10 – 3:20) to reach to the farthest mother's home.

Coverage of FANC

Seven hundred fifty two mothers were contacted by health care providers at least once during their recent pregnancy, making the overall antenatal care coverage of 83.7% (95% CI: 81.28 – 86.12). From the contacted included mothers, 44.2% (95% CI, 40.95 – 47.45) were contacted by HEWs, while the remaining 39.5% (95% CI, 36.01- 42.99) were contacted by skilled providers. The mean time of first antenatal care

visit was 4.14 ± 2 months. Interestingly, from the total contacted mothers 34.44% (95% CI, 31.04 – 37.84) of them were seen by health care providers within the first trimester of gestation (less than 12weeks).

Frequency of FANC service utilization

The mean number of the antenatal visits were 3 ± 1.6 , and on average, 34.97% (95% CI: of 31.56 – 38.39) of mothers received at least four antenatal care visits during their recent pregnancy. Higher number of antenatal visit was related with increased FANC package contents provided to mothers (Figure 1).

Components of FANC

On average 6.12% (95% CI: 4.40-7.83) of the contacted mothers received all the components of focused antenatal care. Of these, 33(4.3%) received the care by HEWs and 13(1.7%) by skilled providers (Table 1).

The overall weighted average FANC package intervention fidelity was 49.78% (95% CI: 47.73 – 51.83). HEWs provided 62.02% (95% CI: 59.71 – 64.32) while skilled providers provided 56.57% (95% CI: 53.94 – 59.19) of the weighted average FANC intervention fidelity. Only 2.2% (n=20) of mothers received all the recommended FANC package intervention with full fidelity.

Provider related factors

Three quarters (n=12) of the HEWs were ever trained on FANC package while only 2 (12.5%) of them received refreshment training in the last three months. Only two of the health posts were supervised weekly from the catchment health center and 9 (56.3%) of the HEWS received onsite assistance for difficult cases. The average time to walk from the health post to the furthest house by HEWs was around 3 hours (Range, 1:00 - 4:00 hours). Nine of them responded that they are able to provide FANC (self-efficacious).

HEWs were asked about the implementation of support/facilitation strategies set by the Ministry of Health. These support strategies were assessed from the health center, district health offices, community, and development armies' perspective. Nearly seventy percent (n= 11) of the HEWs reported that the implementation of support either from the community, health development armies or district health offices were lower than the planned standard.

Quality of service delivery

From all included mothers, 16.3% (n=146) of them did not receive antenatal care services in their last pregnancy. About two-thirds (n=489), and almost all (n=706) of them have not received the required number and contents of FANC package respectively.

Customer perspective

Only 20% (n=180) of mothers were living within 15-minute of walking distance from the health post, while about one-third (n=333) of them travelled more than 45 minutes on foot to get to the health posts. Of

those mothers who received antenatal care service, just above 90% (n=685) were self-referral. One-fifth (n=187) of mothers encountered pregnancy-related medical problems (like bleeding, convulsion, high temperature, etc) in their previous pregnancy.

Organizational perspective

No health post had all the required functional equipment and medical supplies for focused antenatal care services. Birth preparedness and complication readiness form, supervision checklist, blood pressure cuff, pregnant women registration book, stethoscope, and tape measure were the most frequently mentioned unavailable equipment in the health posts.

Facilitators' and barriers' of FANC intervention fidelity

To select the appropriate statistical model for the hierarchical nature of the data, the intra-class correlation coefficient (ICC) was computed by running the intercept only model. The ICC observed in the model was 17.73%, which indicates that 17.73% of the variation in FANC package intervention fidelity is explained by health post (cluster) level factors. This shows the application of multilevel linear regression model was appropriate.

In the first level model, maternal age, distance from the health post, maternal education, pregnancy related medical problems in the previous pregnancy, partner's education, and total number of abortions were considered. Support/facilitation strategies, distance from the farthest household, and availability of supplies in the health post were considered in the second level model. Finally, pregnancy related medical problems in the previous pregnancy, partner's education and support/facilitation strategies were found to be statistically significant facilitators for FANC package intervention fidelity (Table 2). In the final model, the ICC was reduced to 4.7% and both Akaike's Information Criteria (AIC) and Bayesian Information Criteria (BIC) were decreased by 187.3 and 168.6 respectively, from the initial model (AIC=334.6 and BIC=349.0).

