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ASSESSMENT OF LABORATORY TEST REPETITIONS AND ASSOCIATED FACTORS AMONG KNOWLEDGE, ATTITUDES AND PRACTICE OF HEALTH CARE WORKERS AT SELECTED GOVERNMENT HOSPITALS IN ADDIS ABABA, ETHIOPIA.

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This is to certify that the thesis prepared by Lubaba Teshome entitled: “Assessment of Test Repetitions and Associated Factors including Knowledge Attitude and Practice Of Health Care Workers in Laboratory Services at Selected Government Hospitals in Addis Ababa, Ethiopia”, and submitted in partial fulfillment of the requirements for Master of Science Degree in Clinical Laboratory Sciences (Clinical laboratory management & quality assurance) complies with the regulations of the University and meets the accepted standards with respect to originality and quality.

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And also TASH and SPHMMC hospitals should be aknolwedged

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V. List of Abbreviations

AAHB	Addis Ababa Health Bureau
CPOE	Computerized physician order entry
DRERC	Departmental Research and Ethical Review Committee
HER	Electronic health records
HIE	Electronic health information exchange
HCWs	Health Care Workers
ICU	Intensive Care Unit
IPD	Inpatient Department
KAP	Knowledge Attitude Practice
LRF	Laboratory request form
PI	Principal Investigation
SPHMMC	St.Paul`sHospitalMelliniumMedicalCollege
SPSS	Statisticalpackageforsocialscience
TASH	TikurAnbesa Specialized Hospital
TAT	TurnaroundTime

Abstract

Background: Laboratory test repetition is a major concern affecting quality of care, & efficiency of clinical laboratory services. Unnecessary repeat testing increases workload, costs, and turnaround time. However, evidence on the magnitude of test repetition and its associated factors in Ethiopia remains limited.

Objective: To assess the frequency of test repetitions, knowledge, attitude and practice (KAP) of clinical staff and associated factors with test repetition in Tikur Anbesa Specialized Hospital and St.Paul`sHospital Mellinium Medical College in Addis Ababa, Ethiopia

Method: A hospital-based cross-sectional study was conducted using laboratory infor mation system (LIS) data from TASH and SPHMMC from February to March 2026, Addis Ababa, Ethiopia. A total of 30,354 laboratory test records were analyzed to determine the magnitude and patterns of test repetition. In addition, structured questionnaires were administered to 100 clinical laboratory professionals and 200 physicians to assess KAP and factors associated with test repetition. Descriptive statistics used to determine the frequency of repeated tests & clinical data distribution. Bivariate and multivariable logistic regression used to identify factors associated with test repetition, and p value <0.05 considered statistically significant.

Results: A total of 30,354 laboratory test records from TASH and SPHMMC were included in the study. Out of the total tests, 11,578(38.1%) of tests were repeated. CBC panel tests accounted for the largest proportion of repeated tests, followed by urinalysis and electrolyte panels. Delayed turnaround time was significantly associated with laboratory test repetition, with delayed tests having approximately 1.5 times higher odds of repetition compared to tests with acceptable turnaround time (AOR = 1.5, 95% CI: 1.41, 1.56). Among laboratory professionals, shorter work experience was significantly associated with involvement in test repetition (AOR = 9.45, 95% CI: 1.98–45.2). Similarly, physicians with 2–5 years of work experience had higher odds of involvement in repeated testing compared with more experienced physicians (AOR = 2.59, 95% CI: 1.36–6.40). Thirty six percent of clinical lab staff & none of the physicians had a knowledge related with training related to laboratory test utilization or quality management. All of the physicians & clinical lab staff had a positive attitude towards having clear test request guidelines to reduce unnecessary test repeat.

Conclusion: Laboratory test repetition was common in the selected hospitals and was significantly associated with delayed turnaround time, staff work experience, and communication-related practices. CBC-related investigations represented the largest proportion of repeated tests. Improving laboratory turnaround time, strengthening laboratory-clinician communication, enhancing staff training, and promoting appropriate laboratory test utilization practices may help to reduce unnecessary laboratory test repetition and improve laboratory service quality.

Keywords: Test repetition, turnaround time, laboratory quality indicators

1. Introduction

1.1. Background of study

Laboratory testing is crucial for the successful medical treatment of many patients for drug treatment or surgical intervention. Researchers often decide whether to average multiple results to produce more precise data, and clinicians often decide whether to repeat a laboratory test in order to confirm its validity or to follow a trend(1). The use of laboratory tests must also be evaluated in terms of the clinical benefit. The appropriate use of laboratory tests is necessary for optimal patient care. Increased laboratory use is appropriate if it allows accurate diagnoses to be made, the ideal treatment to be identified and monitored, accurate prognoses to be established, and patients' hospital stays to be reduced (1).

Laboratory test repetition may occur due to physician-related factors such as uncertainty in clinical decision-making, lack of access to previous results, or inadequate knowledge of recommended testing intervals.(2). Additionally, laboratory-related factors including delayed turnaround time, equipment malfunction, reagent shortages, poor sample quality, and communication gaps between laboratory professionals and physicians contribute significantly to repeated testing. Patient-related and system-related factors also influence test repetition(2,3).

Information technology can reduce the need for repeat testing by showing test results from the past or the likelihood that a test was abnormal (3). A significant amount of a laboratory's workload can be attributed to needless routine test requests. The practice of repeating a test to ensure its accuracy was historically necessary when testing was performed using instruments with poor analytical precision (4).

The use of electronic health records (EHRs) is purported to facilitate electronic health information exchange (HIE) across providers and systems of care. However, the evidence is mixed as to whether EHRs and HIE systems reduce duplicate diagnostic and laboratory testing, and thus the costs of care. To reduce inappropriate testing can focus on computerized physician order entry (CPOE) systems. Reshaping the electronic request form is a classic intervention that can be coupled with other strategies(5).

There areseveral reseans why unnecessary tests may be under taken.This include

physicians being un

aware of the costs associated with tests,lack of educatin regarding benefit and harm of tests and practising defence medicine(6).

The purpose of this study was to assess the prospective cross-sectional laboratory appropriateness of test repetitions over two months. Therefore, this study aims to identify test repetitions and associated factors among KAP at selected government hospitals in Addis Ababa, Ethiopia.

1.2. Statement of problem

Despite the importance of rational laboratory test utilization, repeated laboratory testing without clear clinical justification remains common in many healthcare facilities. Studies conducted in various countries have reported high rates of unnecessary test repetition, leading to increased healthcare costs and inefficiencies in laboratory services(7). Repetition of tests can have negative impacts on patients, such as delayed diagnosis and inappropriate treatment. In many laboratories, repeated tests are often undocumented to determine root causes (8). In many healthcare settings, lack of standardized guidelines, absence of electronic medical records, poor communication between laboratory professionals and physicians, and limited training on test utilization contribute to repeated testing(9). In our country evidence regarding the magnitude and determinants of laboratory test repetition is limited. Without adequate data, it is difficult for healthcare managers and policymakers to design effective interventions. (10).

