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DEPARTMENT OF MEDICAL LABORATORY SCIENCES

Bio Risk Management Practices and associated factors among Hospital Laboratories in Addis Ababa, Ethiopia

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1. Introduction

1.1 Background

Laboratory services are an essential and fundamental part of all health systems. Reliable and timely laboratory tests are at the center of the efficient treatment of patients. Moreover, prevention and management of infectious and non-communicable diseases require accurate laboratory diagnostic information. (1)

Injuries through infected needles and sharp cutting instruments encountered in diagnostic procedures represent potential sources of laboratory-acquired infections. These infections could result in poor performance of laboratory personnel and, in extreme cases, loss of infected laboratory staff (2). Laboratory-acquired infections involving contagious diseases have also demonstrated the potential to spread beyond the laboratory into the general community at large (3).

Biorisk is a combination of the probability of occurrence of harm and the severity of that harm where the source of harm is a biological agent or toxin. The source of harm may be an unintentional exposure, accidental release or loss, theft, misuse, diversion, unauthorized access or intentional unauthorized release (3).

Biorisk management is the effective management of risks posed by working with infectious agents and toxins in laboratories; it includes a range of practices and procedures to ensure the biosecurity, biosafety, and bio containment of those infectious agents and toxins. Biorisk management includes the full spectrum of safety and security measures for laboratories, from standard operating procedures to physical measures to individual practices in the laboratory (1).

There forBiosafety and biosecurity are fundamental bio risk management practices that should be employed in all biological laboratories (2).

Biosafety is the combination of practices, procedures, and equipment that protect laboratory workers, the public, and the environment from the infectious agents and toxins used in the laboratory. BiosafetyEquipment includes Personal Protective Equipment, biosafety cabinets, and other specially designed devices. Biosafety also includes practices such as Standard Microbiological Practices and the practices identified for each biosafety level in Biosafety in Microbiological and Biomedical Laboratories(1). Laboratory biosecurity describes the protection, control and accountability for biological agents and toxins within laboratories, in order to prevent their loss, theft, misuse, diversion of, unauthorized access or intentional unauthorized release(3).

All procedures in the diagnostic medical laboratories are associated with risks. Laboratory personnel handling clinical samples containing highly infectious agents are at a high risk of contracting laboratory-acquired infection. This risk is particularly high for those working in microbiological laboratories(4, 5).

Most risk from biological hazards can be reduced through engineering controls, personal protection, the use of appropriate microbiological techniques and procedures, and decontamination. Engineering controls in the laboratory include control of the laboratory ventilation (e.g., negative pressure laboratories), biological safety cabinets, sealed centrifuge rotors and buckets, and other devices designed to minimize exposure to infection. Personal protective devices available for the laboratory include laboratory coats and surgical gowns, gloves, safety glasses and visors, and occupational health Services including vaccination and immunization. Appropriate microbiological techniques include standard operating procedures that incorporate "universal precautions" (e.g., avoidance of "sharps"; rules prohibiting eating, drinking, smoking and application of cosmetics in the laboratory; and requiring

Regular hand-washing) designed to minimize exposure to infection. Each laboratory should use an appropriate disinfectant based on its efficacy against the organisms (6).

Previously; as the best of my capacity for searching related publication and review in Ethiopia bio risk management practices and associated factors in clinical laboratory of hospitals have not been assessed. Therefore, this study will designed to assess bio risk management and among Addis Ababa hospitals laboratories and its associated factors.

1.2. Statement of the problem

Health care workers are exposed to many microbiological agents that are present in patients and patients sample. There is an increased risk in developing countries of acquiring blood borne pathogens through occupational exposure, due to combination of higher prevalence of infections and fewer safety precautions. Every year, at least half a million people contract human immunodeficiency virus (HIV) in healthcare settings .WHO estimate that the global burden of disease due to occupational exposure to of HIV infection (4.4%) among health care workers to be attributable to percutaneous injuries (22).

Another study in Egypt showed the mean rate of needle stick injury to be 4.9 per worker per year (27).Similar observational have been made in Pakistan and Yemen .WHO estimates that occupational

exposures cause approximately 10000 HBV infection AND 3500 HCV infection per year among healthcare worker in the region (23).

Many laboratories around the world face challenges due to varying levels of organizational and financial resources to mitigate bio risks. Many laboratories do not have the institutional guidance to address their safety or security risks, or the programs and management systems in place are *ad hoc* and not fully supported by management(7).

