Spatial distribution, magnitude and determinants of postnatal care service utilization in Farta district, South Gonder Zone, Amhara Region, Ethiopia.

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1.

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Acknowledgment

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To Farta district health office staffs and Fart district Finance Office head, Ato Atnafu, who gave me all necessary material and offered me transportations.

To all health extension workers in Farta district for valuable information they gave me.
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<table>
<thead>
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<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANC</td>
<td>Antenatal care</td>
</tr>
<tr>
<td>FMOH</td>
<td>Federal ministry of health</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic information system</td>
</tr>
<tr>
<td>GPS</td>
<td>Global positioning system</td>
</tr>
<tr>
<td>HEWs</td>
<td>Health extension workers</td>
</tr>
<tr>
<td>HH</td>
<td>Household</td>
</tr>
<tr>
<td>HSDP</td>
<td>Health Sector Development Program</td>
</tr>
<tr>
<td>MCH</td>
<td>Maternal and child health</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium development goal</td>
</tr>
<tr>
<td>MMR</td>
<td>Maternal mortality ratio</td>
</tr>
<tr>
<td>PNC</td>
<td>Postnatal care</td>
</tr>
<tr>
<td>SVD</td>
<td>Spontaneous vaginal delivery</td>
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Abstract

Introduction: In Ethiopia maternal mortality has been a major public health problem. Postnatal care services utilization was very low as whole. In this regard, hot spot areas were not clearly identified. Besides, there was variability in the determinants of PNC services utilization among districts of nation. Hence, to introduce locally adaptive measures, it was essential to study spatial pattern, prevalence and determinants of PNC service utilization at district level.

Objective: The aim of this study was to assess the spatial distribution, magnitude and determinants of postnatal care service utilization in Farta district, South Gonder Administrative Zone, Amhara Region, Ethiopia, in 2017

Methodology: Cross sectional study was carried out among 737 mothers in 11 Keble’s and multi stage sampling technique was used to select the subjects. Binary logistic regression statistical model using adjusted odd ratio (AOR) and 95% CI was used to identify determinants of PNC services utilizations. Getis-Ord Gi* statistics was used to determine hot and cold spot areas of PNC service utilization status.

Results: The spatial analysis showed that hot spot clusters of PNC services utilization were found in Kanat, Amjeya, Askuma, and Wokerotadiomender & Huletwanomagera Kebles and cold spot clusters of PNC services utilization were found in Lemdo-debrsena, Worken and Genamechwecha. The magnitude of PNC services utilization in Farta District was 26.19 % [95% CI: (22.8-29.2)] with variations in between Kebles. Having formal education of mother [95 % CI: 2.8(1.75-4.48)], birth at health facility [95% CI: 3.18 (1.73-5.85)], counseling given during ANC visits [(95 %Cl: 5.72(3.42-9.55)], complications during or after delivery [95%CI: 2.78(1.20-6.52)] and living with in 5km of health facility [95 % CI: 2(1.29-3.10)]were identified as determinants of PNC services utilization.

Conclusion and Recommendation: Spatial distribution of PNC services utilization was not randomly distributed. Having formal education, counseling during ANC and facility delivery were positively associated whereas having no complications during or after delivery and residing far from health facility were negatively associated with PNC services utilization. Tracing mechanism for reaching pregnant women should be developed and strengthend to improve counseling services at home. Frequent support and supervision for remote Kebles.

Key word: Postnatal care, utilization, distribution, Farta district, Amhara Region
1. Introduction

1.1 Statement of the problem

The days and weeks following childbirth are critical period for the lives of women and new born. Most mothers and new born deaths occurs during the first months after birth. In 2013, 2.8 million children were died in the first months of life of which 1 million were died in the first days of life globally(1). In Africa, half of all postnatal maternal deaths occurs during the first 24 hours after delivery. Hemorrhage was being the leading immediate cause which accounted 34%. Sub-saharan Africa had the highest neonatal and maternal mortality in the first week after delivery. Each year, at least 1.16 million babies dies in the first four week.(1, 2).

In Ethiopia, postnatal care was planned as priority intervention in the Health Sector Development Program (HSDP) so as to increase the coverage to 78% by 2014 (3). Yet, the level of postnatal care coverage was extremely low in Ethiopia; Among women who had got PNC care services, 5% percent of women received postnatal care within 3 to 41 days(4). Maternal mortality ratio was 667 per 100,000 live birth 2013/2014 while the excepted MMR was below 267 per 100,000 live birth by 2015. This figure might even higher in rural settings. This was much attributed to poor postnatal care service at community level(5). If routine PNC care service had been offered, 10% to 27% of new born deaths could have been avoided. In other words, high PNC coverage could save up to 310,000 newborn lives a year in Africa (2).

The fourth Health Sector Development Program (HSDP-V) promotes safer pregnancy through providing free MCH services, improving access and infrastructures of health services and enhancing training to primary health workers(6). The health sector in Ethiopia is organized into a three-tier system. The first tier is the Primary Health care system which includes a primary hospital, which serves 60,000–100,000 people, health centers, serving 15,000– 25,000 people each and Keble-level health posts, which serve 3,000–5,000 people. The second level consists of General hospitals which serves 1–1.5 million people. In the third tier, there are specialized hospitals serving a patient population of 3.5–5 million (5, 6). FMOH of Ethiopia instituted health care financing
reform (HCFR) which consists of exemption maternal and child health services so as to decrease the health cost of mothers and families (5).

The low access to emergency obstetric care services in rural Ethiopia showed that maternal mortality was unlikely to significantly decline (7). Despite the prior attention given to MCH service to the rural communities, the achievements so far were not satisfactory. Knowing the spatial distribution of PNC service utilization will help to know where priority problem areas were found so as to introduce locally adaptive measures or intervention. The determinants for PNC service utilization needed to be known at each corner of the district because they could vary from place to place. To this, I have not seen any study which showed the spatial patterns in PNC service utilization at district level in Ethiopia. Indeed, this study by far identified spatial patterns, prevalence and determinants of PNC service utilization in Farta district.
1.2 Literature Review

1.2.1 Spatial distribution of PNC services utilization

A report of mini DHS Ethiopia showed that there was variation in PNC services utilization across the region of Ethiopia. Addis Ababa, Tigray and Dire Dawa regions had the highest PNC services coverage whereas Amhara, Oromia, Afar, Benshangulguzm the least PNC services utilization (4).

1.2.2 Magnitude of postnatal care service utilizations

Postnatal care service utilization was very low in many developing countries. A study conducted in Nepal showed that PNC service utilization within two days was 40.9 % (8). A secondary data analysis of Rwandan and Tanzanian demographic health survey stated that only 12.8% and 8.6% of women got at least one PNC service respectively regardless of where the services have been obtained (9, 10). A secondary analysis of Ethiopian DHS stated that less than 10% of women got at least one PNC service (11). Studies conducted in Hosanna, Ethiopia and Deberamkose Ethiopia, Abune Ginderbert, Ethiopia showed that PNC services utilization within 24 hours after delivery were 24.1%, 33.5% and 31.7% respectively (12-14).