In Ethiopia, there is limited data regarding the test repetitions and association factors in the Laboratory services. Therefore, the current cross-sectional study aimed to assess test repetitions and associated factors including KAP in the Laboratory services at selected government hospitals in Addis Ababa, Ethiopia.

1.3.Significance of the study

The findings of this study was provide evidence on the magnitude of laboratory test repetition and identify key contributing factors. The results was help:Healthcare facilities to optimize laboratory resource utilization ,to improve workflow and turnaround time to enhance rational test ordering practices and to develop guidelines and policies on laboratory test utilization

Understanding the amount of usage and possible causes of high test repetition practice would help policymakers, program designers, and implementers to develop a tailored solution that aims to reduce test repeats. Furthermore, this study might provide inspiration and baseline data for future investigations in this field.

2. Literature Review

2.1. Frequency of Repeated Tests

Studies indicate that a significant percentage of laboratory tests are repeated without protocol guidelines. A need to detect a change in a laboratory test over time is widespread in clinical medicine. Of course, in this case, the question is not whether to repeat the test, but how many times and how to interpret the result. The smaller the degree of change that one wishes to detect, the more likely that the combination of within-subject biological variation and analytical imprecision will make that task challenging(11).

The efficiency of laboratory services is crucial for effective healthcare delivery. Test request repetitions, defined as the ordering of the same laboratory tests within a specified timeframe for the same patient, can significantly undermine this efficiency. This literature review explores the frequency of test request repetitions and associated factors in laboratory services. In a study conducted by Carl van Walraven and Michael Raymond are study was conducted in Canada that involved 4 million tests over the course of a year. The majority of tests (76%) were performed on community-dwelling patients(12).

The overall testing rate was 367 tests per 100 persons annually, meaning that over half of the population had at least one laboratory test. Thirty percent of the tests were repeated within a month (109 repeat tests per 100 persons annually). Repetition was concentrated in a small group of individuals, varied widely among tests, and was more prevalent in hospitalized patients(13). Inappropriate laboratory utilization is widely prevalent and explains a significant portion of increased laboratory utilization. The average inappropriate rate of repetetition(IRR) for these nine parameters was 10.6% (14). The IRR was 16.4% in another study by Morgen and Noogler that used data from all laboratories in the Calgary area of Canada and looked at six factors that were identical to those we looked at (15).

In the study, an investigation carried out in Turkey that solely looked at lipid profile repeats revealed that IRRs were carried out more frequently in inpatients (16). According to Cadamuro et al., outpatients are less likely to have needless test repetitions because they have less time to request tests and collect blood, while inpatients are more likely to have needless test repetitions since they are available for

blood collection while they are in the hospital (17).

According to a study conducted in a Turkish university hospital, 35.5% of HbA1 requests were made again prior to 90 days (20). An IRR of 19.89% was found in the same study (18) .The study was composed of 1,350 samples in Brazil which 1,429 repetitions were recorded. After analysis of the data, it was found that from the 1,429 repetitions performed, 1,162 (81.31%) were classified as unnecessary.

According to research, for instance, missed and swapped results resulted in treatment delays and incorrect laboratory diagnoses. Inappropriate test requests, order input, incorrect patient and specimen identification, mistakes in sample collection, hemolysis, clotting, insufficient quantity, improper container, handling, storage, and transportation are among the reasons for errors(19). These mistakes can have a lot of repercussions, such as missed or delayed diagnoses and invasive procedures performed on the wrong patient that are reported for the wrong patient (20).

2.2. Factors influencing the frequency of repeat testing

The techniques used to assess the human factor's contribution to the reliability and security of a system are called the human factor reliability analysis (HRA) (21). The first industry to develop and implement HRA was the nuclear industry (21), concluding that most accidents were due to human error rather than equipment malfunction. Research indicates that test request repetitions are common in Laboratory tests and cost of the health care system (large amounts of money), and their inappropriate use may be associated with other inefficiencies in health care delivery(22-23). Identifying inadequacies in the use of laboratory services may disclose problems in other areas of health care.

A total, 9231 requests for immunoglobulin measurement were repeated during the year, making up 29.6% of the total number of these tests performed. Repeat requests within 12 weeks of a previous request made up 14.6% of the total number of tests(24) . A literature review was performed to identify published guidelines for performing each test, and test-specific time intervals within which a repeat test was unlikely to show clinical change were developed(25). In Ethiopia, research conducted by Fanta Ali, contributing factors for the occurrence of laboratory test errors were 85% of

laboratory professionals who believed in the purchasing system(26)(21).

2.3 knowledge ,Attitudes , and Practices of Health Care Workers

The knoelege,attitude and practice of health care workers (KAP) are important determinantes of laboratory test utilization. Educational fe(27) .

Knowledge of HCWs regarding laboratory test repetetion

Aprimary driver behind inappropriate test repetetionis the variancein baselineclinical knowledge regarding minimum retesting intervals,test cost,and the physiological recovery rates of biomarkers. (28).

Attitude of HCWs towarding laboratory test repetetion

Attitude shapes how clinicians balance risk management against resource optimization.The literature consistantlyidentifiespsychological and institutional factors influencingHCWs mindset (29).

Practice patterns and systemic Drivers of Test Repetitions

The practice components ofKAP highlight's the translation of knowledge and Attitude in to day today operations,demonstrating where standerd protocolsdiverge from reality.ordering habits and routing reflexes in hospital and ICU settings ,the practice of ordering daily standing labs.this habit persists regardlessof changesin the patient baseline physiological status,rendering the repetitions clinically redundant(30).

In this study, we aimed to evaluate laboratory use of institutions in terms of the appropriateness of test repetitions in the 2-month period. Against this background, the purpose of this study is to reduce test repetitions at selected government hospitals in Addis Ababa, Ethiopia.

3. Conceptual framework

The conceptual framework was look at the factors that influence the frequency of

test repetitions of the study.