Discussion

The antenatal care coverage was 83.7%; 6.12% of mothers received all the recommended components and 34.97% received at least four ANC visits. Moreover, over 90% of mothers who had antenatal care visits were self-referral. The overall weighted average FANC package intervention fidelity was 49.78%, of these, 62.02% were by HEWs and 56.57% by skilled providers. Having pregnancy-related medical problems, formally educated partners, and implementation of supportive/facilitation strategies were significant facilitators for FANC package intervention fidelity.

In the study, the weighted average FANC package intervention fidelity score was too low compared to the standard stated in the implementation guideline. Durlak et.al. suggested that the level of an intervention implementation should be around 60% to produce a positive result (48). This implies that the FANC package intervention fidelity, according to the finding, is too low to result in a reduction in neonatal

mortality. Our finding implies that the stagnation of neonatal mortality reduction could be partly due to the low fidelity of the FANC packages intervention implementation. We have also shown that the level of FANC frequency was 34.97% and content of 6.12%. This implies that though reaching the target audience was optimal (83.7%), non-conformity with the prescribed frequency and content is evident. In the study, the observed increase in antenatal care visit (frequency) was accompanied by the reception of the recommended FANC contents, which is in line with the data from 41 countries' demographic and health surveys (49). The present study suggests that the mere increase in the contact coverage does not warrant the increase in the provision of expected contents and intervention fidelity of the FANC packages.

In the study, mothers' who encountered pregnancy-related medical problems in their previous pregnancy had a 0.0889 times higher level of FANC package intervention fidelity than mothers who did not encounter any problem. This may indicate that mothers' pregnancy-related risk perception play an important role for their adherence to the recommended of FANC package intervention implementation.

Mothers who had formally educated partners had a 0.0751 times higher levels of FANC package intervention fidelity in their recent pregnancies than their counterparts. Partners' attendance of formal education facilitates FANC package intervention fidelity, but not mothers at the same level of educational status. This finding indicates that paternal education, even at the lowest level (elementary), contributes for improving service uptake and adherence to the recommended package of care. This implies that maternal and child (MCH) health care uptake decision making might depends on partners particularly for mothers with low levels of educational status. Therefore, MCH policy development and implementation needs to involve partners as well particularly for mothers with low levels of education living in rural areas.

An average increase in the implementation of health post level supportive/facilitation strategies resulted in a 0.0375 increase in the level of FANC package intervention fidelity of their affiliated mothers. When the facilitation strategies that put in place to optimize the implementation of FANC package intervention increased, the intervention fidelity of FANC may be optimized to the expected level of the affiliated mothers. This result indicates that measuring facilitating effects of supportive strategies is essential for optimizing and harmonizing the FANC package intervention implementation (50). The weakness in the facilitation/supportive strategy could be the main possible reason for the observed low level of FANC package intervention fidelity, thereby contributing to the stagnant neonatal mortality reduction.

Nonetheless, since the last six months information was collected from the mothers by non-health professional data collectors, the effect of social desirability bias needs to be considered in interpreting the findings.

Conclusion

The study shows that FANC package intervention fidelity is too low to achieve the expected level of neonatal mortality reduction. Maternal previous pregnancy-/delivery-related medical problems, partner's education, and implementation of facilitation strategies were significant facilitators of FANC package intervention fidelity. This indicates that paternal education and implementation of facilitation strategies

plays significant contributions for improving focused antenatal care package intervention fidelity. Further studies that focus on why facilitation strategies were in a scarcity of implementation is needed.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the ethical board of the University of Gondar (Ref. No O/V/P/RCS/05/810/2018), and permission letters were sought from Amhara regional state health bureau, South Wollo Zone and district health offices. Written informed consent was taken from all participants.

