Original article

Laboratory services in hospitals and regional laboratories in Ethiopia

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Abstract

Background: Laboratory service facility in health institutions in Ethiopia of is very weak and limited. This can be explained by lack of properly designed laboratory rooms, shortage of equipment and supplies, poor maintenance system and lack of close follow-up and supervision.

Objective: To assess the laboratory service at a Hospital and Regional levels, and to come up with some recommendations that may help for the improvement of the service in the country.

Methods: Thirty-four health institutions with laboratory service (28 Hospitals and 6 Regional Referral laboratories) were assessed from 9 Regional and 2 Administrative states of the country. A pre-tested well-structured questionnaire was administered. Site supervision on the general conditions of the laboratories was also made.

Results: Almost all the health institutions reported shortage of common supplies and reagents. Common and simple tests were not even done due to severe reagent shortages. Majority of the health institutions reported problems related to maintenance. Weak referral system and absence of quality assurance network were also observed.

Recommendations: Planning together with laboratory professionals and/or budgeting the laboratory service separately and close follow-up for the proper utilization were suggested to alleviate the problems related to shortage of supplies and reagents. Establishing national quality assurance network, addressing problems related to maintenance, equipping the laboratories would help the laboratories to meet the need of the service users in the sector. [*Ethiop.J.Health Dev.* 2004;18(1):43-47]

Introduction

In 2001, in Ethiopia, the potential health service coverage was estimated to be 51.2% (a maximum of 93.4% for the capital Addis Ababa and 30% for Somali Regional state) with health service utilization of 0.27%. The government health expenditure percapita (Ethiopian Birr) was about 11.5%. There were 110 Hospitals (80 of them owned by the government), 785 Health centers, 2393 Health stations and 1023 Health posts. In all health institutions except health posts, though the level is different, laboratory service with limited facility is available. The total number of laboratory personnel was reported to be 1050 (1).

The problems in the laboratories could be aggravated, particularly at peripheral levels, due to different reasons such as lack of properly designed laboratory rooms, lack of water and electricity access, shortage of equipment and supplies, absence of effective maintenance and spare parts and lack of follow up and supervision (2).

In 2001, there were 8 Regional referral laboratories established with the aim of strengthening the referral system for the service. However, the objectives were not met mainly due to the shortage of trained human resource, inadequate supply of consumables and reagents and the absence of a quality assurance program network (3). Few studies were carried out to assess the statuses of the laboratories and their contribution to the overall health service especially at the hospital and regional levels (3,4,5).

Since laboratory service is a dynamic process, for new tests to be introduced, it needs continuous assessment. To fill this gap this assessment has been done. Therefore, the main aims of the study were assessing the service at Hospital and Regional level, analysing the situation of the laboratories and coming up with recommendations that may help.

Materials and Methods

The study was designed to cover all Regional states in the country. It was conducted in July 2002. Of the total 80 government owned Hospitals and 8 Regional laboratories, 28 Hospital and 6 Regional laboratories were assessed.

Detailed pre-tested structured questionnaire was administered in all of these health institutions. Onsite supervision to examine the general conditions of the laboratories were also made. At least one urban-based health institution with a laboratory service was randomly selected and included from each Region. Collected information includes: Human resource, supplies, reagents, equipment and the type of tests that were performed by each laboratory. Standard of tests were included according to the list made by MOH in 1988 (6).

Results

Of the 34-health institution assessed, 28 (82.4%) and 6(17.6%) of them were Hospital based & Regional laboratories, respectively (Table-1). This number represents 35% of the government owned and 25.5% of the total

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number of Hospital based laboratories in the country in 2001. A total of 260 (87.5%) laboratory personnel were registered in the assessed health institutions. This represented 24.8% of the total number of laboratory personnel in the governmentally owned health institutions. Of these, 6(2.3%) of them were with M.Sc degree, 17(6.5%) with B.Sc, 30(11.5%) senior laboratory technicians, 188(72.3%) with diploma and 19(7.3%) assistant laboratory technicians. The majority of those with M.Sc 4(66.7%) and B.Sc 12 (70.6%), were assigned in the Regional Laboratories (Table-2).

Though, the problem was aggravated in hospital-based laboratories, shortage of supplies and reagents were reported from all health institutions (Table-3).

Table 1: **Representation of the assessed Health Institutions in the Regional States**

Region	Number of government owned Hospitals (From the total 110 Hospitals)	Number of government Hospitals assessed (n,%)	Number of Regional Laboratories assessed (n, n_T)
Tigray	12	3(25.0)	1(1)
Afar	2	1(50.0)	0(na)
Amhara	14	7(50.0)**	2(2)
Oromya	20	8(40.0)	1(2)
Somali	6	1(16.7)	0(na)
Benshangul-Gimuz	2	1(50.0)	0(na)
SNNPR	10	3(30.0)	1(1)
Gambella	1	1(100.0)	0(na)
Hararri	3	0(0.0)	1(1)
Addis Ababa	9	2(22.2)	0(1)*
Diredawa	1	1(100.0)	0(na)
Total (n,%)	80(72.7)	28(35.0)	6(75.0)

na- there is no Regional laboratory with culture facility *- Regional Laboratory without culture facility n- Number of health institutions assessed **-One Teaching Hospital with culture facility included n_T- Total number of regional laboratories in the Region

