

Women in Tigray, Ethiopia Who Attended the Recommended Number of Prenatal Visits were More Likely to Deliver in Health Institutions

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Abstract

Background

Saving the lives of mothers and newborns requires prompt access to appropriate health services. Ethiopia is committed to improving access to maternity care by expanding the number of health facilities and health workers. However, institutional delivery is not yet universal, even when the service is free and available within a reasonable geographic distance.

Objective

To identify factors associated with institutional delivery service utilization in Adigrat town, Tigray Regional State, Ethiopia.

Methods

We conducted a community based cross-sectional study using mixed quantitative and qualitative approaches. Employing cluster sampling, we collected quantitative data through interviewer-administered questionnaires from 767 mothers from Adigrat town who gave birth within 2 years of the study. Bivariate and multivariate logistic regressions were used to identify factors associated with institutional delivery. We also collected qualitative data with two focus group discussions, which were thematically analyzed. Ethical approval was granted by the Institutional Review Board of Mekelle University, and informed consent was obtained from each participant.

Results

In our sample, 81% (621) of mothers reported that their last deliveries were conducted at health institutions. Of the 682 women who received antenatal care services in their last pregnancy, 85% (580) had all 4 recommended antenatal care (ANC) visits. In multivariate analyses, institutional delivery was significantly higher among mothers who had 4 or more ANC visits (AOR= 1.99; 95%CI:1.09, 3.63) than those with fewer visits. In addition, the odds of institutional delivery were higher among mothers who conceived for first time at the age of 20-34 years than those who conceived as teenagers. The qualitative findings suggested that the increased utilization of health institutions for delivery was due to efforts made by health extension workers. However mothers who delivered at health institutions expressed concern about how they were treated by care providers and the facilities' hygienic conditions.

Conclusions

Strengthening the antenatal care services and improving the quality of delivery services can potentially help achieve universal institutional delivery in Ethiopia.

Keywords: Institutional delivery; Antenatal care; Health extension workers; Home delivery; professionals' approach; Ethiopia

Background

Women need care from skilled health professionals during childbirth (1) as complications may not be predictable (2,3) and most deaths (75%) occur during delivery or shortly after (4,5). In countries where health professionals attend more than 80% of deliveries, maternal mortality rates are below 200 per 100,000 live births (6). In many developing countries, however, the majority of births occur at home without the help of a skilled assistant (7-9) and are associated with adverse maternal outcomes (10,11).

Among the reasons for low utilization of birthing institutions are distance, availability of transportation and its costs, service costs and other individual related factors (12). Mothers with primary and higher education are more likely to deliver at a health facility, along with younger mothers and higher socio-economic status (SES) women compared to uneducated, older, and low SES, respectively. Shortages of staff, equipment and supplies

are common barrier to service provision (13), which is also true in Ethiopia. Ethiopia's recently documented achievements in increasing usage of health facilities for delivery could be through the interventions focusing on increasing health access such as the Health Extension Program (HEP). The HEP was initiated in 2003 with the intention to provide equitable access to primary/basic services for everyone with a special focus on maternal and child health (14).

Other than distance and cost, perceived factors that have been identified as barriers to institutional delivery include negative attitudes of health professionals, lack of privacy (15,16), and unwillingness of professionals to communicate with mothers during delivery (17). In an institution with a high number of prenatal visitors, re-visit for institutional delivery services was unacceptably low (15,18) though it differed with the number of prenatal visits (12). Perceived quality of care was an independent predictor of place of delivery. Women who perceived the quality of care to be high had a significantly higher probability of delivering at a health facility than those who perceived it to be low (17).

Ethiopia, with a high maternal mortality ratio (estimates range from 353 to 676/100,000 live births) (19–22), is trying to reach 100% coverage of skilled delivery. It is becoming evident that service utilization in Ethiopia, though it is not universal, is improving. Studies indicate that relatively higher proportion of mothers gave birth to their current child in health institutions for example 82% in the capital Addis Ababa (19), 78.8% in Bahridar (23) and even in towns ranging from 47% to 62% (17,23–27). According to the HSDP-IV report, 60.7% of births at national level and 60% of births in Tigray Region were attended by skilled providers in 2015 (21).

