
Predictors of Postnatal Care Supplements in Bole Sub-City Health Centers Under the COVID-19 Environment: Analysis of Service User's Perspective

Nolawit Kebede^{1,*}, Nigatu Regassa²

¹Hidase Health Center, Department of Maternal and Child Health Care Service, Addis Ababa, Ethiopia

²Center for Population Studies, College of Development Studies, Addis Ababa University, Addis Ababa, Ethiopia

Email address:

nolakebede7@yahoo.com (N. Kebede), negyon@yahoo.com (N. Regassa)

*Corresponding author

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Abstract: *Background:* Postnatal Care (PNC) visits help decrease maternal morbidity and mortality right after delivery. However, the services are severely affected during crisis time, such as the recent COVID-19 pandemic, as most health care services were suspended and shifted to combat the pandemic. *Objective:* to assess the determinants and challenges of postnatal care service utilization, specifically intake of key supplements (iron, folic acid, and antibiotics) among pregnant women attending Bole Sub City Health Centers, Addis Ababa, under the COVID-19 pandemic. *Method:* A sample size of 405 mothers with the most recent births who got the service in selected health centers in Bole Sub-City were interviewed. A Negative Binomial (NB) regression analysis was used to assess the determinants of postnatal supplement intake. *Results:* 44.9 percent of the respondents used Post Natal Care (PNC) services but only 10.6 percent of them took the postnatal supplements. For respondents in the age group 25-34, the expected mean number of postpartum intakes increased by 1.22 times (95%CI: 1.121-1.346) compared to women aged 35 and above. The mean number of postpartum intakes decreased by 38.1 percent (IRR=0.619; 95%CI: 0.548-0.700) for women who were currently living with their husbands compared to the reference category. For women who had 2-3 children, postpartum supplement intake decreased by 32.8 percent (IRR=0.672; 95%CI: 0.618-0.730). Women with primary education had lower intake (IRR=0.903, 95%CI: 0.825-0.987) than those who had college or university education. Postnatal supplement intake decreased by 25.7 percent (IRR=0.743, 95%CI: 0.678-0.814) and 22.9 percent (IRR=0.771, 95%CI: 0.706-0.841) among those with very low and low household income, respectively. Intake was higher among Orthodox Christian and Muslim women by 1.092 times (95%CI: 1.010-1.180) and 1.24 times (95%CI: 1.136-1.354), respectively when compared to followers of other religion (i.e., Catholics and Protestants). Women who were not engaged in gainful employment had significantly higher mean score of intakes (IRR=1.130; 95%CI: 1.063-1.202) compared to those working during the survey period. *Conclusion:* Given the higher likelihood of maternal morbidity and mortality during the postpartum period, the findings suggest that continued awareness creation and health education to mothers could make a significant increase in the access and uptake of both supplement intake and PNC services.

Keywords: Delivery, Postnatal Service, Iron, Folate, Supplement, Ethiopia

1. Background

The WHO defines the postnatal period as the time between an hour after the placenta is delivered and six weeks after the child is born. To ensure safe delivery for mothers and their infants, proper care, skilled birth attendants, and a sanitary

environment must be in place. According to a WHO report, approximately 295,000 women died during and after pregnancy and childbirth in 2017 [1, 2]. Most of the deaths occurred in low-resource settings which in fact could have been avoided. The main cause of death was complications such as severe bleeding, infections after childbirth, delivery complications, and high blood pressure during pregnancy [2].

Postnatal care service also serves as a medium for intake of supplements that are given after delivery. According to the WHO standards of maternal and neonatal care, Iron and Folate must be given for six months during pregnancy and should continue for three months after delivery. This is important to prevent iron deficiency during and after pregnancy [3]. In addition, antibiotics are given after simple vaginal delivery (SVD) or caesarian section to minimize infection to the mother [4].

Furthermore, WHO recommendations state that when labor is attended in a health facility via SVD, ordinary newborns must be given a minimum of 24-hour care [2]. However, if the birth takes place outside of a health facility, it's crucial that the first postnatal visit must take place within the first 24 hours of delivery. In addition, regardless of where the baby is born, at least three additional postnatal visits must be scheduled for all mothers and newborns. This visit occurs on the third day following delivery, between the first and second weeks, and six weeks after delivery. Despite these recommendations, only less than a quarter of newborns in developing countries received PNC within 48 hours of birth [1].

