READINESS OF HEALTH FACILITIES IN PROVIDING ANTENATAL CARE LABORATORY TESTS AND SATISFACTION OF CLIENTS IN ETHIOPIA

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ABSTRACT

BACKGROUND: For early identification of pregnancy complications and other problems that affect the outcomes of pregnancy, pregnant women need to receive laboratory tests during antenatal care. The provision of antenatal care laboratory tests is influenced by the availability and capacity of the support systems.

OBJECTIVE: The objective of this study is to assess the readiness of health facilities in providing antenatal care laboratory tests and satisfaction of clients.

METHODS: A health facility based cross-sectional study design was employed. Facility readiness was assessed in a sample of 205 health facilities and exit interview with 1,180 pregnant women.

RESULTS: 199 facilities and 960 pregnant women were involved. The sampled facilities have fulfilled the minimum requirements including 67% for infrastructure, 67.2% for documents, 49.6% for equipment, and 76% for trained laboratory personnel. The average reagents stockout rate on the date of the visit was 29.6% with stockouts during the past thirty days being at 32% and the mean number of days stocks last for 93 days. The average availability of the laboratory tests was 84% with infrastructure (p=0.018) and equipment (p=0.000) being the significant predictors. The overall satisfaction rate with the services provided was 83.2%.

CONCLUSIONS: Readiness of health facilities to deliver antenatal care laboratory tests was low with acceptable client satisfaction rate. The identified gaps need to be addressed to ensure better quality antenatal care laboratory test services.

KEYWORDS: Laboratory test, Antenatal care laboratory tests, ANC laboratory tests, USAID, Transform: Primary Health Care.

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INTRODUCTION

Globally, 303,000 maternal deaths, 2.6 million stillbirths, and 2.7 million newborn deaths occur annually from preventable causes related to pregnancy and childbirth. Antenatal care (ANC) is crucial for the prevention of these deaths. Eighty six percent of pregnant women access at least one ANC service from a skilled provider and 78% deliver with the assistance of skilled provider globally [1].

Ethiopia has made progress in reducing maternal mortality with the maternal mortality ratio declining from 1,400/100,000 live births in 1990 to 401/100,000 in 2017: mainly due to improved access, quality, and utilization of services [2].

The major causes of maternal deaths in the country include hemorrhage, anemia, hypertension during pregnancy, and sepsis which can be prevented by interventions like ANC [3].

To achieve the benefits of ANC, at least four visits where essential evidence-based interventions are provided is required. The essential interventions in ANC focus on the identification and management of complications which require effective laboratory services. In Ethiopia, ANC 1 coverage is 74% and ANC 4+ is 43%. However, only 20% attend their first ANC visit before 16 weeks of gestation [4-8].

Pregnant women should receive ANC laboratory tests (hemoglobin, blood group and Rh status, urinalysis, test for human immuno-deficiency virus (HIV) serostatus, Rapid Plasma Reagin (RPR) test for syphilis, and hepatitis B surface antigen) to identify complications and other potential problems that affect the outcomes of pregnancy [6].

Provision of quality ANC is influenced by the availability and capacity of support systems, including adequately staffed and stocked laboratories. The Service Availability and Readiness Assessment (SARA) is used in Ethiopia to determine the availability of basic equipment, amenities, essential medicines, and diagnostic capacity at health facilities (HFs) [7,9-11].

The limited capacity of HFs in Ethiopia to provide adequate laboratory tests remains a major barrier to the quality of ANC services. ANC-related laboratory tests can be hampered by shortages and quality of human resources, equipment, test kits, reagents, and other supplies [12].

The objective of this study is to assess the readiness of HFs in providing ANC laboratory tests and satisfaction of clients.

METHODS

Study setting and period: The study was conducted in primary hospitals (PHLs) and health centers (HCs) in three regions (Amhara, Oromia, SNNP) of the country where USAID Transform: Primary Health Care has been operating since January 2017. During the study time, Sidama and South-west regions were part of SNNP and hence, the term "SNNP" refers to Sidama, SNNP, and South-west. The study period was July–September 2020.

Study design: A HF based cross-sectional study design was employed.