Several laboratory-associated infections have occurred in different parts of the world involving both known and previously unknown agents(8).The largest survey of infections was reported in 1976 by Pike, who found that 4079 laboratory-acquired infections were due to 159 agents, although 10 agents accounted for >50% of the .cases at least 173 deaths have resulted from laboratory-acquired infection(9).

Surveys of diagnostic laboratory workers in the United Kingdom conducted since 1971 have reported that tuberculosis and enteric infections (especially shigellosis) were the most common laboratory-acquired infections (21).The risk of developing tuberculosis among laboratory workers estimated at 3 to 9 times higher than the general population(10).Laboratory-acquired infections involving contagious diseases have also demonstrated the potential to spread beyond the laboratory into the general community at large(11).

Studies indicate that most hospitals in developing countries, especially those in Africa, have rudimentary and highly compromised infection control programs owing to the lack of awareness of the problem; lack of personnel trained in infection control practices; inadequate and aging

infrastructure; irregular supply of gloves, masks, and disinfectants; and poor laboratory backup(12). The situation in private and public clinical diagnostic laboratories that constitute an integral part of most hospitals in Nigeria is unlikely to be any different. The need for continuous risk assessment and review of laboratory practices to ensure safe working environment which should complement other risk management processes in the laboratory (13).In Ethiopia, there is currently legislative guideline for Biorisk management Practice, but no enforcing in clinical laboratories.

1.3. Significance of the study

Regular monitoring and assessment of diagnostic laboratories for biorisk management practice will not only promote a safer working environment, but could also impact greatly on maintaining qualitative laboratory service delivery. At present, very few reports exist on bio risk management practise and associated factor diagnostic laboratories in Ethiopia. Against this background, the aim of this study will be.

The findings which will be obtained from this study will helps to update Hospital laboratory management on Justification for space and equipment need; Evaluation of exchanges and workflow with other laboratories/units and quality laboratory service selection for hospital use.

This research is highly valuable for policy makers and decision to alert the problem in the area.

This study will be used as baseline data by international agencies and nongovernmental Organization in strengthening the capacity of laboratories in Ethiopia for better service delivery.

2 Literature Review

There are many studies in different part of the world regarding assessment of bio risk management practise in clinical laboratory among them a cross-sectional study which was conducted , among 223 laboratory personnel of 4 selected governmental hospitals in Bangkok. The finding that all participants, who voluntarily participated, were interviewed using a structured questionnaire towards biosafety practices the majority of the studied personnel had finished undergraduate degrees and higher (55% to 63.6%) (14).

Another study conducted in 2011 on bio risk management clinical laboratory in kirsch Out of these 60 labs. 83% of these laboratories do not have any association with any professional organization. Almost 91.7% have no standard operating procedures (SOPs) in place and no locally developed Biosafety manual for reference as per Bio risk management standards. Appropriate biohazard signage was found in only 8.3% of the laboratories; in the level of Biosafety management in place in these laboratories was not adequate, with 75% demonstrating no commitment to Biosafety and Biosecurity at their facility. In 21.6% of the labs, these plans were being developed, while about 3.4% had already developed clearly defined roles and responsibilities in this context. An occupational health program was not implemented in 45% of these laboratories. 30% of the laboratories' shave – adequate illumination, properly secured shelving, and ease of cleaning. 1.7% were taking into account PPE waste products to the public waste area is customary at 68.3% of the labs, while 12% add autoclaving before disposal .In 82% of the surveyed labs, no formal or informal training for Biosecurity was available(15).

A cross sectional study was carried out to study the safety measures being adopted in clinical laboratories of India. Heads of laboratories of teaching hospitals of India were subjected to a standardized, pretested questionnaire. 73 % of laboratories had safety education program regarding hazards. In 91% of laboratories staff is using protective clothing while working in laboratories.

Hazardous material regulations are followed in 78% of laboratories. Regular health check-ups are carried among laboratory staff in 43.4% of laboratories. Safety manual is available in 56.5% of laboratories. 73.9% of laboratories are equipped with fire extinguishers. Fume cupboards are provided in 34.7% of laboratories and they are regularly checked in 87.5% of these laboratories. In 78.26% of laboratories suitable measures are taken to minimize formation of aerosols. In 95.6% of laboratories waste is disposed of as per bio-medical waste management handling rules (16).