Despite the gains in accessibility of maternity care in Ethiopia, service utilization is not universal, even where distance and service cost are no longer barriers. The goal of this study was to identify factors associated with utilization of institutional delivery services in Adigrat town, Tigray, the northernmost part of Ethiopia's nine regions, in order to identify areas where service quality can be improved and to design intervention to increase skill attended deliveries and improve maternal health.

Methods

This study was conducted in April 2011 in Adigrat Town, in the eastern zone of Tigray region. It is located 120 kilometers north of Mekelle, the capital city of Tigray Regional State. The town is divided into 6 administrative kebelles (localities), each of which further sub-divided into 3-6 ketenas (sub-localities). According to the 2009/10 census, the total population was estimated to be 57,572. It has one governmental hospital, one health center, and eight private clinics. In each kebele, two urban health extension workers (HEWs) are assigned to implement the health extension program. Under each health extension worker, there are volunteers from the community called women's development armies. This approach simplifies the identification of a pregnant mother in a kebele, the provision of advice at the household level, and the provision of referrals to health institutions.

We conducted a community-based cross-sectional study using both quantitative and qualitative approaches. Study subjects were women who gave birth within 2 years of the survey for the quantitative. For the qualitative, two focus group discussions (FGDs) of eight participants each were made with mothers who gave birth with 2 years of the survey.

Sample size was computed using the standard formula for population proportion with the assumption: proportion (P) = 52% of education as a factor for institutional delivery taken from EDHS 2005, desired precision of 0.05 with CI of 95% and design effect of 2. Based on the above assumptions the desired sample size was 767. A cluster-sampling technique was used in selecting study units. From the six kebelles (localities) of Adigrat town, two were selected randomly using a lottery method, namely Kebele 01 (4 ketenas) and 03 (5 ketenas). The ketenas were considered as clusters, which were then, selected using lottery methods. Eligible mothers within the households of the selected ketenas (clusters) were included in the study.

Structured closed and open-ended questionnaires were used to generate data on socio-economic characteristics, obstetric profiles and other factors affecting institutional deliveries. At the beginning, question items were pre-tested on subjects with similar characteristics outside the study area to determine feasibility. Data were collected using face-to-face interviewer administered questionnaires. Nursing students and professional nurses, who were fluent in the local language, were trained for data collection. Investigators gave training for both data collectors and supervisors. Training was given on principles of data collection and on the specific challenges of how to administer the questionnaire. Upon completion of the training the data collectors and supervisors re-demonstrated how to fill out the questionnaire.

The questionnaire responses were coded and checked for its completeness and then entered into SPSS. Descriptive analysis was done using tables, figures, frequencies, percentages and mean. Furthermore, inferential statistics, bi-variate, and multi-variate analysis were performed to examine the relationship between dependent and independent variables. Odds ratios (crude and adjusted) were calculated to estimate the probability of utilization of institutional delivery using binary logistic regression. All statistical associations were considered to be significant at $P < 0.05$. All statistical analyses were performed employing SPSS version-20.

For the qualitative study, mothers for FGD study were selected from the area where the quantitative study was conducted. Places for the FGDs were selected in consultation with participants, a household known to the majority, and having adequate and comfortable sits. Each focus group discussion had taken about 75 minutes. Principal and co-investigators took down notes and tape recorded the focused group discussions. The information acquired through the qualitative method were transcribed and then translated. Through repeated readings, the data was analysed according to the thematic areas.

Ethical approval for the study was acquired from the Institutional Review Board of Mekelle University. Additionally, permission was obtained from Eastern Zonal Administration and Zonal Health Bureau. Informed consent was obtained verbally from each study participant after they had been informed of the purpose of the study, its risks and benefits, as well as the rights to anonymity, confidentiality and to discontinue their participation at any time. At the end of the consent form, there are two check boxes, one for acceptance and the second for decline for the request to participate in the study. The committee approved the verbal mode of informed consent at proposal stage, as it is preferred in our context.

Results

Out of 767 mothers who participated in the study, 88.7% (680) were aged between 20-34 years and almost all were Tigray by ethnicity. Eighty percent of the participants (614) were literate while the rest had not attended school. Out of the literate, 20.5% were college or university graduates. Regarding family income, 72% earned two US Dollars per day or less (Table 1).