Many factors determine PNC service utilization and provisions. These could be socio-demographic factors, obstetric characteristics, and physical accessibility of the health care services [4-8]. Previous studies conducted on the subject showed that women's education positively impacts the use of PNC services [5, 9, 10]. Though it is not as strong as maternal education, the husband's education also reflects preferences for health-care utilization [11]. Mothers' age, household wealth status, and difficulty or complications from previous labor were reported as important determinants of PNC [12-16]. Maternal autonomy and decision-making power also influence mothers' ability to seek services, even in places where services are readily available [17, 18].

The COVID-19 pandemic has affected maternal health care services in various ways. Lockdown and movement restrictions that were in place to control the spread of the virus have acted as a barrier to service utilization [19]. The supply and delivery of sexual and reproductive health commodities have also been affected by the lockdown measures due to the low priority given to these products [20]. In addition, fear of contracting the virus has also decreased the health-seeking behavior of mothers.

Meanwhile, health care workers are facing a risk of exposure due to their direct contact with patients, inadequate supply of personal protective equipment, draining shifts, staff shortage, and scarce supplies. Maternity hospitalizations post-delivery have been shortened as little as 24 hours, limiting the opportunity for staff-supported labor recovery, breastfeeding support, education in infant care, and planning for postpartum mental health management [21].

This study aims to assess postnatal supplement utilization and provision under the COVID-19 pandemic in Bole Sub-City Health Centers, Addis Ababa.

2. Methods and Materials

2.1. Study Context

The study was conducted in Addis Ababa, the capital city of Ethiopia. With a total estimated population size of over 3 million. Addis Ababa city administration has 10 sub-cities and 117 districts called 'woredas'. There were a total of 14 hospitals, seven of them are under the Federal Ministry of Health and the remaining are under the Health Bureau of the City. Furthermore, there were 98 functional health centers and 23 are construction [22]. The study was done in selected health centers in Bole Sub City of Addis Ababa, Ethiopia. The study population was women of reproductive age group who visited the health centers for maternal and reproductive health care services during the reference period of 12 months prior to the survey date.

2.2. Data Sources

Primary data were collected through quantitative individual surveys/interviews of women respondents. Secondary data were collected from the registry of PNC in the selected health centers.

2.3. Sampling Method

As the primary focus of the study was postnatal supplements, it was important to use these indicators for the sampling purpose. As the prevalence of these indicators varies and the most current/accurate proportion of the parameters was not readily available for facility-level studies, the default 50% ($p=0.50$) was used for maximum effects. Thus, sample size was estimated using the following single population formula:

$$n = \frac{z^2 * p * (1-p)}{\delta^2}$$

Replacing the components of the formula with values, the sample size computed was:

$$n = \frac{(1.96)^2 * (0.5) * (1-0.5)}{(0.05)^2} = 384.16 \approx 385 \text{ women}$$

Adding a 5% for non-response rate, the total sample size was 404 clients from three health centers (Bulbula, Goro, and DilFrie). Then the number of respondents was divided proportionally to the health centers client load. This was done by reviewing the number of clients that the health centers had for three months. Accordingly, 179 women from Goro, 120 women from Bulbula, and 106 women from DilFrie were interviewed. The respondents were selected by lottery method using their vaccinations cards when visiting the immunization rooms to get their newborns vaccinated. Three clinical nurses and one health officer were recruited to collect the data.

2.4. Measure of Outcome and Exposure Variables

The outcome variable was postnatal supplement intake. It was measured by linearly combining three binary responses (yes/no) on intake of key supplements during the PNC visit.

For this analysis, the explanatory variables were divided into three major categories: Maternal and child factors (which includes, birth order, parity, mothers' education, age, work status, ever experiencing pregnancy termination), household factors (which include household income, religion, husbands' education and occupation, and type of family structure).

2.5. Statistical Analysis

Data processing and management were done using SPSS version 23. Simple descriptive statistics such as frequencies were employed to report the socio-demographic and service characteristics.

Both bivariable and multivariable Negative Binomial (NB) regressions were used to identify the presence of a significant association between selected independent variables and the dependent variable of interest. Those variables with $p < 0.2$ in the bivariate analysis were considered for multivariable NB regression analysis. Multi-collinearity among the potential

predictors was checked using a correlation matrix. An adjusted odds ratio for a 95% confidence interval was computed to see the strength and directions of association between independent variables and the outcome variable. All statistical tests were two-sided, and the significant association was declared at a p-value less than 0.05.

3. Result

Table 1 displays the background characteristics of the study participants. Around 65 percent of the study participants were in the age group 25-34 and 40 percent of the respondents had already given birth at least once. With regards to educational status, 46 percent of the women and 40 percent of their husbands had completed primary education. 51 percent reported living in a household size of 4-6. Most of the respondents (74%) stated that they were not working during the survey period. Close to two-thirds (63%) of the study participants were Orthodox Christians.