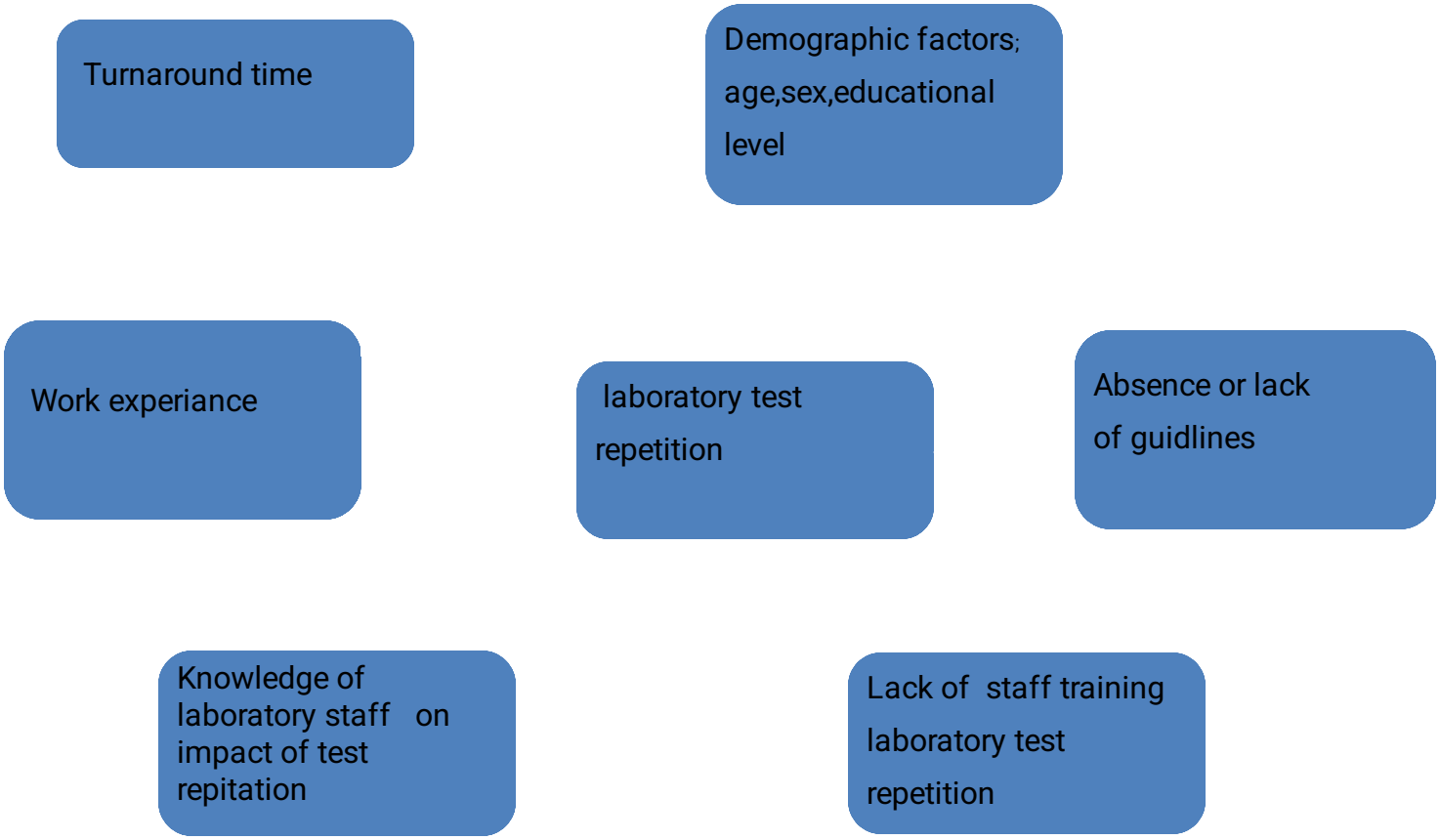


Figure 1: Conceptual framework

4. Objectives

4.1 General Objective

To assess the frequency of test repetitions,KAP of clinical staff and associated factors in the laboratory services at TASH and SPHMMC hospitals in Addis Ababa, Ethiopia

4.2. Specific objectives

To determine the frequency of test repetitions at selected government hospitals in Addis Ababa, Ethiopia.

To identify factors that contributed to test repetitions at selected government hospitals in Addis Ababa, Ethiopia.

To identify the association between test repetitions with health care providers and KAP of HCWs at selected government hospitals in Addis Ababa, Ethiopia.

5. Materials and Methods

5.1. Study Area

The study was conducted in Addis Ababa, the capital city of Ethiopia, at two selected facilities. The study was conducted in 2 public hospitals, which are Tikur Anbesa Specialized Hospitals and St. Paul's Hospital millennium Medical College.

The study was conducted at St. Paul`s Hospital Millennium Medical College and Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia, from feb 2026 to Mar 2026. Those are referral hospitals in Addis Ababa .

SPHMMC is a teaching and a referral hospital located in the western part of Addis Ababa, Gulele Sub-city, Woreda 09. The hospital was built in 1969 E.C., and the medical college started in 2007 G.C. St. Paul`s Hospital Millennium Medical College is a specialized teaching public Hospital in Ethiopia with the mission to provide and promote preventive, curative, and rehabilitative healthcare services in our country. Since then, it has been a source of medical care for the underserved population. The hospital serves over 1000 patients daily. The hospital has over 1700 clinical and non-clinical staff. From these, 860 are clinical staff. The Hospital has different departments, including a diagnostic laboratory, hemodialysis, and kidney transplant department (31).

Tikur Anbessa Specialized Hospital (TASH), with more than 700 beds, is Ethiopia's largest specialized hospital since 1972 and the primary teaching facility for the majority of academic disciplines' preclinical and clinical training. Committed to delivering healthcare services, the TASH staff comprises 115 additional health professionals, 379 nurses, and 200 doctors. Additionally, 950 contract and permanent administrative employees work at the hospital to support its operations(32)

5.2. Study Design and Period

A hospital-based cross-sectional study design was used to assess the test repetitions and associated factors in laboratory service at St.Paulo's Referral Hospital and Tikur Anbesa Specialized Hospital from February 2026 to March2026 in Addis Ababa, Ethiopia.

5.3. Source of population

- All Laboratory tests done during the study period.
- Health providers(general practitioners, residents, specialists, laboratory professionals) who care during the study period.

5.4. Study population

- All participants of healthcare providers at TASH and SPHMMC during the study period are the study population.
- All laboratory repeated tests at TASH and SPHMMC during the study period.

5.5. Sample size determination

The sample size for this particular study was determined by all laboratory test requests performed in selected public hospitals in Addis Ababa during the two -month study period are included, the study was included all eligible tests during study period.In this study, 200 clinicians and all laboratory professionals was involved.

5.6. Sampling method

The data was collected through a search from software (LIS or EMR) all laboratory test requested throw the sudy period and by selecting repeated laboratory tests during the study period . The data obtained was allocated in spreadsheets in Microsoft Excel.

The convenience sampling method was used to record repeated laboratory test requests daily and by Administered self structured questionnaire to the clinicians and laboratory professionals who work during the study period in TASH and SPHMMC from feb 2026 to Mar 2026 in Addis Ababa, Ethiopia.

5.7. Inclusion and exclusion criteria

5.7.1. Inclusion criteria

- All laboratory tests requested during the study period was included in the study.
- All the clinicians and laboratory professionals who work during the study period.

5.7.2. Exclusion criteria

- Clinicians and laboratory professional's who are not willing to participate in the study.
- Test ordered with incomplete information
- Referred tests processed outside the facility.

5.8. Data Collection Methods

Document review: data was collected using daily requested test in the laboratory record log book or computer in order to get the repeated test results, and the data was quantitative, which is going to be analyzed.