Consent for publication

Not applicable

Availability of data and materials

The dataset used and analyzed for this study contains the individual private information and is available from the corresponding author. This data can be made available up on reasonable request.

Competing interest

The authors declare that there is no competing interest.

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Authors' contribution

AMT conceived the idea, develop and implemented the proposal, analyzed and interpreted data and wrote the manuscript under the supervision of AG, SM, KA, and ZT. AG, SM, KA, and ZT critically reviewed the manuscript. All authors read and approved the final manuscript.

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Tables

Table 1. The components of focused antenatal care package provided for pregnant mothers by providers qualification in South Wollo Zone, Ethiopia.

Contents		Number of mothers (%)	By HEWs (%)	By skilled provider (%)
<i>Weight measured</i>	Yes	629 (83.6)	296 (47.1)	333 (52.9)
	No	123 (16.4)	101 (82.1)	22 (17.9)
<i>Height measured</i>	Yes	488 (64.9)	252 (51.6)	236 (48.4)
	No	264 (35.1)	145 (54.9)	119 (45.1)
<i>Blood pressure measured</i>	Yes	558 (74.2)	305 (54.7)	253 (45.3)
	No	194 (25.8)	92 (47.4)	102 (52.6)
<i>Advised for institutional delivery</i>	Yes	686 (91.2)	372 (54.2)	314 (45.8)
	No	66 (8.8)	25 (37.9)	41 (62.1)
<i>Advised for BPCR*</i>	Yes	645 (85.8)	350 (54.3)	295 (45.7)
	No	107 (14.2)	47 (43.9)	60 (56.1)
<i>Advised on danger signs during pregnancy</i>	Yes	606 (80.6)	327 (54.0)	279 (46.0)
	No	146 (19.4)	70 (47.9)	76 (52.1)
<i>Advised on personal hygiene</i>	Yes	695 (92.4)	372 (53.5)	323 (46.5)
	No	57 (7.6)	25 (43.9)	32 (56.1)
<i>Advised for PMTCT*</i>	Yes	633 (84.2)	320 (50.6)	313 (49.4)
	No	119 (15.8)	77 (64.7)	42 (35.3)
<i>Advised and screened for STI*</i>	Yes	622 (82.7)	308	314 (50.5)

			(49.5)	
	No	130 (17.3)	89 (68.5)	41 (31.5)
<i>Advised for bed net use</i>	Yes	527 (70.1)	299 (56.7)	228 (43.3)
	No	225 (29.9)	98 (43.6)	127 (56.4)
<i>Mothers tested for HIV</i>	Yes	678 (90.2)	345 (509)	333 (49.1)
	No	74 (9.8)	52 (70.3)	22 (29.7)
<i>Advised for nutrition during pregnancy</i>	Yes	634 (84.3)	350 (55.2)	284 (44.8)
	No	118 (15.7)	47 (39.8)	71 (60.2)
<i>Told to seek care for pregnancy danger signs</i>	Yes	669 (89.1)	363 (54.3)	306 (45.7)
	No	82 (10.9)	34 (41.5)	48 (58.5)
<i>Number of TT* vaccine received</i>	No	58 (7.7)	23 (39.7)	35 (60.3)
	TT ₁	287 (38.2)	185 (64.5)	102 (35.5)
	TT ₂ +	407 (54.1)	189 (46.4)	218 (53.6)
<i>Iron folic acid received</i>	Yes	425 (56.5)	203 (47.8)	222 (52.2)
	No	327 (43.5)	194 (59.3)	133 (40.7)
<i>Referred for institutional delivery</i>	Yes	475 (63.2)	284 (59.8)	191 (40.2)
	No	277 (36.8)	113 (40.8)	164 (59.2)
<i>Expected date of delivery told</i>	Yes	462 (61.4)	228 (49.4)	234 (50.6)