Majority of the study participants (461; 61%) were para 3-5 mothers, while 682 (88.9%) had ANC follow up for their last pregnancy (Table 2). Among mothers who visited institutions for ANC follow up for their last pregnancy, 659 (96.6%) reported that they got advice on institutional delivery during prenatal visits and the remaining did not receive advice or did not remember. Almost all respondents (734; 97.6%) were aware of the importance of institutional delivery and 66% (494) of them mentioned either health professionals or health extension workers as a source of information.

The majority of the mothers (621; 81%) reported that the place of delivery for their last baby was a health institution (Table 2), and almost all of them (736; 96%) preferred for institutional delivery (Table 3). About 3% mentioned home delivery as their first preference and 1% of mothers reported that it was the same to give birth at home or health institutions. Out of 146 mothers who gave birth at home, 80% were attended by traditional birth attendants or family members, and two gave birth without any assistance. Among the reasons given for home deliveries was uncomplicated labour.

Twenty-eight mothers (3.7%) were not satisfied with the delivery service they received at health institutions. Of those, 21 (75%) mentioned the health professionals' approach as cause of dissatisfaction followed by low ability of the workers and unhygienic conditions.

Institutional delivery utilization among women aged 20-34 years in their first conception were two times that of women under age 20 (Table 4). Utilization of institutional delivery was significantly associated with family income. The odds of utilizing institutional delivery increased with increases in family income, except for highest income category (Table 4). Women with four or more prenatal visits were more likely to deliver at health institutions (AOR 1.99; 95% CI:1.09, 3.63) than women with fewer visits (Table 4).

In the qualitative study, all mothers agreed on a noticeable marked difference in institutional delivery service utilization. Among the reasons mentioned for the increased in service utilization were increases in level of education, free health services, and increased awareness on importance of institutional delivery. Health extension workers were cited as main source of information, and participants also mentioned things that need improvement such as companionship and cleanliness of bedding (linen and blanket) and mattresses. The importance of escorting by family members during labour and delivery was mentioned because accompanying family members play a vital role in physical support, and in relieving pain and stress. However, sometimes family was prohibited from accompanying a woman in labour to the delivery room.

Participants described maternity wards as "unhygienic" and reported fear of acquiring infections from blood or body fluids. Regarding health professionals' approach, women reported that they were sometimes unfriendly and practices were worse among newly employed professionals and those who had little experience.

Among the perceived undesirable practices were ignoring requests, and teasing or laughing while mothers were in labour pain. One participant explained that while she was in active labour and verge of delivering, she was ignored and told to remain in the same position for she was in early stage of labour.

Reasons for home delivery like tolerable labour process, unknown expected date of delivery, fear of higher incidental costs, and challenges in transportation were also mentioned. In addition, participants believed "*Saint Marry is found everywhere, so regardless of the place, a labouring mother is safe even at home.*" Some women reported that they felt at ease and comfortable at home, and care for older children is uninterrupted.

Discussion

The main finding of this study was that a high proportion (81%) of mothers in Adigrat town reported using health facilities to birth their last child. Attending the optimal number of prenatal visits and maternal age (20-34 years) at first conception were both significantly associated with utilization of institutional delivery. Urban health extension workers contributed highly to mother's practice of seeking maternity care. However, the undesired health professionals' approach and the dirty bedding in the health facilities were mothers' main concerns when utilizing the services.

In this study, mothers reported that prenatal care utilization for their last pregnancy was 88.9% which is consistent with that of others (15,23,27,28) but it is much higher when compared to national and other studies (18,29,30). The difference could be because the present study was conducted entirely among urban dwellers who tend to have better health care access. Among the prenatal care users in our study, 98.1% reported that they were advised on the importance of institutional delivery during their visits and this is in line with the finding of Abeje (98.3%) conducted in Bahridar in the Amhara region of Ethiopia (23). In our study, the percentage of reported institutional delivery (81%) was similar to findings of studies conducted in Addis Ababa and Bahridar (19,23). However it is much higher than most other studies conducted in Ethiopia which range from 12.3% in Munisa woreda (29), 18.2% in Dodota Woreda (15), and 40.6% in the Kilte-Awlaelo Demographic and Health Surveillance Site in Tigray (18) to 61% in Holeta Woreda (31). This finding (81%) was higher than findings of other comparable towns like Woldia (48.3%) (26) and Goba (47%) (27). The likely explanation for this is that Health Extension Program (HEP) was pioneered in the Tigray region where our study was conducted. Thus, the health extension workers (HEWs) in Tigray have longer experience and their contribution to maternal health services has been immense (32). Furthermore, Tigray region has effectively organized additional female volunteers from the community (known as "women's development group") which complement the HEW's efforts. The achievements in the area of maternal health in Tigray are summarized in Melaku's longitudinal study, for instance the increase in institutional delivery from 14.3% in 2010 to 40.6% in 2012 (18).