Study done by Bankoll, H*etal,* 2013 in Nigeriaon Bio risk Assessment of Medical Diagnostic Laboratories. The results showed the presence of an isolated unit for microbiological work, leak proof working benches, self-closing doors, emergency exits, fire extinguisher(s), autoclaves, and hand washing sink, in 21.3%, 71.3%, 15.0%, 1.3%, 11.3%, 82.5%, and 67.5%, respectively, of all laboratories surveyed. It was observed that public diagnostic laboratories were significantly more likely to have an isolated unit for microbiological work, hand washing sink , and an autoclave than private ones. Routine use of hand gloves, biosafety cabinet, and a first aid box was observed in 35.0%, 20.0%, and 2.5%, respectively, of all laboratories examined. Written standard operating procedures, biosafety manuals, and biohazard signs on door entrances were observed in 6.3%, 1.3%, and 3.8%, respectively, of all audited laboratories. No biosafety officer(s) or records of previous spills, or injuries and accidents, were observed in all diagnostic laboratories studied. In all laboratories (public and private) surveyed, marked deficiencies was observed in the area of administrative control responsible for implementing biosafety (17).

Another study was conducted in 2009 by Adel Hussein E.**i**nKhartoum to evaluate the biosafety precautions. A total of 190 laboratories were surveyed about their compliance with standard biosafety precautions. The study found that 32 (16.8%) of labs appointed Biosafety officers, 45 (23.7%) labs had a written standard operation procedures (SOPs), and 35 (18.4%) had written procedures for the lean-up of spills. Of the total number, 112 (58.9%) lab staff usually wear lab-coat in all labs procedures, 72 (37.9) sometime do that and 6 (3.2%) never wear it during work time. Regarding eating and drinking inside the labs, only 6 (3.2%) of lab staff do that usually 117 (61.6%). Of the investigated labs stated that gloves worn in all laboratory procedures and 166 (87.4%) labs indicated that they practiced hand washing before and after each laboratory procedures. Drinking water was available in 172 (90.5%) labs and toilet for both male and female were provided in 99 (52.1%) SudanOnly 24 (12.6%) laboratories had separated room for sampling. ,. Also, only 5 (2.6%) laboratories had waste container chemical materials. Fire alarm system was found in 2 (1.1%) laboratories, fire extinguisher in 39 (20.5%) labs, and fire emergency exit found in 14 (7.4%) labs (18). Another study was done by Henry Mogaroetal 2018 in Kenyaon Comparative Assessment of Private and Public Medical Diagnostic Laboratories showed that. phlebotomy room (20.4%), hand-washing sinks (71.7%), laboratory access controlled (24.7%), inventory for valuable biological materials (16.8%), portable fire extinguishers (23%), emergency exits (15.9%), issuance of appropriate vaccination (60.2%), presence of a trained biosafety officer (60.2%), availability of equipment SOPs (86.7%), biosafety cabinets (48.7%), color-coded waste disposal bins (15.9%), laboratory waste segregation (50.4%). Private laboratories were more likely than their public, Remarkable deficiencies were noted on attributes of fire prevention and protection, administrative control, and personal protective devices. Enhanced training on biosafety and biosecurity is likely to improve compliance with biorisk codes in Kenya (19).