1.2.3 Determinants of PNC services utilization

1.2.3.1 Socio demographic and economic factors

Postnatal care is essential in maintaining and promoting the health of the woman and the newborn baby, while providing an opportunity for health professionals to identify, monitor and manage health conditions that may develop in the mother and new-born during the postnatal period.

PNC service utilization varies by sociodemographic characteristics of the partners especially the women. A secondary analysis of 2010 DHS data of Rwanda showed that younger women than older women who did use PNC services (9). Another two similar studies conducted in Nepal both of which revealed that age of the mother was significantly associated with postnatal care service utilization (8, 15).
Educating women’s means empower them to decide on behalf of themselves in their health. A secondary data analysis from DHS2011 of Ethiopia and a across sectional study on effect of women’s autonomy on maternal health service utilization in Nepal both of which outlined that likelihood to use PNC service was significantly higher among educated women (11, 15). Those findings showed educational status of the women has big influence on PNC service utilization. Two other studies conducted in West Shea, Ethiopia and Acela, Ethiopia explained that educational status of women was not significantly associated with PNC services utilizations (14, 16). Those findings were found contradicting and showed that educational achievement is not universal predictor which contributes to weather mothers will or will not utilizes PNC services.

Prim-gravid fears pregnancy complications so that they could visit health facility more frequently than women with higher parity. A study in Nigeria reveled that mothers with high parity (5 and above) were statistically significantly more likely not to use postnatal care than women with low parity (less than 2)(17).

As economic status of the women gets better, the tendency to access the health service will get better. Studies in Madhya Pradesh state of India and a secondary data analysis of Ethiopian DHS 2011 both of them outlined that women from the richest households had significantly higher likelihood of using postnatal care than women from the poorest households (11, 18). Contrary to this, a study in Kenya explained that wealth index of the household was found not significant predictors of PNC service utilizations (19). From those findings it is possible to underline that wealth index of household alone was not a predictor women’s tendency of PNC service utilizations.

As number of children in the house increases, the burden of caring for children will maximizes which intern have effect on her health service seeking behavior of the mother. A study on determinants of PNC services utilization in Kenya promoted that the number of children the mother have were found not significantly associated with PNC services(19). In the other corner, a study in Bangladesh showed that as the number of children increased, it was significantly less likely for women to visit PNC services(20).
1.2.3.2 Antenatal care service utilization

Previous MCH service utilization creates an opportunity for mothers to have awareness on benefits of maternity services there by enabling her to uptake maternity services. Studies done in Acela district, Ethiopia and in West Shea, Ethiopia emphasized that women who had ANC service were significantly more likely to utilize PNC service than who did not attend ANC services (12, 14). This was further supported by a study in Tanzania where mothers who attended ANC services more frequently were significantly more likely to use PNC services than women who attended fewer ANC services (21). Indeed, previous ANC visits are very important gateways for future MCH services utilization in women as far as good counseling are provided at facility or community level.

1.2.3.3 Place of delivery, outcome and mode of delivery

Mothers who gave birth outside health care facility had significantly lower tendency of utilizing postnatal care service than women who delivered at health facility and outcome of delivery was found statistically significantly very important as far as PNC service utilization of women was concerned(17). A study in Dembecha district, West Gojjam Zone, Ethiopia showed that Women who delivered at health facility had statistically significantly chance of getting PNC service than women who gave birth at home (22). Cross sectional studies on determinants of PNC service uptake in Zimbabwe and Nigeria both of which stated that women who delivered outside health facility had significantly a lesser chance of utilizing PNC service than women who delivered in health facility (23, 24). Another similar study in Debremarkose town, Ethiopia reveled mothers who gave birth at health institution were significantly more likely to get PNC service than those who gave birth at home. This study also further explained that mothers who gave birth alive baby were statistically significantly more likely to get PNC service than women who had still birth (13).

If women experienced complication during or after deliver, the tendency of getting PNC service will be higher than women without complication. A cross-sectional study in in the West Bank, Palestine demonstrated that women who delivered with instrumental deliver or caesarian section had significantly higher likelihood to utilize PNC services than
women who had spontaneous vaginal delivery (25). A study in Nigeria mentioned that women who had complications after delivery had got PNC service than women without complications(18)

1.2.3.4 Distance to health facility
Distance from health facility is an important factors for maternity service utilization in women especially in low resource settings where transportation infrastructures are undeveloped. A study in Sylhet, Bangladesh stated that distance from health facility was significantly negatively associated with PNC service utilization(20). A study in Kampala, Uganda reveled that there was significant association between distance from the hospital and attendance of PNC services (26). Another quantitative and qualitative study in Zimbabwe on PNC service utilization showed that mothers who resided far from 5kms from the nearest health center had statistically significantly reduced likely hood of PNC uptake as compared to mothers who resides with in 5kms (27). A qualitative in depth study in Southern rural Tanzanian about reasons in delay in PNC service uptake promoted that distance from health facilities significantly impeded mothers from service uptake (10). Evidence from analysis of the 2011 Ethiopian Demographic and Health Survey stated that physical proximity to health facilities was significantly more important factor to PNC service uptake and resulted in variability PNC service coverage(4).Far and above all, distance matters in rural set up like Fart districts for mothers in PNC services utilizations
Figure 1 Conceptual framework for the determinants of PNC service utilizations
(Source: Adopted from different literatures)
1.3 Justification of the Study

Postnatal period is a critical period for the lives of the mother as well as the new born. This because most maternal and new born deaths occurs after delivery of the baby. Hence, postnatal care at place of delivery for the mothers and new born is critical

In Ethiopia, mortality has not been significantly decreased and PNC service utilization was by far very low. There was variability in utilization of PNC services and the main focus area of previous studies were the urban community

Despite the fact that there have been government and nongovernmental initiatives which have been working on maternal health, the outcomes of those programs were not contributing much as to maternal health was concerned. In order to effectively address those problems, it is very important to scientifically identify geographic patterns of PNC service utilization, assess prevalence and factors contributing to low PNC service utilization with particular emphasis to the rural communities where the problem was more pronounced.

To my knowledge spatial studies in Ethiopia have been the new emerging science in identifying public health problem areas and its contributions in Epidemiology were crystal clear. To the best interest of those justifications, this paper was the first and will contributes much by exploring spatial patterns of PNC service utilization, determining prevalence and assessing factors associated with PNC service utilization in Farta districts.
2. Objectives

2.1 General Objective

✓ Was to assess the spatial distribution, magnitude and determinants of postnatal care service utilization among women who give birth in the last one year in Farta district, south Gonder zone, Amhara Region, Ethiopia, in 2017

2.2 Specific objectives

✓ Was to explore the spatial pattern of postnatal care service utilizations status
✓ Was to determine the magnitude of postnatal care service utilizations
✓ Was to identify determinants of postnatal care service utilization
3. Methods

3.1 Study design

✓ Quantitative community based cross sectional study was conducted.