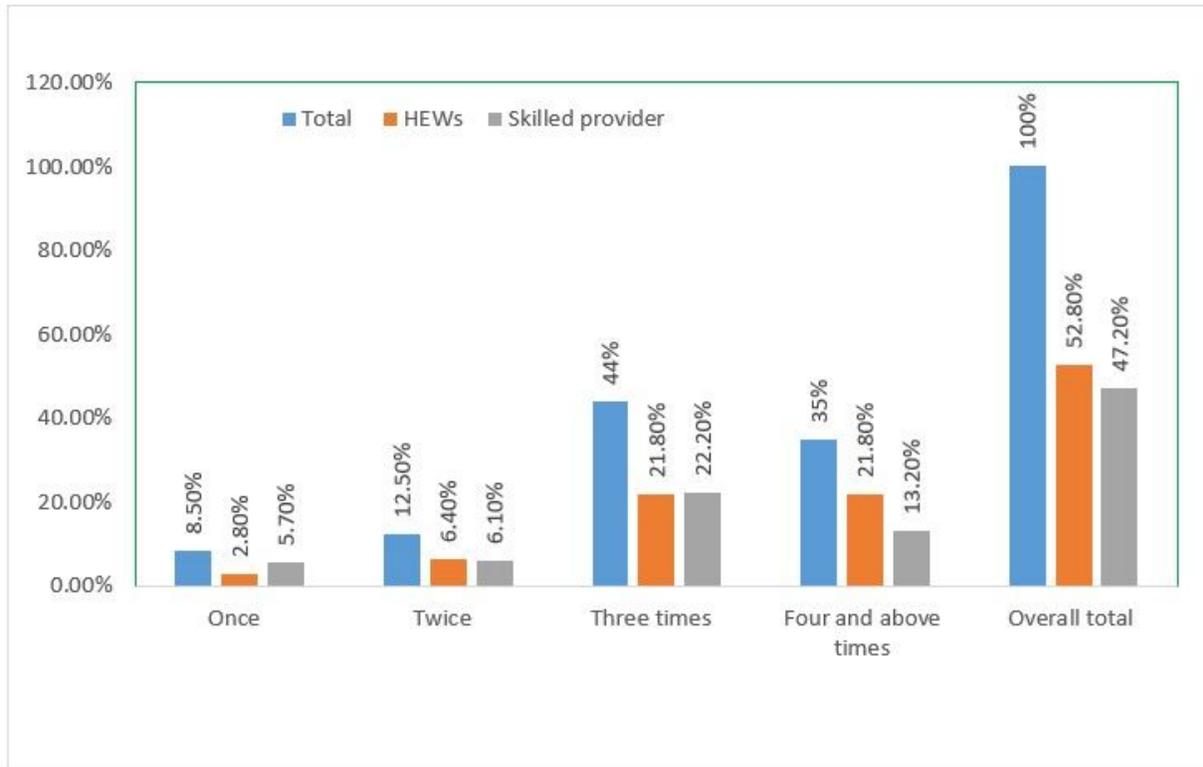
	No	290 (38.6)	169 (58.3)	121 (41.7)
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**BPCR- Birth preparedness & complication readiness, PMTCT- Prevention of mother to child transmission of HIV, STI- Sexually transmitted infection, TT-Tetanus toxoid*

Table 2. Significant level one (maternal level) variables with the corresponding effect size

Variables		Estimate	95% Confidence interval
Level 1 variables			
Age of mothers (in years)		0.0044	0.0003 - 0.0083
Maternal problems in previous pregnancy	No	1	
	Yes	0.0618	0.0111 - 0.1125
Total number of abortions		0.0135	0.0050 - 0.0217
Husband education	No formal education	1	
	Attend formal education (1-8)	0.09731	0.0470 - 0.1475
Combined model			
Pregnancy related-medical problems in previous pregnancy	No	1	
	Yes	0.0889	0.0235 - 0.1544
Husband education	No formal education	1	
	Attend formal education (1-8)	0.0751	0.0162 - 0.1344
Implementation of supportive/ facilitation strategy		0.0375	0.0218 - 0.0533

Figures



Skilled providers - Nurses, midwives and physicians

Figure 1

Percentage of frequency of antenatal care visit by providers in South Wollo Administrative Zone, Ethiopia.

Supplementary Files

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