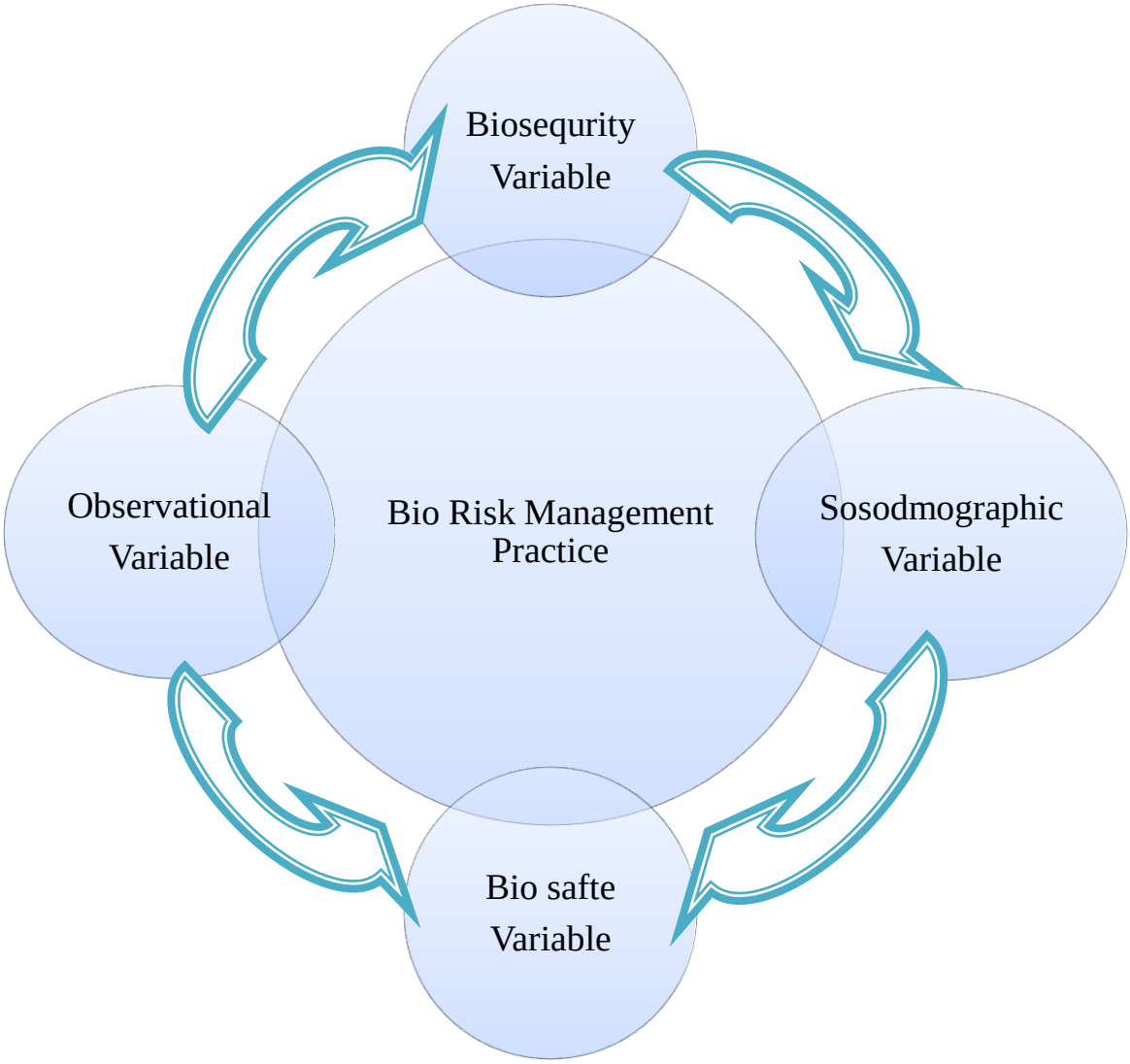

Fig. 1 Conceptual Frame Work for the of Dependent and Potential Independent Factors of Bio Risk Management Practice, Addis Ababa, 2019

3 Objective of the study

3.1. General objective

To asses bio risk management practices and associated factors among private and governmental hospital laboratories in Addis Ababa, Ethiopia

3.2 Specific objectives

To asses current practise of bio risk management among hospital laboratories in Addis Ababa, Ethiopia

To identify factors associated with bio risk management practices among hospital laboratories in Addis Ababa, Ethiopia

To compare bio risk management practice in private and governmental hospital laboratory in Addis Ababa, Ethiopia..

4. Study Materials and Methods

4.1. Study area

Addis Ababa is the capital city of Ethiopia with an area of 530 km2 and a total population of 3.4 million and it has 10 sub cities(20).

The study was conducted in hospitals found in Addis Ababa 14 governmentaland 14 randomly selected (lottery method) privet hospital laboratories. Namely, in governmental hospital: TikurAnbessa specialized hospital which is the largest tertiary and teaching referral hospitals in the country, St. Paul's Referral Hospital which is the second largest tertiary and teaching referral hospitals in the country , St. Peter's TB Specialized Hospital, Alert Center , St. Amanuel Mental Specialized Hospital, Minilik II Referal Hospital, Yekatite 12 Hospital, Zewditu Memorial Hospital, Gandi Memorial Hospital, RasDestaDamtew Memorandum Hospital , Tirunesh Beijing Hospital, Federal Police Referral Hospitals, Federal Prison administration general hospital and Armed Force Referraland Teaching Hospitaland.in private:Saint Gabriel general hospital, Tibebu general hospital, Hayat hospital(Teaching Hospital), bethzatha General hospital, Dinberua hospital, Addis Hiwotplc,St Yared General hospital, Tezena General Hospital, Girum Hospital, , Kadisco General Hospital, Landmark Hospital, International cardiovascular Hospital, Addis Specialized cardiac Hospital, Bethel Hospital.