In this study, women aged 20-34 years of age at their first conception were more likely to go to health facilities for delivery than their younger counterparts. A possible reason for the difference in utilization among age groups could be maturity or other factors such as literacy or level of education. Furthermore, women with family income of 1-4 USD per day were more likely to utilize health institutions for delivery than mothers with the lowest family income (less than one USD). However, the behaviors of women with the highest income (more than 5 USD per day) did not significantly affect their usage of health institutions for delivery. This could possibly be explained by the fact that wealthiest mothers have access to private vehicles and other safety measures to counteract labour complications and hence they choose to deliver at home. In addition, it can be explained by a threshold phenomenon, where in the highest family income, there is no additional increase seen in facility-based delivery.

In this study, almost all mothers preferred health facility to home for delivery which is a higher finding than other studies conducted in the Tigray and Amhara regions in Ethiopia and in Kenya (32-34). Almost all the mothers in this study (96.3%) reported that they were satisfied with the service they got, which was similar to the study done in Cote d'Ivoire (35) but higher than the finding of Tayelign (62%) conducted in Amhara region (32). Such differences could be attributed to the strategies used by the region. The involvement of local community in health services evaluation process, which is a common and consistent practice in the region, could possibly explain the higher client satisfaction rates. In our study, only 28 mothers (3.7%) were not satisfied with the delivery services they received; among whom 75% of them mentioned the health professionals' approach as cause of dissatisfaction. The approach of professionals was also reported as determinant of satisfaction in a study in Tanzania (13) and in Ethiopia's Amhara Region (32).

We found associations between place of delivery and number of prenatal visits, age of mothers at first conception and level of family incomes. Similar results were found in Agha's study (36). In our study, attending ANC was associated with utilization of institutions for delivery, which is consistent with a study conducted in Damascus (37). However, level of education in our study had no significant effect on utilization of institutional delivery services which contradicts the findings of others (18,23,26,30,38). This difference could be due to the awareness created by HEWs who conduct regular house-to-house visits or due to the near 100% utilization of pre-natal services among our study population.

Regarding mothers' perception of delivery care services, the practices they mentioned as undesirable were ignoring their demand, teasing and laughing while the mother was in pain, and not allowing them to have companionship during labor and delivery. These findings are consistent with that of Gebrehiwot's finding conducted in Tigray (39). The degree of undesirable practices varied with level of professionals' experience. The practices were higher among young fresh employees. Unhygienic conditions (couch and beddings) were reported as the main concern in utilizing the delivery services which is consistent with Melese's research findings conducted in Bahirdar Ethiopia (40).

Conclusions

In this study, we found a high proportion of women reported that they had utilized institutions for birthing in Adigrat Town. Family income, and attending the recommended number of prenatal visits (four and above) were found to be associated with increased utilization of institutional delivery. Health extension workers were reported as contributors in increasing skilled delivery utilization by identifying pregnant mothers in the community encouraging them and referring them to health institutions for their deliveries. However, mothers reported that they were concerned about certain issues like unprofessional and undesired behaviors of health professionals and unhygienic bedding. Considering the aforementioned findings, service-rendering health institutions should strive to attract mothers to utilize their services with a clean and welcoming environment in addition to encouraging them to attend the recommended prenatal visits.

Ethics approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Mekelle University. Verbal consent was obtained from each study participant.

Consent for publication

Not applicable.

Availability of data and materials

Our data is not available for ethical reasons.

Abbreviations

ANC: ante natal care, AOR: adjusted odds ratio, CI: confidence interval, COR: crude odds ratio, ID: institutional delivery, HEWs: health extension workers, HEP: health extension program, HSDP: health sector development program, FGD: focus group discussion.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MW wrote the proposal, participated in data collection, analyzed the data, and drafted the paper. GA wrote the proposal, participated in data collection, and analyzed the data. YB drafted the paper and revised subsequent drafts of the paper. All authors read and approved the final manuscript.