Sample size and sampling: HFs: HF numbers were determined based on the Aga Khan Foundation's recommendations [13] and 205 HFs [22 PHLs and 183 HCs] were selected.

Exit interviews: A single population proportion survey formula was used. P was 56.3%-proportion of satisfied women with ANC laboratory test services in Addis Ababa [10], margin of error of 4% with confidence interval at 95% and design effect of 2. Hence, the sample size was 1,180.

The sample size was allocated proportionally for the three regions and primary healthcare entities. The primary health care entities were identified through simple random sampling. Exist interview was completed through consecutive sampling method until an adequate sample was obtained.

Data collection process and instrument: 25 data collectors and three supervisors, fluent in the local languages, were involved. All were health workers with at least master's level degrees in health fields. Data was collected using structured interview questionnaires; an equipment, reagent, materials, and supply audit tool; and a secondary data extraction format. Readiness of HFs in delivering

ANC laboratory tests was assessed in relation to infrastructure; standard operating procedures (SOPs), guidelines, protocols, and documentation; equipment; reagents; personnel; and overall availability of ANC laboratory tests. Interviews of pregnant women were conducted after they received ANC laboratory tests. The five scale Likert scale was used to assess degree of satisfaction of clients. The questionnaire used in the interviews was developed in English language, was translated into local languages, and back to English.

To ensure quality of data, properly designed data collection processes were followed. Data collectors and supervisors attended a two-day training with pretesting of data collection tools. Supervisors reviewed samples of collected data daily and held discussions with data collectors.

Data management and analysis: The research team assessed the quality, accuracy, and completeness of the collected data using range plausibility and cross-validation checks. The exit interview data was collected using local languages and was translated back to English before analysis. The quantitative data was entered into EPI-Data version 10 for Windows and exported into SPSS version 25 for analysis. A bivariate logistic regression analysis was used. An odds ratio of 95% confidence interval (CI) was calculated to identify predictors of the availability of ANC laboratory tests and satisfaction levels.

Ethics

Ethical clearance was granted from JSI IRB, REFERENCE: IRB #19-30E and the IRBs of the three regional state health bureaus. The necessary and appropriate information about the study was explained to the study participants. Written consent was sought from pregnant women for the exit interviews. Verbal consent was obtained from heads of the HFs and the professionals who provided information.

RESULTS

Findings are categorized into: 'readiness of HFs' and 'client satisfaction'.

1. **Readiness of HFs**: 199 of the sampled 205 HFs (97.1%) were assessed.

1.1. Infrastructure: 67% of the HFs had the minimum infrastructure ranging from 26.8% for 'access to safe drinking water' to 91.9% for 'a well-maintained roof'. Running water was available in 42.1% while 64.0% had consistent electric power supply (table 1).

Table 1. Status of laboratory infrastructure in HFs at USAID Transform: Primary Health Care intervention woredas, July-September 2020, Ethiopia.

Variables	N	n (%)
Infrastructure	191	128 (67.1%)
Area is maintained in good condition	197	173 (87.8%)
Is secured with lock and key, accessible during normal working hours	198	178 (90.4%)
Has shelves and lockable cupboards; access is limited to authorized personnel	197	139 (70.6%)
Has enough space to store existing supplies	198	82 (41.4%)
Has running water.	195	82 (42.1%)
Has a consistent power supply and/or a generator with a guaranteed supply of petrol or solar power	189	121 (64.0%)
Has an adequate number of power points	198	147 (74.2%)
Has separate sinks for washing laboratory ware and staining, and for washing hands after being exposed to infected materials	198	130 (65.7%)
Has drainage for laboratory sinks that are closed and that lead to either a septic tank or deep pits	197	134 (68.0%)
Has a functioning incinerator or another nationally acceptable waste management system (e.g., a protected pit) to correctly dispose of all hazardous waste (e.g., needles, toxic materials) and fuel for the incinerator (if applicable)	198	165 (83.3%)
Floors are in good condition without the need for repair	198	169 (85.4%)
At all times, roof is maintained in good condition to avoid sunlight and water penetration	197	181 (91.9%)
Internal walls are in good condition without the need for repair	196	179 (91.3%)
External walls are in good condition without the need for repair	197	176 (89.3%)
Is well lit	194	172 (88.7%)
Is well ventilated and cross-ventilated	198	173 (87.4%)
Windows and doors are in good condition without the need for replacement or repair	197	174 (88.3%)
Has firm built-in benches with leveled tops in good condition	196	132 (67.3%)
Has firm shelves to store supplies and reagents	197	125 (63.5%)
There is adequate glassware and/or plasticware	197	100 (50.8%)
Distilled/deionized water is available	196	90 (45.9%)
Windows have security bars	196	126 (64.3%)
There is an adequate number of laboratory stools	195	76 (39.0%)
Has an indoor patient waiting area with seats	196	96 (49.0%)
Staff have access to clean toilet facilities	198	112 (56.6%)
Staff have access to safe drinking water	194	52 (26.8%)
Has a working fire extinguisher	193	80 (41.5%)
The working environment is kept organized and clean, with safe procedures for handling of specimens and waste material	198	146 (73.7%)
Has adequate lighting, ventilation, water, waste and refuse disposal.	195	134 (68.7%)