4.2. Study design

An institutional based Cross sectional study designs were employed to asses bio risk management practices and associated factors among hospital laboratories in Addis Ababa, Ethiopia

4.3. Study period

This study was conducted between February and April 2019 at government and private hospitals of Addis Ababa, Ethiopia

4.4. Population

4.4.1. Source population

Clinical laboratories in Addis Ababa governmental and private Hospitals and professionals working in the selected health facilities

4.4.2. Study population

Selected clinical laboratory Clinical laboratories in hospital settings and professional working in the selected health facility

4.5. Inclusion and exclusion criteria

4.5.1. Inclusion Criteria

Clinical laboratory in hospital setting found in government and selected private hospitals in Addis Ababa

Service year more than one year

4.5.2. Exclusion Criteria

Laboratories were not willing to participate in the study.

Professionals who were not willing to participate in the study

Service years less than one year

4.6. Study variable

4.6.1. Dependant/ outcome Variable**:**

- Bio risk management practices

4**.6.2.** Independent/Explanatory Variables**:**

- Age
- sex
- Marital Status
- Level of Education
- Work Experience :
- Biosafety practice

4.7. Sample size calculation and Sampling method

4.7.1. Sample Size Calculation

Laboratory professional in the selected hospitals willing to participate during the study period included. Sample size is calculated according to the sample size equation for single population formula N = Z^2 pq/d^2 ,were n = number of study population participated in the study, Z = constant, p= previous data, q = 1-p, d = level of confidence

From 28 hospital based clinical laboratory 367 laboratory workers were participated.

4.7.2. Sampling Technique

Simple random sampling technique were be used .to assess the bio risk and associated factor in selecting laboratories

In general, all government hospital laboratories were selected based on purposive sampling technique. On the other hand private hospital laboratories were selected based on simple random sampling. Finally all willing laboratory professionals working in those selected hospital laboratories were participated

From a total of 367 clinical laboratory (285 governmental and 82 private workers), the numbers of workers were proportionally allocated based on the number of workers in the hospital, Allocated based on proportional to size of the laboratory professionals found in each hospital.