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Paper context statement

We conducted a community based cross-sectional study, and we found majority of women gave their last delivery at health institutions. Most of them had the recommended antenatal care visits. Institutional delivery was significantly higher among mothers who had the recommended visits than those women with fewer visits. Besides, women's concern about how they were treated by care providers was reflected. Service strengthening and quality improvement can potentially help achieve universal institutional delivery.

References

1. WHO. Making pregnancy safer : the critical role of the skilled attendant : a joint statement by WHO, ICM and FIGO [Internet]. 2004. Available from: http://www.unscn.org/layout/modules/resources/files/Making_pregnancy_safer_the_critical_role.pdf
2. Paxton A, Maine D, Freedman L, Fry D, Lobis S. The evidence for emergency obstetric care. *Int J Gynaecol Obs* [Internet]. 2005;88(2):181–93. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/15694106>
3. Gabrysch S CO. Still too far to walk: literature review of the determinants of delivery service use. *BMC*

- Pregnancy Childbirth. 2009;9:34.
4. Koblinsky M, Stanton ME, M RK, Conroy C, Kureshy N, Me S, et al. Issues in Programming for Safe Motherhood [Internet]. Vol. 18, Journal of deaf studies and deaf education. 2000. 1 of 66. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/24030913>
 5. Killewo J Bashir I, Yunus M, Chakraborty J, AI. Perceived delay in healthcare -seeking for episodes of serious illness and its implications for safe motherhood interventions in rural Bangladesh. *J Heal Popul Nutr.* 2006;24(4):403–12.
 6. WHO. Maternal Mortality in 2005: Estimates developed by WHO, UNICEF and UNFPA. Geneva: WHO; 2007.
 7. Darmstadt GL, Lee ACC, Cousens S, Sibley L, Bhutta ZA, Donnay F, et al. 60 Million non-facility births: Who can deliver in community settings to reduce intrapartum-related deaths? *Int J Gynecol Obstet.* 2009;107(SUPPL.).
 8. Idris S, Gwarzo U, Shehu A. Determinants of place of delivery among women in a semi-urban settlement in Zaria, northern Nigeria. Vol. 5, *Annals of African Medicine.* 2007. p. 68–72.
 9. World Health Organization, and D of RH, Research. Coverage of maternity care: a listing of available information. 1996;
 10. Koblinsky MA, Campbell O, Heichelheim J. Organizing delivery care: What works for safe motherhood? *Bull World Health Organ.* 1999;77(5):399–406.
 11. De Brouwere V, Tonglet R, Van Lerberghe W. Strategies for reducing maternal mortality in developing countries: what can we learn from the history of the industrialized West? *Trop Med Int Heal [Internet].* 1998;3(10):771–82. Available from: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med4&AN=9809910>
<http://sfx.scholarsportal.info/uhn?sid=OVID:medline&id=pmid:9809910&id=doi:&issn=1360-2276&isbn=&volume=3&issue=10&spage=771&pages=771-82&date=1998&title=Tropical+Medicin>
 12. Eijk AM van, Bles HM, Odhiambo F, Ayisi JG, Blokland IE, Rosen DH, et al. Use of antenatal services and delivery care among women in rural western Kenya: a community based survey. *Reprod Health.* 2006;3:2.
 13. Mrisho M, Obrist B, Schellenberg JA, Haws RA, Mushi AK, Mshinda H, et al. The use of antenatal and postnatal care: perspectives and experiences of women and health care providers in rural southern Tanzania. *BMC Pregnancy Childbirth.* 2009;9:10.
 14. Federal Ministry of Health of Ethiopia. Health Extension Program in Ethiopia Profile. Addis Ababa , Ethiopia : Health Extension and Education Center, Federal Ministry of Health. 2007;
 15. Fikre AA, Demissie M. Prevalence of institutional delivery and associated factors in Dodota Woreda (district), Oromia regional state, Ethiopia. *Reprod Health [Internet]. Reproductive Health;* 2012;9(1):1. Available from: Reproductive Health
 16. Mrisho M Mushi AK, Obrist B, Mshinda H, Tanner M, and Schellenberg D, SJ. Factors affecting home delivery in rural Tanzania. *Trop Med Int Heal Jul.* 2007;12(7):862–72.
 17. Hailemichael F, Woldie M, Tafese F, Management S. Predictors of institutional delivery in Sodo town, Southern Ethiopia. *Afr J Prm Heal Care Fam Med.* 2013;1–8.
 18. Melaku YA, Weldearegawi B, Tesfay FH, Abera SF, Abraham L, Aregay A, et al. Poor linkages in maternal health care services? evidence on antenatal care and institutional delivery from a community-based longitudinal study in Tigray region, Ethiopia. *BMC Pregnancy and Childbirth.* 2014;14:418.
 19. Central Statistical Agency (Ethiopia) and ICF International. Ethiopia demographic and health survey 2011. Addis Ababa, Ethiopia: Central Statistical Agency and ICF International. 2012.
 20. WHO. Trends in Maternal Mortality : 1990 to 2015: Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division [Internet]. 2015. Available from: www.who.int/about/licensing/copyright_form/en/index.html
 21. Federal Ministry of Health of Ethiopia. HSDP IV: Annual Performance Report. 2015.
 22. Hogan M, Foreman KJ, Naghavi M, Ahn SY, Wang M, Makela SM, et al. Maternal mortality for 181 countries, 1980–2008: a systematic analysis of progress towards Millennium Development Goal 5. *Lancet.* 2010;375:1609–1623.
 23. Abeje G, Azage M, Setegn T. Factors associated with Institutional delivery service utilization among mothers in Bahir Dar City administration, Amhara region: a community based cross sectional study. *TT -. Reprod Health.* 2014;11:22.
 24. Adewemimo AW, Msuya SE, Olaniyan CT, Adegoke AA. Utilisation of skilled birth attendance in Northern Nigeria: A cross-sectional survey. *Midwifery [Internet]. Elsevier;* 2014;30(1):e7–13. Available from: <http://dx.doi.org/10.1016/j.midw.2013.09.005>
 25. Birmeta K DY a. WD. Determinants of maternal health care utilization in Holeta town, central Ethiopia. *BMC Health Serv Res.* 2013;13:256.
 26. Awoke W, Muhammed J, Abeje G. Institutional Delivery Service Utilization in Woldia, Ethiopia. *Sci J*