Table 1. Socio-demographic characteristics of the respondents, Addis Ababa Bole Sub-city health centers (n=405).

Background Variables	No.	Percentage
Age of the respondents		
15-24	113	27.9
25-34	263	64.9
35+	29	7.2
Parity		
1	160	39.5
2	138	34.1
3	63	15.6
≥4	44	10.9
Educational status of the respondents		
No formal education	64	15.8
Primary education	187	46.2
Secondary education	87	21.5
College or Higher	67	16.5
Household size		
1-3	188	46.4
4-6	206	50.9
>6	11	2.7
Work status respondents		
Not working	299	73.8
Working	106	26.2
Educational status of the husband		
No formal education	34	8.4
Primary education	161	39.8
Secondary education	117	28.9
College or University	91	22.5
Religion of the respondent		
Orthodox Christian	256	63.2
Muslim	89	22.0
Others	60	14.8

Table 2. Results of bivariable Negative Binomial regression (unadjusted) for postpartum supplement intake, Addis Ababa Bole Sub City Health centers (n=405).

Variables	p-value	IRR	95% CI	
			Lower	Upper
Age of the respondent				
15-24	0.769	0.986	0.899	1.082
25-34	0.009	1.112	1.027	1.204
35+ ^{RC}	-	1.00	-	-
Educational status of the respondent				
No formal education	0.811	0.990	0.910	1.076
Primary education	0.052	0.932	0.867	1.001
Secondary education	0.216	0.950	0.875	1.030
College or University ^{RC}	-	1.00	-	-
Living arrangements				
Currently living with husband	0.000	0.677	0.604	0.757
Currently not living with husband ^{RC}	-	1.00	-	-
Planned for pregnancy				
Yes	0.000	0.798	0.744	0.857
No ^{RC}	-	1.00	-	-
Household Income				
Very low	0.001	0.884	0.821	0.952
Low	0.041	0.923	0.855	0.997
Moderate	0.000	1.324	1.194	1.468
High ^{RC}	-	1.00	-	-
Religion of the respondent				
Orthodox Christian	0.495	1.025	0.954	1.102
Muslim	0.002	1.135	1.046	1.231
Others ^{RC}	-	1.00	-	-
Children ever born				
≤1	0.488	0.973	0.902	1.050
2-3	0.000	0.754	0.703	0.809
≥4 ^{RC}	-	1.00	-	-
Work status of the respondent				
Not Working	0.190	1.023	0.968	1.081
Working ^{RC}	-	1.00	-	-

The outcome variable had a Poisson distribution with nearly equal mean and variance. As the outcome is a count variable with a right-skewed distribution (see figure 1 below), a Negative Binomial regression was fitted.

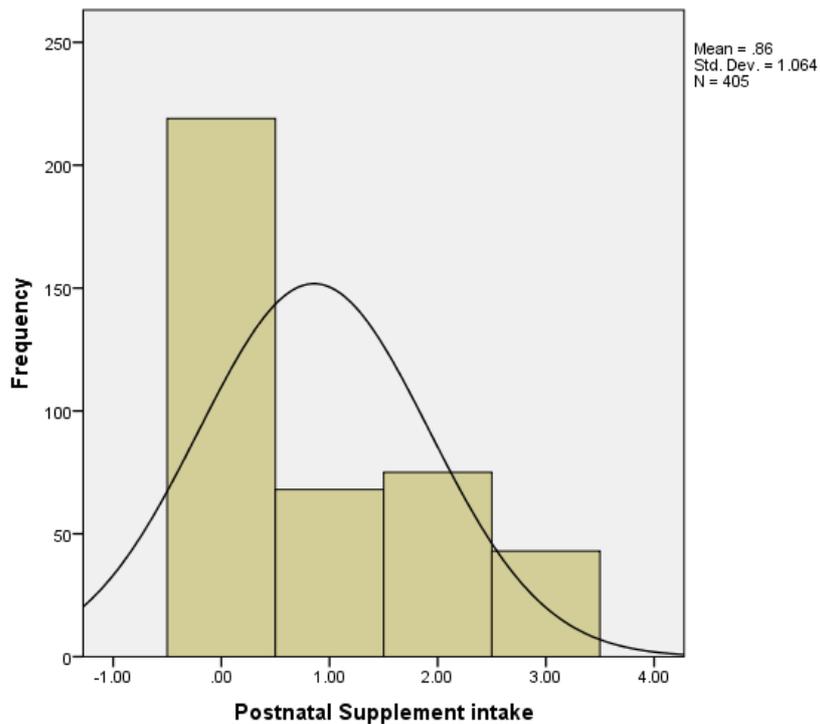


Figure 1. Histogram of Postnatal Supplement Intake.