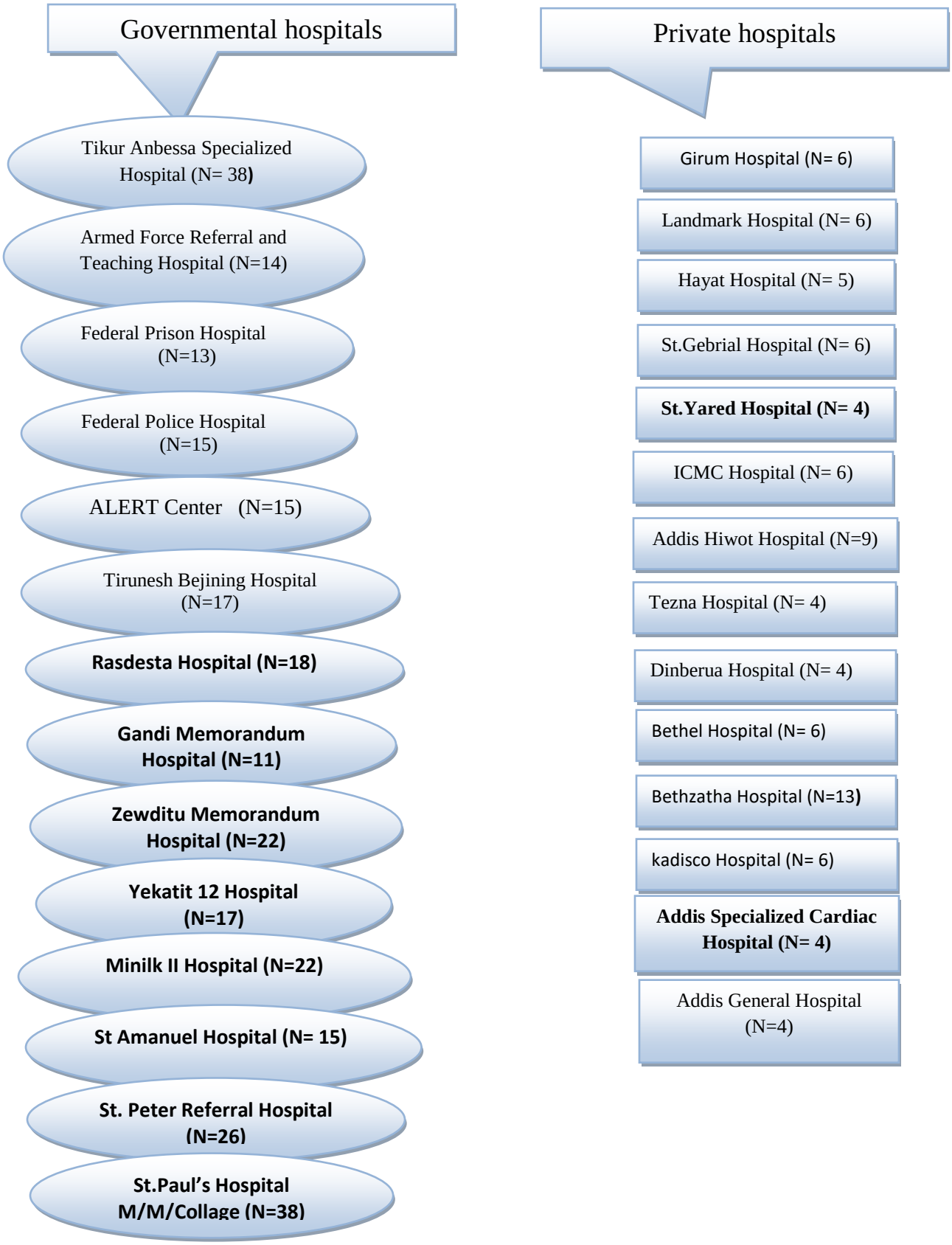

Fig.2 A schematic frame work of sampling for the study of biorisk management practice in hospital laboratory workers in governmental and private hospital in Addis Ababa, 2019.

4.8. Data Collection Procedure

Structured self-administered questionnaire and observational checklist were used to collect the data. Questionnaire including data on age, sex, address, and marital status, level of education, year of experience and Biosafety practice Workers related variables and Biosafety practice Workers related variables and biosecurity variables also other associated factors were included.

4.9. Quality Control and Quality Assurance

All data collection tools were pre tasted and appropriate modification was made before actual data collection and daily supervision of the data collectors during data collection some of were taken for the quality of the data. One day training was given for the data collectors on how the data collected. If there are unfilled and missed question during data collection in the questionnaire, it was recheck and corrected by the data collectors and correct. When data collection phase was finished, visits were made to laboratory participation in this study. Any wrong information in the questionnaire of the checklist was corrected. Information collected from labs revised by supervision visits.. Any wrong data corrected before entered into the data analysis program. To improve the quality of this study data was double entered and the missing data will discard.

4.10. Data Entry, Management and Analysis

After data collection the data was coded manually and double data entry wasdone using SPSSversion 20 software for descriptive and inferential analyses. Frequencies and cross tabulations were checked for missed values and variables. The necessary assumption of the logistic regression was used to assess the relative effect of the explanatory variables on the outcome variable. For all data analysis level of significance was set at 5% α value and 95% confidence intervals.

4.11. Operational Definition

Bio risk management: is analysis of ways and development of strategies to minimize the likelihood of the occurrence of bio risks. When we see this practice we side bio risk management practise (2)Also bio risk management practise is concern the management of bio risk places responsibility on the facility and its Manager (director) to demonstrate that suitable and effective bio risk reduction (minimization) Procedures have been established and applied. (2).

Good bio risk management practice; from those bio risk management practice questions who answered 55% and above were as a minimum requirement for good bio risk management practice.
Poor bio risk management practice;from those bio risk management practice questions who answered below 55% is poor bio risk management practice

4.12. Ethical Consideration

The study was ethically approved by Addis Ababa University, college of Health Science, Departmental Research and ethics review committee (DRERC).Formal permission letter was written from medical laboratory department in order to get support from senior manager of the selected Hospitals of Addis Ababa. Informed consent was taken from each study participants, to take questionnaire from each laboratory staffs. The objective, benefit and method of the study were clearly explained to the participants. All of the study subjects were informed that, their response were kept secret. Finally they was done in a way that was not violating their privacy and confidentiality of information. Thus, name and address of the participant was incorporated at any stage of data processing and also in dissemination of the results. The respondents were informing that their participation in the study was on voluntary basis even after consent will obtained. They are free to withdraw from the study at any time without losing any benefits they were

4.13. Dissemination of Results

After conducting the research, the results of the study was submitted to Addis Ababa University, College of Health Sciences, and Department of Laboratory Sciences. In addition,a copy of this material will be given to participant facility, annual conferences of professional societies and other concerned bodies. . The finding of the study will also be presented to the medical scientific community and manuscript will be submitted to peer reviewed journals for publication

5. Result

5.1. Socio demographic characteristics of laboratory personal

A total of 367 laboratory personnel were studied in fourteen public and fourteen private hospital laboratory. Among the total study participant 174(47.4%) were male and half of 181(49.3%) were single. Regarding age 144 (39.2) study personal were 26-30 years age groups. The majority 234(63.8%)of the study personnel had completed undergraduate degrees. Regarding position the majority 241(65.7%) of them were laboratory staffs and section /department hade were 62(16.9). Almost Half 183(49.9%) study personnel had with the experience of 1-5 year which is followed by 6-10 year 149 (40.6%). The widely held 70(19.1%) studied personnel hade work in hematology department also 70(19.1%) work in clinical chemistry department. The detail was depicted at table 1.