3.2 Study Area and Period

The study was conducted in Farta districts, in South Gonder Administrative Zone, in Amhara Region from February to June 2017. Farta district is one of highly populated districts in South Gonder Administrative Zone with a total population of 276,144 in 2007 E.C. The district is found surrounding Debertabor town which is capital of South Gonder Administrative Zone. Farta district has 43 Keble’s and the expected number of women who had given birth were 29,308 by 2015/16. There are 9 Health centers and 43 health posts. The study was conducted from March to April 2017.
Figure 2 Study Area (Clipped from Ethiopian woreda)
3.3 Source Population
All women from 15 to 49 years of age who gave birth in the last one year in Farta districts

3.4 Study population
Women from 15 to 49 years of age who gave birth in the last one year in selected Kebles

3.4.1 Inclusion criteria and Exclusion criteria

3.4.1.1 Inclusion criteria
- All women of reproductive age group (15-49 years) who gave birth one year prior to this study and who was randomly selected

3.4.1.2 Exclusion criteria
- Women who was not permanent resident in the study area (who lived in the area for > 6 months).

3.5. Sample Size and Sampling procedure
The study design was a community-based cross sectional study. Multistage sampling technique was used for this study. There are 43 Keble's in the Woreda. In the first stage eleven neighboring Keble's were selected purposefully. The reason behind this to maintain continuity in the geographic location of selected Keble and to assure representativeness of sampled Kebles (approximately 26% of whole Kebles) and by taking in to account feasibility. The continuity of study Kebles was essential input for the analysis of spatial patterns(28).

In the second stage, the registration books in Health posts which contain list of women who gave birth was served as a sampling frame to identify the required sample size. Then samples were selected using systematic random sampling technique. The sample was allocated non-proportional for each selected Keble's so that it will be easy to see
spatial pattern. If the selected woman was not available at home, the next woman in list was visited. For households with more than one selected woman, interview was done for only for one of the mother. The sample size was calculated using a prevalence of 31.7% of rural women who were used postnatal care service based on a similar study done in Abuna Gindeberet District, in West Shewa, Oromiya Region(14). Thus with 95 % confidence level, and marginal of error 5%, 10% non-response rate and a design effect of 2, the sample size was calculated using a single population proportion formula as follows:-

\[
n = \frac{(Z\alpha/2)2 P(1 - P)}{e^2}
\]

\[
n = \frac{(1.96)^2 \times 0.317(1 - 0.317)}{(0.05)^2}
\]

\[n = 332\]

Then the final sample size will be:-

\[
n = [332 + (332\times0.1)] \times 2
\]

\[n = 737\]

Where n= sample size
e= marginal error
p= proportion of women who used PNC
Z\alpha/2=Confidence level:

3.5.1 Sample size for factors

The sample size estimation for the second objective was calculated based on a community-based cross-sectional study conducted in Abuna Gindeberet District, West Shewa, Oromiya Region, Central Ethiopia district in March, 2013. After exhaustive calculation and comparison with other variables and by considering the following statistical assumptions, we calculated the sample size total by taking in to account design affect and contingency (10%).
Table 1. Sample size for determinants of PNC service utilisations

<table>
<thead>
<tr>
<th>Variables from previous study</th>
<th>PNC service utilization</th>
<th>P-Value</th>
<th>Assumptions</th>
<th>Proportion</th>
<th>Sample size</th>
<th>AOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Family</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not model family*</td>
<td>139</td>
<td>421</td>
<td>&lt; 0.005</td>
<td>95% CI</td>
<td>P1=0.24</td>
<td>147</td>
</tr>
<tr>
<td>Model family</td>
<td>84</td>
<td>59</td>
<td></td>
<td>95% CI</td>
<td>P2=0.58</td>
<td></td>
</tr>
<tr>
<td>Household distance from health institutions</td>
<td></td>
<td></td>
<td></td>
<td>power =80%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–5 km</td>
<td>172</td>
<td>289</td>
<td>&lt;0.003</td>
<td>P2=0.373</td>
<td>542</td>
<td>2.32</td>
</tr>
<tr>
<td>&gt;5 km*</td>
<td>51</td>
<td>191</td>
<td>&lt;0.003</td>
<td>P1=0.211</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you used ANC</td>
<td></td>
<td></td>
<td></td>
<td>95% CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>210</td>
<td>369</td>
<td>&lt;0.003</td>
<td>P2=0.36</td>
<td>179</td>
<td>4.956</td>
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<tr>
<td>No*</td>
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<td>111</td>
<td></td>
<td>P1=0.10</td>
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<td></td>
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<tr>
<td>Institutional delivery for recent baby</td>
<td></td>
<td></td>
<td></td>
<td>95% CI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>60</td>
<td>41</td>
<td>&lt;0.003</td>
<td>P1=0.59</td>
<td>159</td>
<td>1.853</td>
</tr>
<tr>
<td>No *</td>
<td>163</td>
<td>439</td>
<td></td>
<td>P2=0.27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N.B. The sample size for the second objective was less than the first objective so that the sample size of the first objective was chosen

Therefore, the final sample size for this study was 737.
Figure 3. Sampling procedure
3.6 Study variables

3.6.1 Dependent variable
- Postnatal care service utilization status (Yes/No)

3.6.2 Independent variables
- Socioeconomic variables
  - Employment status of the mother
  - Women education
  - Husband education
  - Family monthly Income.
- Demographic Variables
  - Age
  - Parity
  - Number of children alive.
  - Last child alive/dead
- Characteristics of Birth
  - Place of delivery
  - Birth outcome
  - Mode of delivery
  - Problems after during or after delivery (like retained placenta, bleeding))
- ANC visits
  - Number of visit
  - Counseling given on PNC.
- Distance from health facility

3.7 Operational definitions

- **Utilized PNC service**: It refers that the mother should have at least one subsequent postnatal visit in addition to her first contact. If the women gave birth at health facility, there should be another contact after discharge. If the women gave birth at home, there should be another contact from HEWs or from health facility. In
both cases the second contact could be either at health facility or at home. Ascertainment of PNC service visit was checked in the community folder at Health Post registration or in the PNC registration book for PNC

- **Household income**: was the total amount of money earned per month. In rural community, it was measured by calculating the money the household earned through selling cash crops and other source of income in year divided by 12 months
- **Counseling**: If the mother mentioned at least 3 benefits of PNC, she got counseling otherwise not

### 3.8 Data Collection and Data quality

#### 3.8.1 Data Collection

Data was collected by data collectors from mothers by interviewing using structured questionnaire at their actual residence after identifying all eligible mothers from HEWs record at health post. In addition, geographic data was collected with GPS for each household. Before starting the interview, the assigned data collector read the consent form for the women. Finally, if she was volunteer to participate in the study, the interview commenced. For the data collection, two data collectors for each Keble were used. Data collectors were trained on how to use GPS and have been living with community for long time

#### 3.8.2 Data quality

Data quality assurance will be maintained with the under taking of the following:

- The questionnaire was prepared in English language and then translated in to Amharic language and then back to English by language expert to check consistency.
- Pre tested structured questionnaires were used.
- Training have been given for data collectors and supervisor on the data collection tool and procedures.
Data completeness was checked daily by the supervisor and principal investigator.