1.2. SOPs, guidelines, protocols, and documentation: The minimum documents were present in 67.2% of the HFs, ranging from 26.1% for 'referral forms' to 96.5% for 'registers' (table 2).

Table 2. Presence of laboratory SOPs, guidelines, protocols, and documentation in HFs at USAID Transform: Primary Health Care intervention woredas, July-September 2020, Ethiopia. (N=99)

Variables	Number	Percent
Availability of laboratory SOPs, guidelines, protocols, and documentation	134	67.2%
SOP manuals	177	88.9%
Guidelines for all tests and equipment	137	68.8%
Request and report forms	172	86.4%
Specimen and results registers	192	96.5%
Equipment and supplies inventory registers	107	53.8%
Quarterly/monthly reporting forms	135	67.8%
Referral forms	52	26.1%
Periodic reporting (monthly, quarterly)	170	85.4%
Preliminary analysis	58	29.1%
Utilization of results	107	53.8%
Collection of useful and appropriate information	117	58.8%
Archiving and retrieval	69	34.7%
Patient identification	189	95.0%
Date and time of specimen collection	160	80.4%
Test performed	184	92.5%
Date of report	170	85.4%
The reference or normal range	76	38.2%
Interpretation	79	39.7%

1.3. Laboratory Equipment: The minimum equipment was present in 49.6% of the HFs, ranging from 13.6% for 'lab coats' to 99.5% for 'waste receptacles' (table 3).

Table 3. Availability of laboratory equipment in HFs at USAID Transform: Primary Health Care intervention woredas, July-September 2020, Ethiopia. (N=199)

Variables	Number	Percent
Availability of laboratory equipment	99	49.6%
General centrifuge for urine	176	88.4%
Micro-hematocrit centrifuge	112	56.3%
Hemo Cue for hemoglobin determination	59	29.6%
Complete blood count machine	66	33.2%
Refrigerators	152	76.4%
Bright field compound microscopes	154	77.4%
Light source	132	66.3%
Desktop computers and printers	56	28.1%
Thermometers	57	28.6%
Hand soaps	57	28.6%
Unused sharps boxes	170	85.4%
Gloves	187	94.0%
Waste receptacles	198	99.5%
Goggles	188	94.5%
Masks	62	31.2%
Plastic aprons	158	79.4%
Lab coats	27	13.6%

1.4. Laboratory reagents, test kits, and other supplies: The average stockout on the day of the visits was 29.6%, ranging from 10.1% for 'immersion oil' to 61.8% for 'xylene'. The average presence of stockout during the last thirty days was 32%, ranging from 6.5% for 'Uristix (dipstick)' to 73.4% for "xylene". The mean number of days the available stocks last was 93 days, ranging from 70 days for 'HIV test kits' to 129 days for 'immersion oil' (table 4).