A self-administered questionnaire, which is going to be filled out by clinicians and laboratory professional's was distributed and collected by well-trained data collectors who have laboratory professional backgrounds. The collected data was coded and cleaned. A record format in Microsoft Excel was prepared to collect daily test repetition data . Once the data is complete then entered into EpiData and subsequently exported to SPSS version 27 for statistical analysis. Descriptive statistical values was used primarily to summarize our findings.

5.9. Study variables

5.9.1. Dependentvariables

- Repeated Test

5.9.2. Independent variable;

- Socio-demographic factors (educational level of the clinician, Age, Sex)
- Work experience
- Availability of clinical guidelines
- Turnaround time (TAT)
- Communication barriers
- Training on lab test utilization

5.10. Data Quality Assurance

All consecutive laboratory tests during the study period was collected to avoid inappropriate data collection, and intensive supervision of data collectors was made during the entire data collection. Data was collected by two data collectors. One-day

training was given by the principal investigator for data collectors and supervisors on how to collect the necessary data using a structured questionnaire, ethical principles, and data management. Key information in interviews are conducted by the principal investigator.

Expert validity views and suggestions of the advisors was incorporated in the questionnaire, and a pre-test of data collection tools was carried out on 5% of the respondents before conducting the study to obtain feedback and modification. The pre-test was conducted at two government hospitals in Addis Ababa. The principal investigator regularly supervised the data collection, focusing on the completeness and consistency of the collected data. Errors, ambiguities, and incompleteness were addressed before the end of each data collection day. The data was collected in the same language as the tool. In addition, data was entered with assigned codes to address any errors that occur easily.

5.11. Data analysis and interpretation

The data collected was coded, and the coded variables was entered in to Microsoft Excel and analysed using SPSS version 27. The data was analysed, in frequencies and percentages that was presented in tables . In addition, logistic regration analysis was run to determine the associations between the dependent and independent variables.the vaeiabe with P-value less than 0.25 in bivariate analysis was included in the multivariable logestic regression model too identify independent predictors of laboratory test repetetions.A critical value of $p < 0.05$ is considered statistically significant with a 95% confidence interval.

5.12. Operational definition

- Laboratory test repetition.the ordering of the same laboratory test for the same patient within agiven time interval without documented clinical justification.
- Knowledge .the level of understanding of health care workers regarding causes,consquences and prevention of unnecessary laboratory test repetition .
- Attitude .the perception and beliefs of health care workers to wards laboratory test repetition.
- Practice.the routine behaviors of health care workers related to

laboratory test ordering,reviewing previous result and adherence to laboratory guidelines .

- Turnaround time; TAT was calculated using the difference between the test request time and the result release time recorded in the LIS. TAT was categorized as acceptable when results were released within agiven time and delayed when results were released after asetting times.

5.13. Ethical consideration

Ethical clearance was obtained from the Department of Ethics Research Committee (DERC/818/25/MLS), Department of Medical Laboratory Science, School of Medicine, College of Health Sciences, Addis Ababa University. A permission letter was obtained from selected public hospitals to conduct the study. Study participants was informed about the purpose of the study.

5.14. Dissemination of findings

The final results of this study will be submitted to Addis Ababa University, College of Health Science, Department of Medical Laboratory Sciences. Furthermore, it will be shared with TASH & SPHMMC to develop interventional strategies. Finally, the manuscript of the research will be published on appropriate peer-reviewed scientific journals for wider communication.

6. Results

6.1 Socio-Demographic and clinical data distribution of Test repetitions

A total of 30,354 laboratory test records from Tikur Anbessa Specialized Hospital (TASH) and St. Paul's Hospital Millennium Medical College (SPHMMC) were included in the study. Out of the total tests, 11,578(38.1%) of tests; 6,489 (21.4%) from TASH & 5,089 (16.8%) from SPHMMC were repeated, and 18,776(61.9%) tests of the total were not repeated. The majority of repeated laboratory tests occurred among patients aged 19–45 years, followed by those older than 45 years. Age group showed a statistically significant association with test repetition (p =0.002).

More than half of the laboratory tests 17004 (56.0%) were performed at TASH, while 44.4% were conducted at SPHMMC and no significant association was observed between hospital type and test repetition (p = 0.941). In contrast, turnaround time (TAT) status showed a strong significant association, with delayed TAT contributing to a higher proportion of repeated tests (p < 0.001). (Table 1)

Table 1Socio-Demographic and clinical data distribution of Test repetitions in TASH and SPHMMC, (n = 30,354, Addis Ababa, Ethiopia) Pearson's Chi-Square Test

Variables		Test repetitions (n= 30,354)			P-value
		Test repeated 11,578 (38.1%)	Test not repeated 18,776 (61.9%)	Total 30,354 (100%)	
Age group (years)	0-18	2202 (7.3%)	3692 (12.2%)	5894 (19.4%)	0.002
	19-45	5889 (19.4%)	9160 (30.2%)	15049 (49.6%)	
	>45	3487 (11.5%)	5924 (19.5%)	9411 (31.0%)	
Sex	Male	5092 (16.8%)	8283 (27.3%)	13375 (44.1%)	0.818
	Female	6486 (21.4%)	10493 (34.6%)	16979 (55.9%)	

Hospital	TASH	6489 (21.4%)	10515 (34.6%)	17004 (56.0%)	0.941
TAT status	Acceptable	8423 (27.7%)	12072 (39.8%)	20495 (67.5%)	<0.001
	Delayed	3155 (10.4%)	6704 (22.1%)	9859 (32.5%)	

6.2 Bivariate and Multivariable logistic regression analysis of Test repetitions

The bivariate logistic regression analysis, demonstrated that age group and turnaround time were independently associated with laboratory test repetition.

After adjusting for potential confounders in the multivariable logistic regression model, delayed turnaround time remained independently associated with test repetition. Tests with delayed turnaround time were 1.5 times more likely to be repeated compared to those with acceptable turnaround time (AOR = 1.5; 95% CI: (1.41, 1.56). (Table 2)

Table 2Bivariate and Multivariable logistic regression analysis of Test repetitions in TASH and SPHMMC, (n = 30,354, Addis Ababa, Ethiopia)

Variable	Category	Test repetitions (n= 30354)		COR (95% CI)	p-value	AOR (95% CI)	p-value
		Test repeated n (%)	Test not repeated n (%)				
Age group (years)	0-18	2202 (7.3%)	3692 (12.2%)	I		I	
	19-45	5889 (19.4%)	9160 (30.2%)	0.93(0.87, 0.99)	0.018	0.91(0.85, 0.97)	0.004
	>45	3487 (11.5%)	5924 (19.5%)	1.01(0.95, 1.08)	0.702	0.97(0.90, 1.03)	0.322