- Public Heal [Internet]. 2013;1(1):18. Available from: <http://www.sciencepublishinggroup.com/journal/paperinfo.aspx?journalid=251&doi=10.11648/j.sjph.20130101.13>
27. Odo DB. Institutional Delivery Service Utilization and Associated Factors among Child Bearing Age Women in Goba Woreda, Ethiopia. *J Gynecol Obstet* [Internet]. 2014;2(4):63. Available from: <http://www.sciencepublishinggroup.com/journal/paperinfo.aspx?journalid=255&doi=10.11648/j.jgo.20140204.14>
 28. Tigray Regional Health Bureau. Nine years performance report on selected core indicators; 1998-2006 EFY Mekelle: Dayo printing. 2014;
 29. Amanu A and Birhanu Z, GA. Institutional Deliver Service Utilization in Munisa Woreda, South East Ethiopia: a Community Based Cross Sectional Study. *BMC Res Notes*. 2012;
 30. Tsegay Y, Gebrehiwot T, Goicolea I, Edin K, Lemma H, Sebastian MS. Determinants of antenatal and delivery care utilization in Tigray region, Ethiopia: a cross-sectional study. *Int J Equity Health*. 2013;12:30.
 31. Birmeta KDy. Determinants of maternal health care utilization in Holeta town, central Ethiopia. *BMC Health Serv Res*. 2013;13:256.
 32. Tayelgn D and Kebede, Y. AZ. Mothers' satisfaction with referral hospital delivery service in Amhara Region, Ethiopia. *BMC Pregnancy Childbirth*. 2011;11:78.
 33. Bazant E M, a. K. Women's satisfaction with delivery care in Nairobi's informal settlements. *International Journal for Quality in Health Care*. 2009;21(5):79–86.
 34. Gebrehiwot T, San Sebastian M, Edin K, Goicolea I. Health workers' perceptions of facilitators of and barriers to institutional delivery in Tigray, Northern Ethiopia. *BMC Pregnancy Childbirth* [Internet]. 2014;14(1):no pagination. Available from: <http://www.biomedcentral.com/1471-2393/14/137%5Cnhttp://ovidsp.ovid.com/ovidweb.cgi?T=JS&PAGE=reference&D=emed12&NEWS=N&AN=2014287523>
 35. Delvaux T Collin S and Ronsmans C, BP. Quality of normal delivery care in Côte d'Ivoire. *Rev Afr Santé Reprod*. 2007;11(1):22–32.
 36. Agha S, Carton TW. Determinants of institutional delivery in rural Jhang, Pakistan. *Int J Equity Health* [Internet]. BioMed Central Ltd; 2011;10(1):31. Available from: <http://www.equityhealthj.com/content/10/1/31>
 37. Bashour H Al-Faisal W, and Cheikha S, AA. Patterns and determinants of maternity care in Damascus. *East Mediterr Heal J*. 2008;14(3).
 38. Khan Z and Soomro S, SG. Mother's Education and Utilization of Health Care Services in Pakistan. *Pak Dev Rev*. 1994;33:1155–66.
 39. Gebrehiwot T, Goicolea I, Edin K SSM. Making pragmatic choices: women's experiences of delivery care in Northern Ethiopia. *BMC Pregnancy Childbirth*. 2012;12:113.
 40. Melese T, Gebrehiwot Y, Bisetegne D, Habte D. Assessment of client satisfaction in labor and delivery services at a maternity referral hospital in Ethiopia. *Pan Afr Med J*. 2014;17:1–9.