Table 4. Stockout of laboratory reagents, test kits, and other supplies in HFs at USAID Transform: Primary Health Care intervention woredas, July-September 2020, Ethiopia. (N=199)

Variables	Stockout on the day of visit		Stockout on the last thirty days		Mean number of days stock is available
	Number	Percent	Number	Percent	
Stockout of laboratory reagents, test kits, and other supplies	59	29.6%	64	32.0%	93
Uristix (dipstick)	21	10.6%	13	6.5%	78
Capillary tube (heparinized)	39	19.6%	35	17.6%	106
Giemsa staining solution	37	18.6%	31	15.6%	97
Crystal violet	109	54.8%	124	62.3%	89
Gram iodine	112	56.3%	130	65.3%	100
Acetone alcohol	95	47.7%	112	56.3%	103
Safranin	108	54.3%	125	62.8%	97
Hepatitis test kits	27	13.6%	23	11.6%	84
RPR antigen kits	21	10.6%	17	8.5%	86
Blood group/type antisera	24	12.1%	18	9.0%	88
Pregnancy test kits	22	11.1%	19	9.5%	85
HIV test kits	40	20.1%	47	23.6%	70
Hematology auto analyzer reagent kits	113	56.8%	126	63.3%	84
Methanol	61	30.7%	66	33.2%	92
Xylene	123	61.8%	146	73.4%	96
Immersion oil	20	10.1%	14	7.0%	129

1.5. Personnel: 76% of HFs have laboratory personnel who can provide services while 6% have non-laboratory personnel who are providing laboratory services.

1.6. ANC laboratory tests: The average availability of ANC laboratory tests in HFs was 84% ranging from 60.8% for 'Hgb/CBC/HCT' to 98.5% for 'RPR syphilis tests' and 'urinalysis'. Fifty three percent of the HFs reported stoppage of providing one or more of the tests during the last six months (table 5).

Table 5. Availability of ANC laboratory tests in HFs at USAID Transform: Primary Health Care intervention woredas, July-September 2020, Ethiopia. (N=199)

Variables	Number	Percent
Availability of ANC laboratory tests	167	84.0%
Hgb/CBC/HCT	121	60.8%
HBsAg	183	92.0%
RPR	196	98.5%
Blood group & RH	192	96.5%
HIV tests	184	92.5%
Urine-analysis	196	98.5%
HF stopped providing service of ≥1 of the ANC laboratory tests in the last six months	105	52.8%

A bivariate logistic regression was performed to ascertain the effects of availing SOPs, personnel, equipment, reagents, and infrastructure on the likelihood that HFs have laboratory test services. Linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell (1962) procedure. A Bonferroni correction was applied using all fifteen terms in the model, resulting in statistical significance being accepted when p<.00333 (Tabachnick & Fidell, 2014). Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable. There was no standardized residual with a value of greater than 3.0 standard deviations. The logistic regression model was statistically significant, $\chi 2(7)=69.638$, p<.0005. The model explained 40.8% (Nagelkerke R2) of the variance in service availability and correctly classified 73.3% of cases. Sensitivity was 73.0%, specificity was 73.6%, positive predictive value was 75.3%, and negative predictive value was 71.3%. Of the potential predictor variables checked, only two were statistically significant: 'equipment availability' and 'infrastructure' (table 6).

Table 6. Predictors of availability of ANC laboratory tests in HFs at USAID Transform: Primary Health Care intervention woredas, July-September 2020, Ethiopia.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
SOPs, guidelines, documentation Personnel	.015	.012	1.506	1	.220	1.015	.991	1.039
Personnel	-.013	.012	1.212	1	.271	.987	.964	1.010
Equipment	.074	.020	14.216	1	.000	1.076	1.036	1.119
Reagents	-.228	.297	.593	1	.441	.796	.445	1.423
Infrastructure	.025	.011	5.635	1	.018	1.025	1.004	1.047
Constant	-6.217	1.327	21.951	1	.000	.002		

2. Client satisfaction: Exit interview was carried out with 960 pregnant women. Clients satisfied with the turnaround time at laboratory were 78.6%, 86% were satisfied with the laboratory staff, and 83.2% with the overall ANC laboratory services. Chi-square test of homogeneity was conducted between HF type and levels of satisfaction. All expected cell counts were greater than five. There is no statistically significant difference (p>.05) between HCs and PHLs in the level of satisfaction with laboratory turnaround time, laboratory staff, and laboratory test services (table 7).

Table 7. Satisfaction of clients with ANC laboratory services rendered in HFs of USAID Transform: Primary Health Care intervention woredas, July-September 2020, Ethiopia.