Sex	Male	5092 (16.8%)	8283 (27.3%)	I		I	
	Female	6486 (21.4%)	10493 (34.6%)	0.99(0.95, 1.04)	0.818	1.02(0.97, 1.07)	0.404
Hospital	TASH	6489 (21.4%)	10515 (34.6%)	I		I	
	SPHMMC	5089 (16.8%)	8261 (27.2%)	1.00(0.96, 1.05)	0.941	1.01(0.97, 1.06)	0.612
TAT status	Acceptable	8423 (27.7%)	12072 (39.8%)	I		I	
	Delayed	3155 (10.4%)	6704 (22.1%)	1.5(1.41, 1.56)	<0.001 x	1.5(1.41, 1.56)	<0.001 x

Note: *Significant association. Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; CI, confidence interval; TAT, turn around time; 1, reference category

6.3 The frequency and percentage analysis of test repetitions by type of tests

The frequency and percentage distribution of repeated laboratory tests showed that the CBC panel accounted for the largest proportion of repeated laboratory tests, followed by urinalysis and electrolyte panels. CBC-related investigations represented more than two-thirds of all repeated tests, highlighting hematology tests as the major contributors to laboratory test repetition in the study hospitals. In contrast, hormonal, microbiology, blood group, and cardiac panels contributed only a small proportion of repeated tests. (Table 3)

Table 3Frequency and percentage analysis of test repetitions of laboratory tests in TASH and SPHMMC, (n = 30,354, Addis Ababa, Ethiopia)

Panel test	Test repetitions		Total(30,354)
	Repeated(11,578)	Not repeated(18,776)	
CBC Panel	7440 (25.1%)	13392 (45.1%)	20832 (70.2%)

Electrolyte panel	567 (1.9%)	915 (3.1%)	1482 (5.0%)
RFT panel	417 (1.4%)	623 (2.1%)	1040 (3.5%)
LFT panel	456 (1.5%)	717 (2.4%)	1173 (4.0%)
Lipid profile panel	68 (0.2%)	84 (0.3%)	152(0.5%)
URINALYSIS panel	1472 (5.0%)	1652 (5.6%)	3124(10.5%)
HORMONAL panel	6(0.0%)	16(0.1%)	22(0.1%)
Glucose panel	398 (1.3%)	363 (1.2%)	761 (2.6%)
Cardiac panel	68(0.2%)	105(0.4%)	173(0.6%)
Microbiology panel	30(0.1%)	41(0.1%)	71(0.2%)
Blood group panel	64(0.2%)	78(0.3%)	142(0.5%)
Other test panel	322 (1.1%)	375(1.3%)	697 (2.4%)

6.4 Socio-Demographic and clinical data distribution of clinical laboratory professionals

Among clinical laboratory professionals, younger age groups and shorter work experience were significantly associated with involvement in test repetition. Most professionals involved in test repetition were aged 25–40 years and had 2–5 years of work experience. Communication frequency with laboratory staff during inconsistent test results also showed a statistically significant association with test repetition. However, sex, educational level, training on laboratory test utilization, communication barriers, and the availability of clear test request guidelines were not significantly associated with test repetition. Table 4

Table 4Socio-Demographic and clinical data distribution of clinical laboratory

professionals in TASH and SPHMMC, (n = 100, Addis Ababa, Ethiopia)

Variables		Involved in repetitions (n= 100)			P-value
		NO n (%)	YES n (%)	Total n (%)	
Age group (years)	25-40	31(31.0%)	45(45.0%)	76(76.0%)	0.01
	>40	17(17.0%)	7(7.0%)	24(24.0%)	
Sex	Male	22(22.0%)	23(23.0%)	45(45.0%)	0.872
	Female	26(26.0%)	29(29.0%)	55(55.0%)	
Work experience	2-5 years	7(7.0%)	22(22.0%)	29(29.0%)	0.002
	>5 years	41(41.0%)	30(30.0%)	71(71.0%)	
Educational level	Diploma	3(3.0%)	5(5.0%)	8(8.0%)	0.824
	BSc	42(42.0%)	44(44.0%)	86(86.0%)	
	MSc & above	3(3.0%)	3(3.0%)	6(6.0%)	
Training for lab test utilization	Yes	13(13.0%)	23(23.0%)	36(36.0%)	0.074
	No	35(35.0%)	29(29.0%)	64(64.0%)	
Communication b/n health workers that reduce repetition	Yes	38(38.8%)	44(44.9%)	82(83.7%)	0.468
	No	9(9.2%)	7(7.1%)	16(16.3%)	
Clear test request guidelines to prevent repetition	Strongly agree	24(24.0%)	18(18.0%)	42(42.0%)	0.119
	Agree	24(24.0%)	34(34.0%)	58(58.0%)	
	Disagree	0(0.0%)	0(0.0%)	0(0.0%)	

I communicate with lab staff during inconsistent test result	Always	3(3.0%)	15(15.0%)	18(18.0%)	<0.001
	Sometimes	9(9.0%)	19(19.0%)	28(28.0%)	
	Rarely	19(19.0%)	17(17.0%)	36(36.0%)	
	Very rarely	17(17.0%)	1(1.0%)	18(18.0%)	

6.5 Bivariate and Multivariable logistic regression analysis of associated factors

After adjustment multivariable logistic regression analysis revealed that work experience and communication practices were significantly associated with involvement in test repetition among laboratory professionals. Professionals with 2–5 years of work experience had significantly higher odds of involvement in test repetition compared to those with more than five years of experience. In addition, professionals who very rarely communicated with laboratory staff during inconsistent test results had significantly lower odds of involvement in test repetition compared to those who always communicated. Age group and educational level were not significant predictors after adjustment. Table 5

Table 5 Bivariate and Multivariable logistic regression analysis of associated factors in test repetitions for Clinical laboratory professionals in TASH and SPHMMC, (n = 100, Addis Ababa, Ethiopia)

Variable		Involved in repetitions (n= 100)		COR (95% CI)	p-value	AOR (95% CI)	p-value
		NO n (%)	YES n (%)				
Age group (years)	25-40	31(31.0%)	45(45.0%)	3.51(1.31, 9.51)	0.013	1.44(0.41, 5.02)	0.571
	>40	17(17.0%)	7(7.0%)	I		I	
Gender	Male	22(22.0%)	23(23.0%)	I			

	Female	26(26.0%)	29(29.0%)	1.07(0.49, 2.35)	0.872		
Work experience	2-5 years	7(7.0%)	22(22.0%)	4.30(1.66, 11.36)	0.003	9.45(1.98, 45.2)	0.005*
	>5 years	41(41.0%)	30(30.0%)	I		I	
Educational level	Diploma	3(3.0%)	5(5.0%)	1.67(0.19, 14.27)	0.641		
	BSc	42(42.0%)	44(44.0%)	1.05(0.20, 5.48)	0.956		
	MSc & above	3(3.0%)	3(3.0%)	I			
I communicate with lab staff during inconsistent test result	Always	3(3.0%)	15(15.0%)	I		I	
	Sometimes	9(9.0%)	19(19.0%)	0.42(0.09, 1.84)	0.251	0.69(0.13, 3.5)	0.650
	Rarely	19(19.0%)	17(17.0%)	0.18(0.04, 0.72)	0.016	0.27(0.06, 1.22)	0.089
	Very rarely	17(17.0%)	1(1.0%)	0.01(0.001, 0.13)	<0.001	0.009(0.001, 0.16)	0.001