Tables

Table-1: Frequency and percentage distribution of subjects on selected sample characteristics

N=767 mothers

Demographic Variables		Frequency	Percent
Age	< 20	14	1.8
	20-34	680	88.7
	> 34	73	9.5
Ethnicity	Tigray	758	98.8
	Amhara	3	0.4
	Erop	6	0.8
Religion	Orthodox	729	95.0
	Muslim	24	3.1
	Catholic	14	1.8
Occupation	House wife	469	61.7
	Self employed	103	13.6
	Government employee	63	8.3
	Student	33	4.3
	No work	91	12.0
	Other	1	0.1
Marital status	Married	684	89.2
	Unmarried	83	10.8
Family income (Ethiopian Birr)	< 540	211	29.6
	540-1080	287	40.3
	1081-2162	156	21.9
	>2162	59	8.3
School attended	Yes	614	80.1
	No	153	19.9
Grade	< 5	87	14.2
	5-8	206	33.6
	9-10	195	31.8
	11-12	70	11.4
	College or above	56	9.1
Living children	1-2	454	59.2
	3-5	270	35.2
	> 5	43	5.6

Table-2: Frequency and percentage distribution of subjects on obstetric related variables

N=767 mothers

Obstetric Related Variables		Frequency	Percent
Gravidity	< 3	248	32.3
	3-5	460	60.0
	> 5	59	7.7
Parity	< 3	251	32.7
	3-5	461	60.1
	> 5	55	7.2
Maternal age at first conception	<20	404	53.0
	20-34	358	47.0
ANC follow up for last pregnancy	Yes	682	94.5
	No	40	5.5
Number of ANC visits for last pregnancy	Four times and above	580	85.0
	Less than four times	102	15.0
Importance of institutional delivery (ID) advised	Yes	659	96.6
	No	13	1.9
	Did not remember	10	1.5
Knew importance of institutional delivery (ID)	Yes	734	97.6
	No	18	2.4
Information sources for importance of ID	Radio	100	13.4
	Neighbour	23	3.1
	Health Extension	244	32.6
	Health Facility	250	33.4
	More than one source	131	17.5
More advantageous, place of birthing	Home	15	2.0
	Health Facility	732	97.3
	No preference	5	0.7
Preference of place for birthing	Home	15	2.0
	Health Facility	736	96.8
	No preference	9	1.2
Place of delivery	Home	146	19.0
	Health Facility	621	81.0

Table-3: Proportion of socio-demographic and obstetric related variables by place of delivery