Table 2 presents the results of bivariable negative binomial regression for postpartum supplement intake. All the potential variables checked for bivariate association had p value <0.2, and thus are good candidate for further analysis in the multivariable NB regression.

Table 3 presents the results of multivariable negative binomial regression analysis for postpartum supplement intake. For respondents in the age group 25-34, the expected mean number of intakes increased by 1.23 (95%CI: 1.121-1.346) compared to women in the age group 35 and above. The mean expected number of intakes decreased by 38.1 percent (IRR=0.619; 95%CI: 0.548-0.700) for women who were currently living with their husbands compared to women who were not currently living with their husbands. Similarly, the mean expected number of postpartum

supplement intake for women who had 2-3 children decreased by 32.8 percent (IRR=0.672; 95%CI: 0.618-0.730) compared to the reference category.

Those who claimed planned pregnancy had lower intake of postpartum supplement (IRR=0.779; 95%CI: 0.721-0.842). Women living in poor wealth status have generally lower score of taking the supplements. In terms of religion background, Christian and Muslim women had higher mean score of intakes compared to those following other religions. Compared to working mothers, those not working had 1.13 higher mean score of intakes (95%CI: 1.063-1.202). It was also found that women who had more visits had higher mean score of supplement intake (IRR=1.138; 95%CI: 1.119-1.158).

Table 3. Results of Multivariable Negative Binomial regression analysis (adjusted) for Postpartum supplement intake, Addis Ababa Bole Sub City health centers (n=405).

Variable	p-value	IRR	95% CI	
			Lower	Upper
Intercept	0.001	1.406	1.156	1.711
Age of the respondent				
15-24	0.916	0.994	0.889	1.112
25-34	0.000	1.228	1.121	1.346
35 + ^{RC}	-	1.00	-	-
Educational status of the respondent				
No formal education	0.551	0.969	0.872	1.076
Primary education	0.025	0.903	0.825	0.987
Secondary education	0.480	1.033	0.945	1.128
College or University ^{RC}	-	1.00	-	-
Living arrangement				
Currently living with husband	0.000	0.619	0.548	0.700
Currently not living with husband ^{RC}	-	1.00	-	-
Planned for pregnancy				
Yes	0.000	0.779	0.721	0.842
No ^{RC}	-	1.00	-	-
Household income				
Very low	0.000	0.743	0.678	0.814
Low	0.000	0.771	0.706	0.841
Moderate	0.000	1.257	1.127	1.403
High ^{RC}	-	1.00	-	-
Religion of the respondent				
Orthodox Christian	0.027	1.092	1.010	1.180
Muslim	0.000	1.240	1.136	1.354
Others ^{RC}	-	1.00	-	-
Children ever born				
≤1	0.231	0.944	0.860	1.037
2-3	0.000	0.672	0.618	0.730
≥4 ^{RC}	-	1.00	-	-
Work status of the respondent				
Not working	0.000	1.130	1.063	1.202
Working ^{RC}	-	1.00	-	-
Number of PNC visits	0.000	1.138	1.119	1.158
Scale	1			
Deviance/DF =1.554				

4. Discussion

The study has primarily aimed to estimate the level of postnatal care service utilization (focusing on postpartum supplement intake) before and during the COVID-19

pandemic in the selected Bole Sub City Health Centers Addis Ababa, Ethiopia. A total of 405 women were interviewed about their experience of utilization of maternal healthcare services during the pandemic.

Women who attended PNC services were 44.9%, of which only 10.6 percent of them received all three postpartum

supplements. This figure is higher compared to findings from other similar studies; 2011 EDHS (9.3%) and 2016 EDHS (17%) [23, 24]. Women who received at least two and at least one PNC supplement were 18.5 percent and 16.8 percent, respectively. About 54 percent didn't receive any of the supplements.

The results obtained from the multivariable analysis showed a range of socio-demographic and service-related factors that determined the utilization of postpartum supplements. It was found that the age of the respondent, education of the respondent, living arrangement, household income, planned pregnancy, number of PNC visits, children ever born, work status of the respondent, and religion were significantly associated with the outcome variable.

Age was found to be significantly associated with the postpartum supplements intake. Women in the age group 25-34 were more likely to utilize the service. This result is somehow inconsistent with a study done in the Hawasa Zuria district which reported that women in the age group below 25 were more likely to use the services [6]. The possible explanation for the results could be that older women probably have experience with childbirth and utilization of postpartum supplements.