Note: *Significant association. Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; CI, confidence interval; 1, reference category

6.6 Socio-Demographic and clinical data distribution of Physicians

The physicians aged 25–40 years, Professional status and those with 2–5 years of work experience were more commonly involved in test repetition, and those variables demonstrated statistically significant associations. Most respondents were specialists and male physicians. All of the participants responded “No” for Training related to laboratory test utilization. Perceptions regarding instrument calibration errors and pre-analytical errors did not show statistically significant associations with test repetition. Table 6

Table 6Socio-Demographic and clinical data distribution of Physicians in TASH and SPHMMC, (n = 200, Addis Ababa, Ethiopia)

Variables		Involved in repetitions (n= 200)			P-value
		NO n (%)	YES n (%)	Total n (%)	
Age group (years)	25-40	20 (10.0%)	46 (23.0%)	66(33.0%)	<0.001
	>40	84(42.0%)	50 (25.0%)	134(67.0%)	
Gender	Male	60(30.0%)	49(24.5%)	109(54.5%)	0.345
	Female	44(22.0%)	47(23.5%)	91(45.5%)	
Work experience	2-5 years	29(14.5%)	53(26.5%)	82(41.0%)	<0.001
	>5 years	75(37.5%)	43(21.5%)	118(59.0%)	
Professional status	General practitioner	35(17,5%)	45(22.5%)	80(40.0%)	0.024
	Specialist	72(36.0%)	48(24.0%)	120(60.0%)	
Training related to laboratory test utilization	No	104(52.0%)	96(48.0%)	200(100%)	
	Yes	0(0.0%)	0(0.0%)	0(0.0%)	
Instrument calibration errors can contribute to test repetition	No	50(25.0%)	50(25.0%))	100(50.0%)	0.571
	Yes	54(27.0%))	46(23.0%))	100(50.0%)	
Repeat testing does not waste lab resources	Strongly agree	0(0.0%)	0(0.0%)	0(0.0%)	0.325
	Agree	0(0.0%)	0(0.0%)	0(0.0%)	
	Neutral	0(0.0%)	0(0.0%)	0(0.0%)	
	Disagree	56(28.0%)	45(22.5%)	101(50.5%)	

	Strongly disagree	48(24.0%)	51(25.5%)	99(49.5%)	
Pre-analytical errors can lead to unnecessary test repetition	No	56(28.0%)	45(22.5%)	101(50.5%)	0.325
	Yes	48(24.0%)	51(25.5%)	99(49.5%)	

6.7 Bivariate and Multivariable logistic regression analysis of associated factors

The adjusted logistic regression analysis showed that physician age group, work experience, and professional status were significantly associated with involvement in test repetition. Physicians older than 40 years had lower odds of involvement in test repetition compared to younger physicians. Those with 2–5 years of work experience had higher odds of involvement in test repetition than physicians with more than five years of experience. Specialists had significantly lower odds of involvement in test repetition compared to General practitioners. Perceptions regarding pre-analytical and instrument calibration errors were not significantly associated with test repetition after adjustment. Table 7

Table 7 Bivariate and Multivariable logistic regression analysis of associated factors in test repetitions for Physicians in TASH and SPHMMC, (n = 200, Addis Ababa, Ethiopia)

Variables		Involved in repetitions (n= 200)		COR (95% CI)	P-value	AOR (95% CI)	P-value
		NO n (%)	YES n (%)				
Age group (years)	25-40	20 (10.0%)	46 (23.0%)	I		I	
	>40	84(42.0%)	50 (25.0%)	0.259(0.14, 0.49)	<0.001	0.22(0.09, 0.53)	<0.001
Sex	Male	60(30.0%)	49(24.5%)	I		I	
							0.137

	Female	44(22.0%)	47(23.5%)	1.31(0.75, 2.29)	0.346	0.58(0.28, 1.19)	
Work experience	2-5 years	29(14.5%)	53(26.5%)	3.19(1.77, 5.74)	<0.001	2.59(1.36, 6.40)	0.006
	>5 years	75(37.5%)	43(21.5%)	I		I	
Professional status	General practitioner	35(17,5%)	45(22.5%)	1.93(1.09, 3.42)	0.025	1.24(0.64, 2.37)	0.526
	Specialist	72(36.0%)	48(24.0%)	I			
Pre-analytical errors can lead to unnecessary test repetition	No	56(28.0%)	45(22.5%)	1.32(0.76, 2.31)	0.325	1.13(0.59, 2.14)	0.707
	Yes	48(24.0%)	51(25.5%)	I			
Instrument calibration errors	No	50(25.0%)	50(25.0%)	I			
	Yes	54(27.0%)	46(23.0%)	1.17(0.67, 2.05)	0.571	1.04(0.55, 1.96)	0.914

Note: *Significant association. Abbreviations: AOR, adjusted odds ratio; COR, crude odds ratio; CI, confidence interval; 1, reference category

6.8 Knowledge, Attitude and Practice of clinical laboratory professionals regarding test repetition in TASH & SPHMMC

The findings indicate that most laboratory professionals had good knowledge regarding factors contributing to test repetition. All respondents (100%) agreed that quality control measures help minimize unnecessary test repeats, while 68% recognized the importance of standard operating procedures and proper patient identification in reducing test repetition. However, only 36% had received training

related to laboratory test utilization or quality management. Furthermore, 70% acknowledged that pre-analytical errors can lead to unnecessary test repetition, highlighting awareness of quality-related factors affecting laboratory services.