N=767 mothers

Variables		Place of delivery	
		Health Facility frequency (%)	Home frequency(%)
Mothers occupation	Employee	139(83.7)	27(16.3)
	Housewife	379(80.8)	90(19.2)
	No work	97(77.6)	28(22.4)
School attended	Yes	504(82.2)	109(17.8)
	No	117(76.0)	37(24.0)
Family income/ month (Birr local currency)	<540	160 (75.8)	51(24.2)
	540-1080	239(83.3)	48(16.7)
	1081-2162	132(84.6)	24(15.4)
	>2162	49(83.1)	10(16.9)
Living children	1-2	368 (81.1)	86(18.9)
	3-5	220(81.5)	50(18.5)
	> 5	33(76.7)	10(23.3)
Parity	1-2	201(80.1)	50(19.9)
	3-5	378(82.0)	83(18.0)
	>5	42(76.4)	13(23.6)
Maternal age at first conception	<20	317(78.5)	87(21.5)
	20-34	300(83.8)	58(16.2)
Number of ANC visits for last pregnancy	Four and above visits	492(84.8)	88(15.2)
	Less than four visits	24(23.5)	78(76.5)
Institutional delivery (ID) advised	Yes	553(83.9)	106(16.1)
	No	11(84.6)	2(15.5)
Knew importance of ID	Yes	605(82.4)	129(17.6)
	No	8(44.4)	10(55.6)
Information source for importance of ID	Radio	89(89.0)	11(11.0)
	Neighbour	16(69.6)	7(30.4)
	House to House	208(85.2)	36(14.8)
	Health Facility	194(77.6)	56(22.4)
	More than one source	106(80.9)	25(19.1)
Is ID more advantageous?	Yes	596(79.3)	136(18.1)
	No or The same with home	13(1.7)	7(0.9)
Preference of place for birthing	Health Facility	603(75.8)	133(75.8)
	Home or Both the same	15(75.8)	9(75.8)

Table-4: Crude and adjusted odds ratios of place of delivery & certain independent variables

N=767 mothers

Variables		Place of delivery		Crude OR (95% CI)	Adjusted OR (95% CI)
		Health Facility	Home		
Mothers occupation	Employee	139	27	1	1
	Housewife	379	90	0.82(0.50,1.34)	0.77 (0.41, 1.45)
	No work	97	28	0.67(0.36,1.26)	0.96 (0.42, 2.23)
School attended	Yes	504	109	1.46 (0.94,2.28)	1.17 (0.61, 2.25)
	No	117	37	1	1
Family income/ month (Birr local currency)	<540	160	51	1	1
	540-1080	239	48	1.59(1.00,2.53)	2.01 (1.13, 3.55)*
	1081-2162	132	24	1.75(0.99,3.11)	2.29 (1.13, 4.67)*
	>2162	49	10	1.56(0.70,3.55)	1.49 (0.58, 3.81)
Living children	1-2	368	86	1	1
	3-5	220	50	1.03(0.69, 1.54)	0.89 (0.48, 1.65)
	> 5	33	10	0.77(0.35, 1.74)	1.34 (0.10, 17.68)
Parity	1-2	201	50	1	1
	3-5	378	83	1.13(0.75, 1.70)	1.22 (0.64, 2.32)
	>5	42	13	0.80(0.38, 1.71)	0.79 (0.07, 8.83)
Maternal age at first conception	<20	317	87	1	1
	20-34	300	58	1.42 (0.97,2.09)	2.09 (1.25, 3.50)*
No of ANC visits for last pregnancy	Less than four visits	78	24	1	1
	Four and above visits	492	88	1.72 (1.03, 2.87)*	1.99 (1.09, 3.63)*
Institutional delivery (ID) advised	Yes	553	106	1	1
	No	11	2	1.05(0.22, 6.99)	
Knew importance of ID	Yes	605	129	1	1
	No	8	10	0.17(0.06, 0.48)*	1.51(0.12,19.06)
Information source for importance of ID	Radio	89	11	1	1
	Neighbour	16	7	0.28(0.08, 0.95)*	0.53 (0.14, 2.08)
	House to house	208	36	0.71(0.33, 1.54)	1.28 (0.52, 3.16)
	Health Facility	194	56	0.43(0.20, 0.89)*	0.52 (0.22, 1.20)
	More than one source	106	25	0.52(0.23, 1.19)	0.63 (0.25, 1.61)
Is ID more advantageous?	Yes	596	136	1	1
	No or The same with home	13	7	0.42(0.15, 1.20)	0.34(0.03, 3.53)
Preference of place for birthing	Health Facility	603	133	1	1
	Home/No preference	15	9	0.37(0.15, 0.93)*	2.90 (0.55, 15.47)