Table 2: **Human resource (number and percent) in the assessed health institutions by qualification (N=34).**

Qualifications	Presence (n,%)	Out of the total human resource (n, %)	In Regional Labs (%)
M.Sc	5(14.7)	6(2.0)	4(66.7)
B.Sc	9(26.5)	17(5.7)	12(70.6)
Senior Lab Technician	19(55.9)	30(10.1)	
Diploma	32(94.1)	188(63.3)	
Assistant Lab technicians	15(44.1)	19(6.4)	
Others (lab aids)	14(41.2)	37(12.5)	
Total		297(100.0)	

Table 3: **Common supplies and reagents assessed in the health institutions (N=34)**

Supplies	Adequate for work (n, %)	Inadequate for work (n,%)	Not available (n,%)
Gloves	11(32.4)	20(58.8)	3(8.8)
Finetipps	9(26.5)	21(61.8)	4(11.8)
Gauze	21(61.8)	6(17.6)	7(20.6)
Cotton	27(79.4)	6(17.6)	1(2.9)
Slides with cover	28(82.4)	6(17.6)	0(0.0)
Syringes	19(55.9)	4(11.8)	11(32.4)
Vacuum tubes	12(35.3)	5(14.7)	17(50.0)
Ethanol	11(32.4)	19(55.9)	4(11.8)
Methanol	21(61.8)	9(26.5)	4(11.8)
HCl	25(73.5)	5(14.7)	4(11.8)
H_2SO_4	20(58.8)	6(17.6)	8(23.5)
Hypo chlorite	26(76.5)	8(23.5)	0(0.0)

Acetone	15(44.1)	7(20.6)	12(35.3)
Ethyl ether	1(2.9)	3(8.8)	30(88.2)
Acetic acid	17(50.0)	4(11.8)	13(38.2)
Acid-alcohol	26(76.5)	8(23.5)	0(0.0)
Transport media	3(8.8)	3(8.8)	28(82.4)

Table 4: **Assessment of equipment (availability and status) in the health institutions (N=34)**

Equipment	Availability (n,%)	Functional (n, %)	Non-functional (n, %)
Refrigerator (electrical)	34(100.0)	103(90.4)	11(9.6)
Incubator	30(88.2)	46(92.0)	4(8.0)
Centrifuge (electrical)	34(100.0)	88(92.6)	7(7.4)
Deep Freezer (-20ºC, -80ºC)	12(35.3)	17(80.9)	4(19.1)
Shaker	28(82.4)	44(97.8)	1(2.2)
Water bath	28(85.3)	38(88.4)	5(11.6)
Dry oven	27(79.4)	35(97.2)	1(2.8)
Safety cabinet (any kind)	7(20.6)	7(70.0)	3(30.0)
Water distiller	22(64.7)	23(74.2)	8(25.8)
Spectrophotometer (chemistry)	29(85.3)	28(68.3)	13(31.7)
Microscope	34(100.0)	114(82.0)	25(18.0)
Autoclave	19(55.9)	25(89.3)	3(10.7)
Coulter (any kind)	8(23.5)	7(87.5)	1(12.5)
Autolab	4(11.8)	4(100.0)	0(0.0)
Cold chain (for transport specimen)	15(44.1)	15(100.0)	0(0.0)
Incinerator	24(70.6)	24(100.0)	0(0.0)
Serum electrophoresis machine	1(2.9)	1(100.0)	0(0.0)

Out of the 114 refrigerators registered in the assessed laboratories, 11(9.6%) were not functional. Deep freezers (either -20ºC or -80ºC) were only available in 12 (35.3%) of the health institutions, of which 4(19.1%) were not functional. Only 7(20.6%) of the laboratories assessed had safety cabinets of any kind and 3(30.0%) were not functioning. Of the 28 checked autoclaves, 3 (10.7%) were not properly functioning at the time of supervision (Table4). As seen from the assessment, majority of the nonfunctional equipment were located in the Hospitals.

Stool concentration test was only available in 4 (11.8 %) of the laboratories simply due the shortage of ethyl ether (Table-3). Protrombine time (PT) and Partial Protrombine Time (PTT) tests were available in 1(2.9%) Hospital. Only 7(20.6%) of the health institutions perform Hepatitis surface antigen test (HBSAg). Blood chemistry tests [(47.1% for liver function test (LFT) and 55.5% for Renal function Test (RFT)] including enzyme tests were limited. Facilities for bacteriological culture and sensitivity were few in number and performed at Regional laboratory level only. None of the health institutions were found to perform sputum and fungal cultures (Table-5).

Updated standard list of tests and standard operational procedures for effective quality assurance mechanisms were not in place in the assessed laboratories.