### 3.9 Data processing and Analysis

EPINFO 7 was used for data editing and entry while Microsoft Excel 2010 was used for data cleaning and preparation. Analysis was done using ArcGIS version 10.2 and Stata12. Locations of the respondents were taken using Geographic positioning system (GPS). Data in EPINFO 7 was exported to Microsoft Excel 2010 for cleaning. Then the data was imported to ArcGis10.2 software and State 12. Projection have been performed on the data using Projected Coordinate System; Adindan Universal TransMercator (UTM) Zone 37. Using the shape file of the woreda as base map, Getis-Ord Gi* statistic was applied on data after checking for the presence of clustering with spatial autocorrelation test. The spatial autocorrelation test signifies whether there is clustering or dispersion of geographical features but it does not tell where this pattern happened. It was after this test that we go further and identify places where the clustering occurred. The value of Morans Index is standardized into Z score. If Morans Index is positive with positive Z score (>1.96, p-value< 0.05), it indicates clustering of geographical features. If the Morans Index is negative with Z score negative (<-1.96, p-value <0.05), it indicates dispersion of geographical features. If Morans Index is zero then it means the geographic features are distributed randomly. Morans Index value ranges from -1(Dispersion) to +1(clustering). Incremental autocorrelation test applied to determine the band width or the critical distance at which clustering of geographic features was maximized. Getis-Ord Gi* statistics determines whether the local pattern (features and neighbor) is statistically significantly different from global pattern and works by looking each feature within the context of neighboring features. The input field for analysis was PNC utilizers or non-utilizers which were coded as 1 and 0 respectively. Then the local sum for a feature and its neighbors were compared proportionally to the sum of all features. When the local sum was very different from the expected local sum, and that difference was too large to be the result of random chance, a statistically significant z-score results. For statistically significant positive z-scores, the larger the z-score was, the more intense the clustering of high values (hot
spot) and for statistically significant negative z-scores, the smaller the z-score was, the more intense the clustering of low values (cold spot). By doing that we mapped pattern of PNC service utilization at 95% Confidence level. Using Getis-Ord Gi* statistics, a positive Z score > 1.96(P< 0.05) were considered as hot spots cluster and a negative Z score Z < 1.96 with (P< 0.05) were considered as cold spot clusters.

Binary logistic regression model was applied and we analyzed each independent variable with simple logistic regression (bivariate analysis) and covariates whose p-value less than 0.2 were entered to multiple logistic regression model for final analysis. Results were summarized and organized by tables and graphs. Frequencies and percentage of different variables with respect to PNC service utilization status were calculated. The association between the dependent and independent variables was evaluated by using adjusted odds ratio with 95% CI. Covariates having p-value less than 0.05 have been considered as significantly associated with outcome variable and AOR was used to measure strength of association.

3.10 Ethical considerations

Before data collection ethical clearance will be obtained from the Institutional Review Board of the University of Gondar, Institute of Public Health. Official permission letters were obtained from Farta district Health Office. Only those who gave verbal informed consent were involved in the study. Questionnaire were administered anonymously at respondent home. Confidentiality of information were obtained from the study participant and assured by all data collectors and the principal investigators.
4. Results

4.1 Demographic and Socio-economic characteristics of the respondents

A total of 737 of mothers were participated in the study. The mean age of the respondents was 26.7(SD 5.6±). The majority of them were in age group 25 to 34. More than half of the respondents were unable to read and write. Less than 1% of them were employed and 99.19% were housewives. Three hundred sixty five (49.53%) had 1 to 3 children. The mean monthly income of the household were 963.6364 ETB (Min 400 ETB, Max 6000 ETB)

Table 2 sociodemographic characteristics of respondents

<table>
<thead>
<tr>
<th>Sociodemographic Characteristics</th>
<th>Frequency</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age of respondents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-24</td>
<td>312</td>
<td>42.33</td>
</tr>
<tr>
<td>25-34</td>
<td>353</td>
<td>47.90</td>
</tr>
<tr>
<td>35+</td>
<td>72</td>
<td>9.77</td>
</tr>
<tr>
<td><strong>Number of children in the HH</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>132</td>
<td>17.91</td>
</tr>
<tr>
<td>1-3</td>
<td>365</td>
<td>49.53</td>
</tr>
<tr>
<td>4+</td>
<td>240</td>
<td>32.56</td>
</tr>
<tr>
<td><strong>Monthly Household income</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;= 500Birr</td>
<td>64</td>
<td>8.68</td>
</tr>
<tr>
<td>500-1500Birr</td>
<td>644</td>
<td>87.38</td>
</tr>
<tr>
<td>1500-2500Birr</td>
<td>20</td>
<td>2.71</td>
</tr>
<tr>
<td>&gt;= 2500Birr</td>
<td>9</td>
<td>1.22</td>
</tr>
<tr>
<td><strong>Educational status of respondents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to read &amp; write</td>
<td>479</td>
<td>64.99</td>
</tr>
<tr>
<td>Primary education</td>
<td>185</td>
<td>25.10</td>
</tr>
<tr>
<td>Junior secondary school</td>
<td>56</td>
<td>7.6</td>
</tr>
<tr>
<td>Secondary education</td>
<td>11</td>
<td>1.69</td>
</tr>
<tr>
<td>College diploma &amp; above</td>
<td>6</td>
<td>0.81</td>
</tr>
<tr>
<td><strong>Educational status of the husband</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unable to read &amp; write</td>
<td>542</td>
<td>73.54</td>
</tr>
<tr>
<td>Primary education</td>
<td>121</td>
<td>16.42</td>
</tr>
<tr>
<td>Junior secondary school</td>
<td>47</td>
<td>6.38</td>
</tr>
<tr>
<td>Secondary education</td>
<td>18</td>
<td>2.44</td>
</tr>
<tr>
<td>College diploma &amp; above</td>
<td>9</td>
<td>1.22</td>
</tr>
<tr>
<td><strong>Occupations of the respondents</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.2 Reproductive Health characteristics of the respondents

Six hundred seventy six (91.72%) had attended at least one ANC visits and of those 444 (60.24%) had four and above ANC visits for the recent baby. Four hundred eighty six (65.94%) had delivered at health facility and two hundred fifty one (34.06%) gave birth at home. 50(6.78%) of them had complications during or immediately after delivery for their recent baby. Four hundred twenty five (57.67%) had got counseling during their recent ANC visit.