Table 8Knowledge, Attitude and Practice of clinical laboratory professionals regarding test repetition in TASH & SPHMMC, (N=100, Addis Ababa, Ethiopia)

Variables	Frequency	Percent (%)
Instrument calibration errors can contribute to test repetition		
Yes	65	65.0
No	35	35.0
Quality control measures help minimize unnecessary test repeats		
Yes	100	100.0
No	0	0.0
Clear test request guidelines reduce unnecessary repeat tests.		
Strongly agree	42	42.0
Agree	58	58.0
Disagree	0	0.0
Sample handling errors do not influence test repetition		
Yes	18	18.0
No	82	82.0
Standard operating procedures (SOPs) help reduce avoidable test repetitions.		
Yes	68	68.0
No	32	32.0
Proper patient identification reduces laboratory test repetition rates		
Yes	68	68.0

No	32	32.0
I communicate with laboratory staff when test results seem inconsistent		
Always	18	18.0
Sometimes	28	28.0
Rarely	36	36.0
Very rarely	18	18.0
Pre-analytical errors can lead to unnecessary laboratory test repetition.		
Yes		70.0
70		30.0
No		
30		

6.9 Knowledge, Attitude and Practice of Physicians regarding test repetition in TASH & SPHMMC

Most physicians demonstrated positive attitudes toward minimizing laboratory test repetition. All respondents agreed that clear test request guidelines reduce unnecessary repeat testing and that test repetitions increase laboratory workload and operational costs. However, none of the physicians had received training on laboratory test utilization or quality management, and none reported consistently documenting reasons for repeated tests or reviewing previous laboratory results before ordering repeat investigations. These findings suggest gaps in utilization practices despite good awareness of the consequences of unnecessary test repetition

Table 9Knowledge, Attitude and Practice of Physicians regarding test repetition in TASH & SPHMMC, (N=200, Addis Ababa, Ethiopia)

Variables	Frequency	Percent (%)
Instrument calibration errors can contribute to test repetition		
Yes	100	50.0
No	100	50.0

Clear test request guidelines reduce unnecessary repeat tests.		
Agree	200	100.0
Disagree	0	0.0
Test repetitions increase laboratory workload and operational costs.		
Yes	200	100.0
No	0	0.0
I document reasons for repeating laboratory tests Always	0	0.0
Sometimes	0	0.0
Never	200	100.0
Have you received training related to laboratory test utilization or quality management?		
Yes	0	0.0
No	200	100.0
I review previous test results before ordering repeat tests.		
Always	0.0	0.0
Sometimes	200	100.0
Very rarely	0.0	0.0
I communicate with laboratory staff when test results seem inconsistent		
Always	36	18.0
Sometimes	56	28.0
Rarely	72	36.0
Very rarely	36	18.0
Pre-analytical errors can lead to unnecessary laboratory test repetition.		
Yes		49.5

99	50.5
No	
101	

7. Discussion

This study assessed a total of 30,354 laboratory test records from Tikur Anbessa Specialized Hospital (TASH) and St. Paul's Hospital Millennium Medical College (SPHMMC), and a all clinical laboratory staff and 200 physicians were included in the study. The findings demonstrated that turnaround time (TAT), patient age, work experience of laboratory professionals and physicians, and communication practices were important factors associated with laboratory test repetition. In addition, CBC panel tests accounted for the largest proportion of repeated laboratory investigations.

The current study found that CBC panel tests represented the majority of repeated laboratory investigations. This finding may be explained by the high clinical demand for hematology tests in routine patient monitoring, emergency care, and inpatient follow-up. Similar studies have shown that hematology-related investigations are among the most frequently requested laboratory tests and are highly affected by workload and TAT challenges. Furthermore, specimen-related problems and pre-analytical errors in laboratory testing can increase repeated sample collection and repeated testing. [17-19].

In this study, delayed turnaround time was significantly associated with laboratory test repetition. Tests with delayed TAT had approximately 1.5 times higher odds of being repeated compared with tests reported within the acceptable TAT. This finding is consistent with studies conducted in Ethiopia and other countries, which reported that prolonged TAT negatively affects laboratory efficiency, clinician satisfaction, and patient management [18, 20]. Delayed reporting of laboratory results may lead clinicians to request repeated tests because of uncertainty regarding the availability or reliability of previous results. Similar Ethiopian studies also identified workload, laboratory information system interruptions, staffing shortages, and analyzer-related problems as major contributors to delayed TAT and repeated laboratory activities [21].

The study also demonstrated that laboratory professionals with shorter work experience were more likely to be involved in test repetition compared with those having longer work experience. This finding is supported by previous studies showing that inadequate practical experience, limited familiarity with laboratory workflows, and insufficient competency in result verification may contribute to laboratory inefficiencies and repeated testing. Experienced professionals may better

recognize pre-analytical, analytical, and post-analytical errors, thereby minimizing unnecessary repetitions. [22]

Among physicians, those with shorter work experience had significantly higher odds of involvement in test repetition compared with more experienced physicians. This may reflect differences in clinical decision-making confidence and laboratory test utilization practices. Less experienced physicians may request repeat investigations more frequently to confirm results or monitor patient conditions more closely. Professional status was also associated with test repetition among physicians. General practitioners had higher odds of involvement in repeated testing compared with specialists [16, 23].

Communication practices among laboratory professionals showed an association with test repetition. Poor or infrequent communication between laboratory staff and clinicians may contribute to misunderstanding of test requests, delayed clarification of inconsistent results, and unnecessary repeat ordering. A similar study showed that effective communication is essential for improving laboratory utilization, reducing duplicate testing, and enhancing patient care quality. [16].

Most laboratory professionals and physicians demonstrated good knowledge regarding factors contributing to laboratory test repetition. However, formal training on laboratory test utilization was limited among laboratory professionals and absent among physicians, indicating a potential gap in continuous professional development.

Overall, the findings of this study indicate that laboratory test repetition is a multifactorial problem influenced by delayed turnaround time, staff experience, communication practices, and high utilization of laboratory tests. Strengthening laboratory workflow systems, improving TAT performance, enhancing staff training, and promoting effective clinician–laboratory communication may help reduce unnecessary laboratory test repetition and improve the quality of laboratory services.

8. Conclusion

This study identified laboratory test repetition as a significant quality and efficiency issue in two hospitals, TASH & SPHMMC in Addis Ababa. The findings indicate that test repetition is predominantly influenced by different factors, particularly delayed delayed turnaround time, staff experience, communication practices, and high utilization of laboratory tests. High repetition of routine tests such as complete blood count, urinalysis, and electrolyte panals further highlights gaps in laboratory workflow efficiency and result management.

9. Recommendations

In line with ISO 15189 requirements for medical laboratory quality and competence, it is recommended that laboratories routinely monitor and evaluate turnaround time as a key quality indicator and implement corrective actions for identified delays. Strengthening pre-analytical, analytical, and post-analytical processes through standardized operating procedures and improved workflow coordination is essential to reduce repeat testing. Targeted competency-based training, mentorship, and periodic performance assessments should be prioritized for less-experienced laboratory professionals to minimize errors leading to test repetition.

Additionally, enhancing laboratory–clinician communication and establishing institutional test utilization guidelines may further reduce unnecessary repeat orders. Collectively, these measures was support accreditation efforts, improve service efficiency, optimize resource utilization, and enhance the overall quality of laboratory services.

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7. Annexes

Annex 1. Participant Information Sheet

Research Title: Assessment of test repetitions and associated factors including KAP of HCWs in laboratory service at selected public hospitals in Addis Ababa, Ethiopia.

Principal Investigator: Lubaba Teshome [+251933678812, lubeteshom8812@gmail.com]

Institution: Addis Ababa University, College of Health Sciences, Department of Medical Laboratory Science

Advisors: Daniel Beshah (Ph.D.), [+251911151317, danibeshah@gmail.com].