Variables	Satisfaction level	Health centers N (%)	Hospitals N (%)	Total N (%)	Pearson Chi-square (P)
Satisfaction with turnaround time	Dissatisfied	54 (8.3)	34 (11.4)	88 (9.3)	0.308
	Neutral	81 (12.5)	34 (11.4)	115 (12.1)	
	Satisfied	514 (79.2)	231 (77.3)	745 (78.6)	
Satisfaction with services	Dissatisfied	43 (6.5)	11 (3.6)	54 (5.6)	0.141
	Neutral	69 (10.5)	38 (12.6)	107 (11.1)	
	Satisfied	546 (83)	253 (83.8)	799 (83.2)	
Satisfaction with staff	Dissatisfied	25 (3.8)	7 (2.3)	32 (3.3)	0.289
	Neutral	65 (9.9)	37 (12.3)	102 (10.6)	
	Satisfied	568 (86.3)	258 (85.4)	826 (86)	

DISCUSSION

The readiness of HFs to provide ANC laboratory tests in terms of infrastructure was at 67.1% which is higher than the 39% of mean availability of tracer items for basic amenities in the 2018 SARA report [9]. This difference may be because the SARA report was based on the overall HF status while this study is on specific unit, the laboratory. Considerable investments have also been made after the SARA report.

Availability of SOPs, guidelines, protocols, and documentation is at 67.2% which is higher than the 15.4% of an Addis Ababa study [10]. This difference may be due to sample size difference (13 versus 199) and a lot has been invested to develop and distribute national documents since the previous study.

The minimum laboratory equipment is available in 49.6% of the HFs which is lower than the 60% for the mean availability of tracer item equipment of the 2018 SARA report [9]. This difference may be because in the SARA report, the tracer items selected were the most easily procured and easy to maintain medical equipment while in this study specific laboratory equipment which are expensive to procure and become non-functional easily were assessed.

Stockout on the day of the visit was found in 29.6% of the HFs which is lower than the 53.8% for equipment down time due to reagents stockout in a study done in Addis Ababa [14]. This difference may be due to the difference in sample size and the country's investment since the Addis Ababa study.

Trained laboratory personnel who can provide ANC laboratory tests were present in 76.1% of the HFs which is comparable with the 77.5% of HCs in Addis Ababa but lower than the 92.4% of hospitals in Addis Ababa [14]. The difference with hospitals in Addis Ababa may be due to the regional difference in the required number of laboratory personnel and the tendency for professionals to be concentrated at the hospitals in the capital city.

ANC laboratory tests were available in 84% of HFs which is comparable with the 80% in Northwest Ethiopia [15] and 83.4% at Debremarkos hospital [16], but higher than the 38.5% of a study in Addis Ababa [14] and the 40% report of mean availability of tracer items in the SARA 2018 report [9]. The difference with the Addis Ababa study may be due to the difference in sample size. Additionally, the significant investments in health after the previous study may explain the difference with both the Addis Ababa study and the SARA 2018 report.

Client satisfaction with overall ANC laboratory test services provided was found to be 83.2% which is comparable with the 87.9% of a study in Wolaita [17] but higher than the pooled estimate of 66% in a systematic review [18], and the 56.9% in a study at public HFs of Addis Ababa [10]. This difference with the systematic review and the Addis Ababa study may be because the systematic review is a pooled estimate of different study settings with varying study populations, while the study in Addis Ababa was on women who are more educated and have better incomes than the women in the current study (rural women with lower educational and socio-economic statuses).

Client satisfaction with turnaround time in facilities was 78.6% which is lower than the >90% in Egypt [19]. This difference may be due to the difference in study settings and population.

The overall readiness of HFs to deliver ANC laboratory tests in terms of infrastructure (67.1%), documents (67.2%), equipment (49.6%), reagents, and personnel (76%) was found to be low. The client satisfaction rate was found to be within the acceptable range (83.2%). There is a need to fill gaps in infrastructure, documents, medical equipment, reagents, and personnel of HFs to deliver a better-quality service. Based on this study more emphasis should be given to infrastructure and laboratory equipment to improve the laboratory test service availability in HFs.

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