4.3 Spatial distribution of PNC Services Utilization

The overall magnitude of PNC services utilization in Farta District was 26.19 % (95% CI: 22.8-29.2). There were variations among Kebles. Kanat 38(56.72%), Amejya (44.78%), Huletwanomagera (37.31%) with relatively higher prevalence. The Lowest magnitude was found Indergefarta (7.46%), Lemado—debresina (10.45%), Genamechawecha (16.42%), Werken (17.91%), Burroteraroch (22.39%) and Wukirotedomender (22.39%). The incremental autocorrelation tests showed that 5km was critical distance at which clustering was maximized. And, the spatial autocorrelation test showed that Morans index was equals to 0.06(P< 0.01, Z score =13.49) and there was clustering. Based on the p-value and the Z score in the output feature class at 95% CI, Getis-Ord Gi* statistics identified that statistically significant hot spot clusters were found in Kanat, Amejya, Askuma, and Wokerotadiomender & Huletwanomagera Kebles and statistically significant cold spot clusters were found in Lemado-debresena, Worken and Genamechawecha.

<table>
<thead>
<tr>
<th>House wife</th>
<th>731</th>
<th>99.19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government Employee</td>
<td>6</td>
<td>0.81</td>
</tr>
</tbody>
</table>
Figure 4 Incremental Autocorrelation showing the critical distance at which clustering was maximized.
Figure 5 Spatial distribution of PNC services utilization
Figure 6 Hot and cold spot clusters of PNC services utilization
4.4 Utilizations of PNC Services

The magnitude of PNC services utilization was 26.19% (95% CI: 22.8-29.2). Among those respondents who had 1 to 3 ANC visits, only 15.65% used PNC services. Among 444 (60.24%) of the respondents who have got 4 and above ANC visits, 157 (35.36%) used PNC services for their last pregnancy. Regarding place of delivery, 176 (36.21%) of those who delivered at health facility but only 17 (6.77%) of whom delivered at home were used PNC services.

Table 2: Utilization of PNC by reproductive characteristics of women

<table>
<thead>
<tr>
<th>Variables</th>
<th>PNC Utilized</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO</td>
</tr>
<tr>
<td>Frequency of ANC Visits</td>
<td></td>
</tr>
<tr>
<td>No ANC Visit</td>
<td>61(100%)</td>
</tr>
<tr>
<td>1-3 Visits</td>
<td>196(84.35%)</td>
</tr>
<tr>
<td>4+ Visit</td>
<td>287(64.64%)</td>
</tr>
<tr>
<td>Counseling in ANC</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>290(92.95%)</td>
</tr>
<tr>
<td>Yes</td>
<td>254(59.76%)</td>
</tr>
<tr>
<td>Place of Delivery</td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>234(93.23%)</td>
</tr>
<tr>
<td>Health Facility</td>
<td>310(63.79%)</td>
</tr>
<tr>
<td>Complications during after delivery</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>521(75.84%)</td>
</tr>
<tr>
<td>Yes</td>
<td>23(46%)</td>
</tr>
<tr>
<td>Distance to HF</td>
<td></td>
</tr>
<tr>
<td>&lt;=5km</td>
<td>287(67.37%)</td>
</tr>
<tr>
<td>&gt;5km</td>
<td>257(82.64%)</td>
</tr>
<tr>
<td>Grand Total</td>
<td>544(73.82%)</td>
</tr>
</tbody>
</table>

Table 3: Utilization of PNC by reproductive characteristics of women
I and my baby were not sick (46.69%), I felt not important (45.96%), Lack of awareness (7.17%) and financial problem (0.18%) were the reasons given for not attending PNC service.

![Figure 7 Reasons for not using PNC services](image)
Concerning place of delivery, 86(51.5%) of those who delivered at government hospital, 90(28.21%) of those delivered at health center and 17(6.77%) of those who delivered at home were used PNC services.

Figure 8 PNC services utilization by place of delivery
Women who had used PNC services had attended at least one ANC visits. 157 (81.35%) of women who used PNC services attended 4 ANC visits.

Figure 9 PNC services utilization by frequency of ANC visits
4.5 Factors associated with PNC services utilization

Eleven variables were included and statistically significant in bi-varite analysis. But after adjusting all variables in Multivariable analysis, educational status of women, place of delivery, distance from health facility, complications during or after delivery, counseling during ANC visits were found statistically significantly associated with PNC services utilization.

The odd of using PNC services were 2.8 times higher [95 % CI: 2.8(1.75- 4.48)] among mothers who had formal education than mothers who had no formal education. Mothers who lived within 5kms from health facility were 2 times [95 % CI: 2(1.29-3.10)] more likely to use PNC services than mothers who resides far from 5km.

Mothers who had counseling during ANC visits were 5.72 times [95 % CI: 5.72(3.42- 9.55)] more likely to use PNC than mothers who hadn’t been counseled. Mothers who delivered at health facility were 3.18 times [95% CI: 3.18(1.73-5.85)] more likely to use PNC services than those who delivered at home. Those who had complications during or after delivery were 2.78 times (95%CI: 2.78(1.20-6.52)) more likely to use PNC services than mothers who didn’t have complication.
<table>
<thead>
<tr>
<th>Variables</th>
<th>PNC Utilization</th>
<th>COR 95% CI</th>
<th>AOR 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Distance to HF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than or equal to 5km</td>
<td>287</td>
<td>139</td>
<td>2.31(1.61-3.29)</td>
</tr>
<tr>
<td>Greater than 5km</td>
<td>257</td>
<td>54</td>
<td></td>
</tr>
<tr>
<td>Frequency of ANC visits</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;4 times</td>
<td>257</td>
<td>36</td>
<td>1</td>
</tr>
<tr>
<td>&gt;= 4 times</td>
<td>287</td>
<td>157</td>
<td>3.91(2.62-5.82)</td>
</tr>
<tr>
<td>Place of delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Facility</td>
<td>310</td>
<td>176</td>
<td>7.82(4.62-13.22)</td>
</tr>
<tr>
<td>Home</td>
<td>234</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Number of children in HH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 4</td>
<td>348</td>
<td>149</td>
<td>1.907(1.31-2.786)</td>
</tr>
<tr>
<td>&gt;= 4</td>
<td>196</td>
<td>44</td>
<td>1</td>
</tr>
<tr>
<td>Educational status of respondents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Formal Education</td>
<td>400</td>
<td>79</td>
<td>1</td>
</tr>
<tr>
<td>Formal Education</td>
<td>144</td>
<td>114</td>
<td>4.0(2.84-5.66)</td>
</tr>
<tr>
<td>Educational status of the Husband</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Formal Education</td>
<td>428</td>
<td>114</td>
<td>1</td>
</tr>
<tr>
<td>Formal Education</td>
<td>116</td>
<td>79</td>
<td>2.56(1.80-3.64)</td>
</tr>
<tr>
<td>Occupation of respondents</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Employed</td>
<td>542</td>
<td>188</td>
<td>1</td>
</tr>
<tr>
<td>Employed</td>
<td>2</td>
<td>5</td>
<td>7.21(1.39-37.46)</td>
</tr>
<tr>
<td>Complications During Delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>No Complications</td>
<td>521</td>
<td>166</td>
<td>1</td>
</tr>
<tr>
<td>Complications</td>
<td>23</td>
<td>27</td>
<td>7.88(3.83-16.23)</td>
</tr>
<tr>
<td>HH monthly income</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;= 1500Birr</td>
<td>529</td>
<td>179</td>
<td>1</td>
</tr>
<tr>
<td>&gt;1500Birr</td>
<td>15</td>
<td>14</td>
<td>2.76(1.31-5.83)</td>
</tr>
<tr>
<td>Counseling given in ANC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>290</td>
<td>22</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>254</td>
<td>171</td>
<td>8.87(5.52-14.27)</td>
</tr>
<tr>
<td>Mode of delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SVD</td>
<td>521</td>
<td>166</td>
<td>1</td>
</tr>
<tr>
<td>Assisted delivery</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instrumental or C/S</td>
<td>23</td>
<td>27</td>
<td>5.16(2.32-11.47)</td>
</tr>
<tr>
<td>Note: 1 = Reference</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>* =p&lt;0.05</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. Discussion