Table 1. Socio Demographic characteristics of Laboratory Personnel at Governmental and Privet Hospital, Addis Ababa, April, 2019 (N=367)

Variable		Frequency	Percent
Gender	Male	174	42.4%
	Female	193	52.6%
Age	20-25	89	24.3%
	26-30	144	39.2%
	31-35	106	28.9%
	36-40	15	4.1%
	41-45	13	3.5%
Marital Status	Single	184	50.1%
	Married	172	46.9%
	Divorced/separated	9	2.5%
Education	Diploma	101	27.5%
	Degree	234	63.8%
	Second degree	30	8.2%
Service Year	1-5 years	183	49.9%
	6-10	149	40.6%
	11-15	23	6.3%
	16-20	5	1.4%
	>20	7	1.9%
Working Department	Microbiology	34	9.3%
	Parasitology /urinalysis	53	14.4%
	Clinical chemistry	70	19.1%
	Hematology	70	19.1%
	Immunology/serology	46	12.5%
	Spacemen collection	41	11.2%
Position	Laboratory hade	20	5.4%
	Section/department head	62	16.9
	Quality officer	15	4.1%
	Biosafety officer	12	3.3%
	Laboratory staffs	241	65.7
	Others	17	4.7

5.2. Utilization of Personal Protective Device towards Biorisk Management Practise

Among the total study participant, 240 (66.8%) lab staff always wear lab-coat in all labs procedures, 32 (8.4%) sometimes do that and 29 (7.92%) never wear it during work time. Majority 298 (81.2%) of the investigated labs personals stated that always gloves worn in all laboratory procedures and. 231 (62.9%) never use eye protection (safety glasses, face shields). Of tested personal, 177(48.2%) never use respiratory protection (face masks, N95 respirators) from the study participant, In this study 56% of government participant always use personal protective equipment but in private it is 48% so in governmental hospital there is relatively good bio risk management practise in personal protective equipment, showed at table 2.

Table 2.Bio risk management practice towards use of Personal protective device among laboratory personnel at governmental and privet hospital, in Addis Ababa, April, 2019 (N=367)

Variable		Frequency	Percent
Use Eye Protection(Safety Glasses, Face Shields	Never	231	62.9%
	Rarely	57	15.5%
	Sometime	62	16.9%
	Often	4	1.1%
	Always	13	3.5%
Use Respiratory Protection (Face Masks, N95 Respirators, Face Shields)	Never	177	48.2%
	Rarely	75	20.4%
	Sometime	68	18.5%
	Often	12	3.3%
	Always	35	9.5%
Use Body Protection (Laboratory Coats, Uniforms, Coveralls, Surgical Scrubs, Rubber Boots, And Disposable Shoe Covers).	Never	29	7.9%
	Rarely	30	8.2%
	Sometime	31	8.4%
	Often	32	8.7%
	Always	245	66.8%
Wear Gloves When Hands May ContactPotentially Infectious Material	Never	22	6%
	Rarely	18	4.9%
	Sometimes	3.5	1.4%
	Often	24	6.5%
	Always	298	81.2%
Good bio risk management practice			57%

5.3 Bio risk Management Practice towards Administrative Control or Managerial Aspect

The majority 329(89.6%) of study participant said that there is copy of SOP in the laboratory and 311(84.7%) participant said that ether is written procedure for clean-up of spill in their laboratory and similarly 303(82.6%) of the participant side that there was availability of copy safety operation manual. Majority 128 (34.9%) study participant use warning and accident privation signs used to minimize work hazard. Majority of the participants, 258(70.3%) of participant said there is chemical waste containers and labelled keep close and easily available. Half of the participants, 192 (52.3%)said that regular training in laboratory biosafety and biosecurity that is provided by the laboratory hade. One third, 128 (34.9%) study participant said that there is protocol for Exclusion of highly susceptible individuals in laboratory from highly hazardous laboratory work One hundred sixty seven (45.5%) of them said that an occupational health service programme is relevant to the worker of the laboratory. The detail was represented at table

Table 3. Biorisk management practice towards administrative control or managerial aspect among laboratory personnel at governmental and privet hospital, in Addis Ababa, April, l201964. (N=367)