Discussion

In 2001, there were 110 Hospitals with 10736 beds and 382 health centers with 785 beds (1). The laboratories in these facilities were supposed to give service to both the outpatient and inpatient departments. However, as described by Kassu et al, the service particularly at the health center (4) and off course at the Hospital level, as observed in this study, was not satisfactory.

This study indicated the majority of the laboratories were suffered from reagent shortages. This has been shown by the presence of a clinical chemistry spectrophotometer in 29(85.3%) with 68.3% functionality status. However, only below 50% of them perform the tests. The same was true for parasitological analysis using stool concentration technique; only 4(11.8%) performed the test due to the absence of reagent. The same finding was reported in 1999 in health centers of Amhara Regional State in Northern Ethiopia, of which about 96.3% of them in the Region were not doing stool concentration (4).

In this assessment, the number of laboratories that perform RPR/VDRL for the diagnosis of syphilis was 26 (76.5%). This was encouraging and will have its own contribution to the success of HIV surveillance system in the country, since RPR/VDRL testing is one entry point in HIV surveillance for unlinked anonymous testing (7).

Culture and sensitivity test facility for bacteriology, which is the most important method for monitoring drug resistance profile, was available only in 1(2.9%) of the Hospitals assessed. This number was not adequate and may lead to prescription of drugs without knowing their status, which makes them not effective against the etiologies. Furthermore, it will increase drug resistance frequency in the country among different pathogenic microbes.

Acid-fast bacilli testing for Tuberculosis was available in almost all of the health institutions, 32(94.1%). This seems encouraging and needs to be maintained. However, the absence of backup, culture facilities as reported elsewhere (8,9), to see drug resistance profiles especially among defaulters and treatment failure cases, and to reduce transmission from smear negatives (10) needs attention.

Table 5: **Tests assessed and their status in health institutions (N=34).**

Specimen/test	
Stool: Direct	Partial Protrombine time (P.T.T)
Occult blood	Fibrinogen time
Concentration	Sedimentation rate
Urine: Microscopy	Cell morphology
Multistix	Blood grouping
Pregnancy Test (Slide tests)	**Serology**
Hematology	Rhematoid factor Rose waaler)
Hemoglobin	Streptococal infection (ASO)
White blood cells	Widal agglutination
Differential count	Weil-Felix agglutination
LE-Cell	RPR/VDRL
Protrombine time (P.T)	HBSAg

Blood Chemistry	1(2.9)
Liver function test (LFT)	1(2.9)
Renal function test (RFT)	1(2.9)
Electrolytes (Na, K, Li, Mg, Ca)	29(85.3)
Sputum	26(76.5)
Acid fast bacilli staining	26(76.5)
Urethral discharge	
Gram stain	6(17.6)
Culture: Stool	5(14.7)
Urine	12(35.3)
Sputum	9(26.5)
Discharge	26(76.5)
Blood	7(20.6)
Fungus	
Ascetic fluid and CSF	16(47.1)
KOH for fungus	19(55.5)
Public Health water chemistry	3(8.8)
Number of Health institutions (%)	
31(91.2)	32(94.1)
5(14.7)	
4(11.8)	31(91.2)
34(100.0)	5(14.7)
34(100.0)	7(20.6)
26(76.5)	0(0.0)
	5(14.7)
29(85.3)	5(14.7)
29(85.3)	0(0.0)
27(79.4)	5(14.7) 8(23.5)
0(0.0)	1(2.9)

The limited number of Widal agglutination tests available in the Hospitals, only in 12(35.3%) of them, and the issue related to case fatality rate reported among children in Addis Ababa, 15.7% (11), as an example, should be addressed by supplying the reagents periodically on time and monitoring their quality before use.

Absence of transport media of any kind in 28(82.4%) of the health institutions, needs more attention particularly in those areas where epidemic diseases frequently occurred, to transport specimens to the near by areas where culture facility is available. Its improvement related to strengthening of the referral system, is essential to avoid empirical treatment, to reduce mortality and morbidity through enhancing the knowledge of the health personnel for periodical epidemic diseases and their sensitivity towards antibiotics and other drugs.

Maintenance remains to be one of the major problems as reported elsewhere (5). In this study, 13 (31.7%) of the chemistry spectrophotometers followed by 8(25.8%) of the water distillers and 25(18%) of the microscopes, which were located in the Hospitals, were not functional either due to maintenance or spare part problems. The problem can be alleviated by training maintenance personnel and/or provision of spare parts accordingly.

The quality assurance system practiced in the supervised laboratories was generally either very weak or non-existent. Except for HIV screening tests, no quality assessment scheme was established for other tests. Therefore, networking of the laboratories in the country should be given priority for all activities to be conducted within the laboratories which could solve the problems related to training (including refreshment courses), maintenance, and systems of reagent and equipment procurement.

Budgeting for the laboratory items separately and/or together with those responsible professionals with maintenance issues, reagent shortages and human resource problems on time are also recommended. Updated list of standard tests according to the levels of each health institution and standard operational procedures needs to be

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