One of the key finding of this study was the spatial distribution of PNC services utilization which was found not randomly distributed. Statistically significant hot spots were found in Kanat Amjeya, Askuma, and Wokerotadiomender & Huletwanomagera. The justification for this could be those Kebles are situated near the Zonal Town with health facility in nearby accompanied by frequent supervision and support from health officers and HEWs. In addition those Kebles were declared as model Kebles in the district. The cold spot clusters were found in Lemdo-debersena, Genamechawecha, and Worken. This might because those areas are situated far from the main road and have no means of transportation with infrequent follow up and support from stakeholders.

Regarding the magnitude, PNC coverage in Farta District was 26.19%. The finding of this study is low as compared to the study done in Dembacha district, Ethiopia (34.8%) and Abuna Gindeberet district, Ethiopia (31.7%)(14, 22). This difference may be because those studies included residents in urban setting (main towns of the district) which makes the magnitude bigger and the sample size was also small as compared to this study. On the other hand, the finding of this study is higher as compared to the secondary analysis of EDHS 2011 (2%) (11). This difference is explained by the fact that government efforts on reduction of maternal death have been strengthened and there is a time difference. Different reason given for not having PNC and among those reasons the most frequent one was (46.69%) I and my baby were not sick.

The study also showed that mothers who had formal education were 2.8 times (95% CI: 2.8(1.75-4.48)) more likely to use PNC services than mother who had no education. Education makes mothers understand benefits of PNC and promotes health care seeking behavior. But educational status of the husband was found not statistically significantly associated with PNC services utilization. This shows that mother education that plays vital role in PNC services utilizations than the husband’s. The result is consistent with studies in Dembecha in Ethiopia, secondary analysis of EDHS analysis, Kenya, Nigeria (11, 19, 22, 24)

Concerning ANC, ANC visits was not statistically associated with PNC services utilization which is contradicting to the study Hossina Ethiopia, Kenya, India, and
Ethiopia (12, 18, 19). Absence of association between ANC visits and PNC service use which was observed in this study might be due to there was strong motivation among mothers towards ANC services utilization than PNC. From this finding it is clear that counseling is vital besides frequent ANC visits for the women to use PNC services.

Regarding counseling, mothers who got counseling were 5.72 times (95% CI: 5.72(3.42-9.55)) more likely to use PNC services than women who did not get counseling. Mothers who got counseling about importance PNC services and dangers in postnatal period will understand the benefit and utilize PNC. This in line with a studies in Addis and Abi-Adi town in Ethiopia, and in Nepal (29-31).

Place of delivery was found one of the strongest predictors of PNC services utilizations. Mothers who delivered at health facility were 3.18 times more likely to use PNC services than mothers who gave birth at home. This is due to the fact that women who give birth at health facility might get counseling. Moreover, attending ANC services as recommended might increase women understanding of the dangers associated during or after delivery as far as good counseling was offered. This will ultimately increases the chance of PNC services uptake. This result is supported by a studies in Zimbabwe and in Debermarkose and Asela town in Ethiopia (13, 16, 27).

This study showed that mothers who had complication during or after delivery were more likely to utilize PNC services than mothers who did not [95% CI: 2.78(1.20-6.52)]. This is attributed to health problem which mother and their baby have. Mother with complication during or after delivery might get more attention by health personals. On the other hand, those who have no complication may feel as if no more danger will come to them afterwards and they will get less emphasis and thus will not come back to the health facility. This finding agrees with study in Pal stain, Tanzania, and Debermarkose, Ethiopia (13, 25, 32).

In line with the objectives of the study, distance from the health facility was found strongly associated with PNC services utilizations. Mother who resides with in 5km of health center or hospital were 2 times more likely to use PNC services than mother who found far from 5km. This is because mothers who is living far from the health facility are
feeling tired of getting there. In addition there might be infrequent support and supervision from stakeholders. This shows geographic proximity plays a vital role in accessing maternity services. This is in line with the study done in Zimbabwe and in Abuna-Ginderberet, Ethiopia (14, 27).
6. Strength and Limitation of the study

6.1 Strength

1. The spatial analysis gave a clear picture of problem area and makes easy to understand where the problems were more pronounced.
2. High response rate

6.2 Limitation

1. Unable to find studies on spatial distribution of PNC services utilization in literature review hence there was difficulty for comparison
2. Not supported with qualitative study
7. Conclusion

- The distribution of PNC services was not randomly distributed i.e. there was clustering.
- Magnitude of PNC services utilizations was low.
- PNC services utilization was low compared with ANC use and facility delivery.
- Facility delivery, having formal education of women and counseling given during ANC visits were positively associated with PNC services utilizations
- Having no complication during or after delivery and living far from health facility were negatively associated with PNC services utilization
8. Recommendations

1. To Minster of Health and Amhara Regional Health Burro
   - Placing a system to trace women who is pregnant so as to enhance uptake of counseling at home.
   - Sustainable in service training on PNC services for HEWs and other health personnel's to improve their knowledge and skill

2. To Woreda Health Office
   - Frequent support and supervision should be strengthen especially for those living in the remote areas of the district.

3. To researchers
   - Survey should be conducted across the district for further detail analysis of the health facility factors associated with PNC services utilizations.
9. Reference Lists


10. Annexes

Annexes 1 Survey questionnaires’ Information sheet

You are invited to participate in a research study to be conducted by MPH student at University of Gondar, Collage of Medicine and Health Science, Institute of Public health. Please read the following statements and ask any unclear points before you agree to participate.

1. Topic: spatial distribution, magnitude and determinates of Postnatal care service utilization in Farta district, South Gonder Administrative Zone.

2. Objective of the study: The main objective the study is to assess spatial patterns of PNC services utilizations as well as to determine the prevalence and predictors of PNC service utilization in district. Your truth full answers for all of our questions about PNC service utilization will be very important to know all the above mentioned issues. Based on the information what you will give, the result of this study will help all concerned bodies to develop strategies that addresses specific problem areas and prevent maternal and child morbidity and mortalities with in the district.

3. Participant procedure and guideline

✓ On this questionnaire your name will not be written and your response will be kept completely confidential.

✓ Your participation is fully voluntary. You are free not to participate totally or stop at any point of time or to choose not to answer any particular answer/s. Your withdrawal from the study will not have any impact up on you. But I greatly appreciate your truthful and honest participation. Responding to the survey questionnaire will take about 20 minutes.