Dr Kassu Desta (PhD.),[0911107099,kasudesta@Gmail .com].

Mr Kasalem Desie (MSc ,PhD candidates),[0930716600,

Dear Participant, you are invited to participate in a research study conducted by Lubaba Teshome, and MSc student from Addis Ababa University, College of Health Sciences, Department of Medical Laboratory Sciences. The study aims to assess test repetitions and associated factors in selected public hospitals in Addis Ababa, Ethiopia.

Study Purpose: - The purpose of this research is to reduce test repetitions and associated factors in the laboratory services.

Your Participation: - Your participation in this study was voluntary. If you agree to participate, you may be asked to share your experiences, perceptions, and opinions related to the influence of test repetitions and associated factors. Your input was crucial in contributing to a comprehensive understanding of the topic.

Confidentiality: - Your identity and personal information was kept confidential. Data collected will be used for research purposes only and isn.t disclosed to any unauthorized individuals. Your anonymity was strictly maintained in any reports or publications resulting from this research.

Benefits and Risks: - While there are no direct benefits to you, your participation was contribute to the advancement of knowledge in the influence of the Laboratory test

trepetitions and associated factors.
Procedures: - You was required to fill out a questionnaire if you decide to take part. It is estimated that your participation is take about ten minutes.
Ethical Considerations: - This study had received ethical approval from the relevant ethics committee at Addis Ababa University. Your participation in this study is subject to your voluntary agreement after understanding the information provided in this participant information sheet.
Consent: By agreeing to participate, you indicate that you have read and understood this information sheet. You were provided with a consent form to sign before participating in the study.
Contact Information: - If you have any questions or concerns about the study, you may contact Lubaba Teshome [+251933678812, lubeteshom17@gmail.com] or the advisor, Daniel Beshah (Ph.D.), [+251911151317, danibeshah@gmail.com].

Thank you for considering participating in this research study.
Sincerely,
Lubababa Teshome
Principal Investigator
Addis Ababa University, College of Health Sciences, Department of Medical Laboratory Sciences
[+251933678812, lubeteshom8812@gmail.com]

Annex 2. Consent Form (study participants)

Principal investigator: Lubaba Teshome

Research title: Assessment of test repetitions and associated factors including KAPof HCWs in the laboratory services at selected public hospitals in Addis Ababa, Ethiopia.

I have read this document read to me in a language that I understand, and I understand the purposes, procedures, and risks of this research project as described within it. I understand that at any time I may withdraw from this study without giving a reason. I have had an opportunity to ask questions, and I am satisfied with the answers I have received. I know that there are no special payment for being a participant in the study. I freely agree to participate in this study, as described. I understand that I was given a signed copy of this document to keep.

Participant

Code of participant_____ Age___ Address_____ Signature_____ Date_____

Interviewer

Name _____ Signature_____ Date_____

Principal Investigator

Name: Lubaba Teshome Signature_____ Date_____

First of all, I would like to thank you in advance for your cooperation and consent to participate in the study. Please read the general information about the study and ask freely if you have any questions regarding the study

Annex 3: Structured KAP Questionnaire for Health Care Workers

Study title: Assessment of Test Repetitions and Associated Factors in the Laboratory Services including knowledge,attitude and practice for healthcare workers at Selected Government Hospitals in Addis Ababa, Ethiopia.

Instruction: Please tick ( ) the appropriate response. All information will remain confidential and will be used only for research purposes.

1. Age (years): _____

2. Sex: Male Female

3. Professional category: Intern General Practitioner Specialist Laboratory Professional Other (specify): _____

4. Educational level: Diploma BSc MSc and above

5. Work experience: _____

6. Department / Unit: _____

7. Have you received training related to laboratory test utilization or quality management?

Yes No

8.Repeating a laboratory test may be necessary if the sample quality is compromised.

Yes No

9.Pre-analytical errors can lead to unnecessary laboratory test repetition.

Yes No

10.Standard operating procedures (SOPs) help reduce avoidable test repetitions.

Yes No

11.Proper patient identification reduces laboratory test repetition rates.

Yes No

12.Instrument calibration errors can contribute to test repetition.

Yes No

13.Test repetitions increase laboratory workload and operational costs.

Yes No

14. Sample handling errors do not influence test repetition.

Yes No

15. Repeat testing is always caused by laboratory equipment failure.

Yes No

16.Quality control measures help minimize unnecessary test repeats.

Yes No

17.Repeating laboratory tests never affects patient care outcomes.

Yes No

18.All repeated laboratory tests are clinically justified.

Yes No

19. Test repetition may delay patient diagnosis and treatment.

Yes No

20.Test repetition has no financial impact on healthcare systems.

Yes No

21. Communication between clinicians and laboratory staff reduces repeat testing.

Yes No

22.Developing countries do not experience test repetition problems.

Yes No

23.Reducing unnecessary test repetition is essential for quality patient care.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

24. Reducing test repetition is not a priority in busy healthcare settings.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

25.Continuous training can reduce laboratory test repetitions.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

26. Clinicians should not be concerned about laboratory test repetition

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

27. Minimizing repeat testing improves patient satisfaction.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

28.Efficient laboratory practices reduce healthcare costs.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

29. Clear test request guidelines reduce unnecessary repeat tests.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

30.Test repetition data should be used for quality improvement.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

31.Test repetition is an unavoidable part of laboratory services.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

32. Clinicians and laboratory staff should jointly address test repetition issues.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

33.. Test repetition should be regularly monitored and audited.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

34..Repeat testing does not waste laboratory resources.

A.Strongly agree B.Agree C.Neutral D.Disagree E.Strongly Disagree

35.I verify patient identification before requesting or performing laboratory tests.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

36. I rarely follow guidelines when ordering laboratory tests.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

37. I document reasons for repeating laboratory tests.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

38.I review previous test results before ordering repeat tests.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

39 I participate in quality improvement activities related to laboratory test utilization.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

40. I communicate with laboratory staff when test results seem inconsistent

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

41. I attend training related to laboratory quality and test utilization.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

42.I repeat tests routinely without clinical justification.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

43. I follow standard guidelines when requesting laboratory tests.

A.Always B.Sometimes C.Rarely D.Very Rarely E.Never

Declaration

The undersigned declares that this proposal complies with the regulations of the university and meets the accepted standerds with respect to orginality and quality.Plalso agrees to accept responsibility for the scientific ethical and technical conduct of research project and for provision of required progress reports.

M.Sc candidate, Lubaba Teshome
Singnature:----------
Date of submission: ----------
This proposal has been submitted with our approval as advisors.

Advisors
1. Dr. Daniel beshah (M.Sc, phD)

Singnature:----------

Date: ----------

Place Addis Ababa,Ethiopia

2.Dr Kassu Desta (MSc ,PhD)

Singnature:----------

Date: ----------

3.Mr. Kasalem Desie

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