Women who had primary-level education were less likely to take the supplements. Comparable studies were not found to confirm this result. But one study affirmed that literate women were more likely to use the services [25]. Another study also stated that women who had secondary and higher education influenced the utilization of the services [5, 10]. Even though literacy increases women's autonomy and boosts the confidence to make decisions on health care, the level of education also plays a role in enabling that decision.

Living arrangement was also another variable that showed an inverse association with postpartum supplement intake. Women who were currently living with their husbands were less likely to use the postpartum supplements. Similarly, a study done in Southwest Shoa, Ethiopia, reported that those women who were married or living with their husbands didn't attend the services [17]. On the contrary, a study done by Tafesse and Nigussie showed that women cohabitating with their husbands used the service more than those separated [25]. The inconsistency in the results could be due to different study times, sample size or both.

Planned/unplanned pregnancy was significantly associated with taking postpartum supplements. Women who planned to get pregnant were less likely to adhere to the services provided. This result was not consistent with other local studies [6]. A possible reason for this difference could be the data collected for this study was conducted during the pandemic. So, women who planned to give birth during this time might not visit the health centers after delivery due to the fear of contracting the virus and passing it to their newborns.

The findings show that household wealth status was strongly associated with the intake of postpartum supplements. Women with moderate household incomes were

more likely to get the supplements. This is supported by different studies which show similar results [8, 10, 14, 15]. It was also seen that women residing in poor households had decreased tendency to use the services compared to those living in higher income households. This could partly be explained by the fact that women who are financially independent can afford to pay for the supplements and transport costs when visiting the health care services.

Interestingly, religion was also another variable that influenced intake of the postpartum supplements. The results from this study showed that Orthodox Christians and Muslims had higher tendency to get the services compared to other religion followers (i.e Catholics and Protestants). This is supported by a study done in Southwest Shoa, Ethiopia [17]. The pathways through which religion influences PNC and related services may warrant further investigation.

The effects of children ever born on postpartum supplement intake was significant. Women who had 2-3 children were less likely to take the supplements. This finding contravenes with a study done by Berhan, et al. [17]. A possible reason for the difference could be the respondents might not have time to visit the health care facility since they were busy with taking care of their children and their work at the same time. In addition, since they have experience with previous birth, they might not think it is essential to visit the health care facility to get the services. On top of that, this study is done in Addis Ababa, whereas the study conducted by Berhan et al, analyzed the 2016 EDHS [8].

Another notable finding is the association between the work status of the mothers and the uptake of the postnatal supplements. Women who were not working had higher mean score of supplement intake than those who were working. In contrast to our finding, a study conducted in Ethiopia reported the reverse [13]. The reason provided was that women have the economic ability to pay for the services. Besides they are more empowered when it comes to decision-making regarding their health and may have good access to information [13].

Strengths and Limitations

This study has some strengths and limitations. The study has assessed the predictors of postnatal care service (more specifically postpartum supplement intake) during the COVID-19 pandemic. Thus, the findings might be useful for informing health planners and policy makers about the importance of PNC visits decreasing maternal morbidity and mortality. In addition, the results could be useful for geographic targeting, monitoring, and evaluation programs. This study is not free from pitfalls. First, the study design is cross-sectional, one which doesn't address the cause-and-effect relationship among the exposure and outcome variables. Therefore, care must be taken when interpreting the results. Second, there wasn't enough literature on postpartum supplements (mainly iron, folate, and an antibiotic) to compare the results with. Since the supplements were given during PNC visits, studies regarding PNC visits were used to compare the results found in this study.

5. Conclusion

Close to half of the respondents used PNC services, while only 10.6 percent of them took all the postnatal supplements. Age of the respondent, education of the respondent, living arrangement, planned pregnancy, household income, religion, children ever born, work status of the respondent, and a number of PNC visits were significantly associated with postnatal supplement intake.

The PNC visit attendance rate was 44.9 percent which is below the WHO recommended rate of 90 percent. It is, therefore, important to increase the PNC visits as most maternal deaths occur during the postpartum period. Continued awareness creation and health education to mothers could make a significant increase in the access and uptake of both supplement intake and PNC services.

List of Abbreviations

CI	Confidence Interval
CSA	Central Statistics Agency
COVID-19	Coronavirus disease 2019
EDHS	Ethiopian demographic health survey
IRR	Incidence rate ratio
PNC	Postnatal care
PPE	Personal protective equipment
SVD	Simple vaginal delivery
WHO	World health organization

Declaration

Ethics Approval and Consent to Participate

Ethical clearance was obtained from the Institution Review Board of Addis Ababa University. Verbal informed consent was obtained from respondents prior to the administration of the questionnaire.

Availability of Data and Material

NA

Competing Interest

The authors declare no competing interest.

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