4. Benefits and risks of participating in this study

✓ Benefit: A study participant will not have incentive for their participation but you will get appropriate maternal and child health services based on recommendations to be forwarded to concerned bodies in the future.

✓ Risks: The participant may spend extra time to respond the questionnaire.
5. You have a right to raise any question about this research project.

If you have any question you can direct to any of the following:

✓ Institutional Research Board of University of Gondar, College of medicine and health science, Institute of public health.

✓ Mr. Tadesse Awoke (MSC, MPH, Associate professor), University of Gondar, Instructor at Institute of public health Epidemiology and Biostatistics Department.
   - Email: tawoke7@gmail.com  Tel: 0910173308

✓ Mrs. Abraham (MPH), University of Gondar, Institute of public health, Instructor at Health Informatics department.
   - E-mail: Abreshyene@gmail.com  Tel: 0920781075

✓ Wondimu Girma (BSC), University of Gondar, Institute of public health, MPH/HI student.
   - E-mail: mengistugirma2008@gmail.com, Tel: 0924519897

Thank You!
Hello my name is _______________________. I am currently a member of data collectors for Wondimu Girma who is a graduating student in UOG, College of Medicine and Health Science. The research will assess distributions, magnitude and determinant factors associated with postnatal care service utilizations in Farta district. Participants should be volunteer to participate in this study. The study does not cause any harm. I would like to assure you about the confidentiality of your information. The information will be used only for this research and you have full right to reject, to participate or to interrupt the interview at any time.

The information that you will give us is very important to meet the objective of the study, for interventions formulation for the district.

If you have any question you can direct to any of the following:

✓ Institutional Research Board of University of Gondar, College of medicine and health science, Institute of public health.

✓ M.r. Taddesse Awoke (MSc, MPH, Associate profess or), University of Gondar, Institute of public health Instructor at Epidemiology and Biostatistics Department.
  • Email:tawoke7@gmail.com, Tel: 0910173308

✓ Mrs. Abraham (MPH), University of Gondar, Institute of public health, Instructor at Health Informatics department.
  • E-mail: Abreshyene@gmail.com, Tel: 0920781075

✓ Wondimu Girma (BSC), University of Gondar, Institute of public health, MPH/HI student.
  • E-mail: mengistugirma2008@gmail.com, Tel: 0924519897.

Are you willing now to participate in the study?

Tick one. Agree_____ Do not agree ______Signature_____________

Thank you.
### Annexes 3 Survey Questionnaires’ English version

Part I- Socio- demographic characteristics of respondents

<table>
<thead>
<tr>
<th>No</th>
<th>Questions</th>
<th>Response categories</th>
<th>Skip</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>What was your age during your last pregnancy?</td>
<td>(in years)__________</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>What is your current age?</td>
<td>(in years)__________</td>
<td></td>
</tr>
</tbody>
</table>
| 103| Educational status of mother                                              | 1= Unable to read and write  
2= Primary education (1-6th)  
3= Junior Secondary education (7th-8th)  
4= High school education (9th-12th)  
5= College education (Diploma and above) |      |
| 104| What is your current occupation?                                          | 1= No job/Unemployed  
2= Self employed  
3= Private employee  
4= Government employee  
5= House wife  
6=Student  
7= Others |      |
| 105| Husbands education                                                        | 1= unable to read and write  
2= Primary education (1-6th)  
3= Junior Secondary education (7th-8th)  
4= High school education (9th-12th)  
5= college education |      |
| 106| Husbands Occupation                                                       | 1= No job  
2= Self employed  
3= Private employee  
4= Government employee  
5= = Others |      |
| 107| What is your average monthly Income?                                      | 1..<500 ETB  
2. 501-1500 ETB  
3. 1501-2500 ETB  
4.>2501ETB |      |
## Part II: Reproductive Health related information of respondents

<table>
<thead>
<tr>
<th>Question</th>
<th>Description</th>
<th>Options</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Number of pregnancy</td>
<td>(write it)____</td>
<td></td>
</tr>
<tr>
<td>202</td>
<td>Number of live births</td>
<td>(write it)____</td>
<td></td>
</tr>
<tr>
<td>203</td>
<td>How many children do you have currently?</td>
<td>(write)____</td>
<td></td>
</tr>
<tr>
<td>204</td>
<td>Have you attended antenatal care during pregnancy of the last child?</td>
<td>1= Yes 2= No</td>
<td>IF No to Q204 Skip to Q207</td>
</tr>
<tr>
<td></td>
<td>How much antenatal care checkup you did in the pregnancy of last child?</td>
<td>1= One 2= Two 3= Three 4= Four and above</td>
<td></td>
</tr>
<tr>
<td>206</td>
<td>What health education were you given during your last antenatal visit about PNC?</td>
<td>1. Danger sign of baby and mothers 2. Family planning services 3. Importance of breastfeeding 4. Importance of immunization 5. Personal hygiene 5. Not given</td>
<td></td>
</tr>
<tr>
<td>207</td>
<td>Where have you delivered your last child?</td>
<td>1= At home 2= At health center 3= At Health Post 4= At hospital 5= At private clinic</td>
<td></td>
</tr>
<tr>
<td>208</td>
<td>What was the mode delivery</td>
<td>1. Normal spontaneous delivery 2. Instrumental delivery 3. Ceserian section 3. Other(specify)</td>
<td></td>
</tr>
<tr>
<td>209</td>
<td>Was there a problem during or after delivery of last child</td>
<td>1. yes 2. NO</td>
<td>If yes Q 209, Skip to 301</td>
</tr>
<tr>
<td>302</td>
<td>Was last child alive/dead?</td>
<td>1. died 2. Alive</td>
<td>If alive skip to Q304</td>
</tr>
<tr>
<td></td>
<td>If died, at what age?</td>
<td>-----------(specify)</td>
<td></td>
</tr>
<tr>
<td>304</td>
<td>Have you ever had a postnatal service for your last child?</td>
<td>1. Yes 2. No</td>
<td>If No to Q304 Skip to 308</td>
</tr>
</tbody>
</table>
| 305 | If the answer of question 213 is Yes, mention the time. | 1. Within the 1st 24hrs before discharged  
2. 24 - 48 hours after birth before discharged  
3. 24-72 hours (3 days) after discharge for the subsequent visit  
4. After one week to 42 days of delivery for the subsequent visit |
| 306 | Have you attended the subsequent postnatal visit during your last child? | 1. Yes  
2. No |
| 307 | How many times you had the subsequent postnatal visit excluding your 1st contact? | 0. Not attended  
1. One time only  
2. Twice  
3. Three times  
4. Four time and above |
| 308 | What services were you offered during your last postnatal visit | 1. Family planning  
2. Physical examination  
3. BP check  
4. Urine examination  
5. Baby growth monitoring  
6. Others (specify)__________________ |
| 309 | What were the reasons for not attending the subsequent postnatal care visit? | 1. I did not to see any need to attend  
2. I and my child felt well  
3. Shortage of money  
4. Lack of awareness  
5. Culturally there is belief that until 40 days of delivery women should not go away from their house  
6. Others (specify)__________________ |
| 401 | How much hours or minutes does it takes you to reach the health facility | Mention_______ |
| 402 | Distance from health facility | 1. <1km  
2. 1-2km  
3. 3-5km  
4. >5km |
Annexes 2 survey questionnaires Amharic version

የአማርኛ ቭጅ መጥይቆች

አድራሻ
በማንኛውም ጀምራ የተጨማሪ በማስቀወት የጥናት በዉስጥ ከላሬ የሚከተሉት የጥናት ዶድኑ ከብላት የጥናት
ደዉለዉ የማነጋገር የችላሉ፡፡

1. ከተታደሰ ከወወ ያስፋ ያለወ በጎንደር የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የድህረ የምረቃ የሳይንስ ዕለት የሚምህር፡፡
   እ.
   እ. በtawoke7@gmail.com የሚባል: +251- 09 11017308

2. ከአብረሀም ጊዜነህ ያስፋ ያለወ በጎንደር የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር፡=: እ.
   እ. በAbreshyene@gmail.com የሚባል: 0920781075

3. ከወንድሙ ጊርማ ያስፋ ያለወ በጎንደር የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር፡=: እ.
   እ. በmengistugirma2008@gmail.com የሚባል: 09 24519897

ከፍል: 1 ወምሳት ከሂ ከማህበራዊ ከኢኮኖሚዊ የሚዳስሱ የሚታከርሇ የሚለው

| እ.
   እ. | ወምሳት | እ.
   እ. |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>የእንኔ ከጎንደር የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር?</td>
<td>____ ይመለከት</td>
</tr>
<tr>
<td>102</td>
<td>የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር?</td>
<td>____ ይመለከት</td>
</tr>
</tbody>
</table>
| 103  | የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር? | 1. ከእንኔ የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር
   2. ከእንኔ የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር
   3. ከእንኔ የእንኔ የህክምና የሳይንስ ዕለት በማ/ሰብ የሚምህር
   4. ከእንኔ የእንኔ የህክምና የሳይንስ ዕለት በማ/ሰብ የሚምህር
   5. የእንኔ የእንኔ የህክምናና የሳይንስ ዕለት በማ/ሰብ የሚምህር
| 104  | የእንኔ የህክምና የሳይንስ ዕለት በማ/ሰብ የሚምህር? | 1. የእንኔ የእንኔ የህክምና የሳይንስ ዕለት በማ/ሰብ የሚምህር
   2. የእንኔ የእንኔ የህክምና የሳይንስ ዕለት በማ/ሰብ የሚምህር
   3. የእንኔ የእንኔ የህክምና የሳይንስ ዕለት በማ/ሰብ የሚምህር
   4. የእንኔ የእንኔ የህክምና የሳይንስ ዕለት በማ/ሰብ የሚምህር

48
| 105 | ይለንትና ዝምትና ዝወንድ | 5. የቤት ከመሰብ
የልል ከልጅጆ
_____________
1. ከስትምሬም
2. ከስትምሬም
3. ውስጥሬም ተትምህት ዝዳቋ
4. ከስትምሬም ተትምህት ዝዳቋ
5. የክልል ተትምህርት

| 106 | ይለንትና እረመ ዝምትና | 1. ይግራታ እም
2. ይግራታ እም
3. ይግራታ እም
4. ውስጥሬም ተትምህርት
የልል ከልጅጆ
_____________

| 107 | ይለንትና የድርጅት ወር ዓር የላል ዝም ዝና ዝር ደረሳ? | 1. ከ500 ከር ዝተ-
2. ከ501-1500 ከር
3. 1501-2500 ከር
4. 2501 ከር ዝተ-


<table>
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<th>ው.ቁ</th>
<th>ወስንፈርት</th>
<th>ከአራት ወስንፈርት</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>ከስትምሬም እረመ ከጌ ቋለ ኮረከም?</td>
<td>---------------ጉለት</td>
</tr>
<tr>
<td>202</td>
<td>ከስትምሬም ወስንፈርት?</td>
<td>---------------ጉለት</td>
</tr>
<tr>
<td>203</td>
<td>ከስትምሬም እረመ?</td>
<td>---------------ጉለት</td>
</tr>
</tbody>
</table>
| 204   | የስትምሬም እረመና ዝም ዝና ዝር ደረሳ? | 1. እም
2. እልፋርም
3. እልፋርም
4. እልፋርም እስከ ዝስ

| 205 | የስትምሬም እረመና ዝም ዝና ዝር ደረሳ? | 1. ከስትምሬም
2. ከስትምሬም
3. ከስትምሬም
4. ከስትምሬም እስከ ዝስ

| 206 | የስትምሬም እረመና ዝም ዝና ዝር ደረሳ? | 1. የወስት እየ እርጆዎ ዝና ዝር ደረሳ}
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<th>价格</th>
<th>数量</th>
<th>总价</th>
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<td>3</td>
<td>¥360</td>
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<tr>
<td>B</td>
<td>产品B</td>
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<td>5</td>
<td>¥400</td>
</tr>
<tr>
<td>C</td>
<td>产品C</td>
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<td>2</td>
<td>¥300</td>
</tr>
<tr>
<td>D</td>
<td>产品D</td>
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<td>4</td>
<td>¥280</td>
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总计：¥1,300
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<th>Page</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1. እወመ ብወልደች ከ1 ሳምንት ያለጠ በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>2</td>
<td>2. እንደር በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>3</td>
<td>3. እንደር በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>4</td>
<td>4. እንደር በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>5</td>
<td>5. እንደር በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>6</td>
<td>6. እንደር በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>305</td>
<td>በስር ከወልደች ከ1 ሳምንት ያለጠ በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>306</td>
<td>በስር ከወልደች ከ1 ሳምንት ያለጠ በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>307</td>
<td>በሆኔ (ከቤት)</td>
</tr>
<tr>
<td>308</td>
<td>በሆኔ (ከቤት)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>309</td>
<td>ወደ ወታ ወራ ወርዐ እርቅ ወት ወራ ወርዐ እስከ ይስል ያለው እርቅ</td>
</tr>
</tbody>
</table>
| 401 | ከስት ወራ ወርዐ እስት ወራ ወርዐ እስከ ይስል ያለው እርቃት | 1. <1h. ይጋ  
2. 1-2h. ይጋ  
3. 3-5h. ይጋ  
4. > 5h. ይጋ |
Annexes 3 Declaration

I, the undersigned declared that this is my original work for requirement for degree of masters of public health in health informatics

Student’s Name: Wondimu Girma (Public Health Officer.) Signature _____________

Place: Institute of public health, College of Medicine and Health Sciences, University of Gondar, Ethiopia

Approval of advisors

Advisor’s Name: Signature

1) Mr. Taddese Awoke (MSC, MPH, Associate professor.) _________________

2) Mr. Abraham Yenhun (MPH). _________________