Variable	YES	
	Frequency	Percent
An occupational health service programme relevant to the worker of the laboratory	167	45.5%
Any protocol for Exclusion of highly susceptible individuals (e.g. pregnant women or immune compromised individuals) from highly hazardous laboratory work	128	34.9%
Immunization programme relevant to the work of the laboratory, HBV vaccinate	263	71.7%
Warning and accident prevention signs used to minimize work hazards	267	72.8%
Encouraged to report potential exposure	235	64%
Development, adoption of bio risk management plan by the director	156	42.5%
Regular training in laboratory biosafety and biosecurity that is provided by the laboratory hade	192	52.3%
Copy of standard operational procedure (sop) in department	329	89.6%
Availability of written procedure for clean-up of spill	311	84.7%
any chemical waste contender(labelled keep close and easily available	258	70.3%
Appointment of biosafety officer with clear written roles and responsibility	234	63.8%
Availability of A copy safety operation manual	303	82.6%
Total	2843	64.5%
Good Bio Risk Management Practice	64.5%	

5.4. BioRisk management Practice towards Engineering Device of Laboratory

The Majority 289 (77.9%) of study participant said that bench surfaces resistant to solvents and corrosive chemicals and easily to cline .of the study participant 207(56.4%) said working temperate is comfortable and there is mechanical ventilation system in there laboratory. Majority 220 (59.9) of study participant said the working space adequate for safe operation. 238 (64.9%) participant side that have supply of good quality water for drinking.(table4)

Table 4. Bio risk management practice towards engineering device of laboratory among laboratory personnel at governmental and privet hospital, in Addis Ababa, April, l2019 (N=367)

Variables	YES	
	Frequency	Percent
Working space adequate for safe operation?	220	59.9%
Bench surfaces resistant to solvents and corrosive chemicals and easily to cline	286	77.9%
Working temperate is comfortable Or is there any mechanical ventilation system	207	56.4%
Have reliable and adequate electricity supply and emergency lighting	251	68.4%
Supply of good quality water for drinking	129	35.1%
Total	1093	59.5%

5.5.Bio risk Management Practise towards Biological Material Handling and Biosecurity

The majority of study participant 269 (73.3%) have computer access for data handling of the study participant 221(60.2%) have no biosecurity training program. 223(60.8%) said that they have adequate sappily and use triple package for sample transported. And 257(70%) majority of the participant have no information on biosecurity adequate supplies, including appropriate shipping containers, are available for transport and use triple brakeage .similarly 234(63.8%) was aware of the required transport procedures.214 (58.3%) of participant said there was policy on visiting personal in your laboratory .the dial displayed attable 5

Table 5.Biorisk management practice towards biological material handlingamong laboratory personnel at Governmental and Privet Hospital, in Addis Ababa, April, l2019 (N=367)

Variable	Yes	
	Frequency	**Percent**
Data handling system (computer access) and security of data	269	73.3%
Policy on visiting personal in your laboratory	214	58.3%
Have any biosecurity training Program	146	39.8%
Association with any professional organization in laboratory	192	52.3%
Adequate supplies, including appropriate shipping containers, are available for transport I(triple brakeage used)	223	60.8%
Anyone sending specimens is aware of the required transport procedures	234	63.8%
Whole building securely locked when unoccupied?	197	53.7%
Information about biosecurity	110	30%
Total	**1612**	**54.9%**

5.6. Equipment and Maintenance to words Biorisk Management Practise

According to the majority 288(78.5%) of the study participant there is sharps disposal containers easily available and being used. Similarly 248(67.9%) of respondent said there is Centrifuge buckets and rotors regularly inspected.More than half242(65.9%) there is a procedures available for decontaminating equipment prior to maintenance. Similarly 218 (59.6%) of participant Ensure equipment has been adequately maintained and validated, preferably with a stockpile of replacement parts. while, almost half 185(50.4%) of the participant have access to appropriate biological safety cabinets (BSCs) and other essential equipment is ensure. In general study parties pant working in private hospital have good bio risk management practise to wards equipment and maintenance which is79.6% were as in governmental it is 61.7%.brifly shows table 6

Table 6.Biorisk Management Practice towards Equipment and Maintenance among laboratory personnel at governmental and privet hospital, in Addis Ababa, April, (N=367)

Variable	Yes	
	Frequency	Percent
Access to appropriate biological safety cabinets (BSCs) and other essential equipment is ensured	185	50.4%
procedures available for decontaminating equipment prior to maintenance	242	65.9%
Autoclaves and other pressure vessels regularly inspected	216	58.9%
Centrifuge buckets and rotors regularly inspected	248	67.6%
Use of mechanical pipette to replace mouth pipette	303	82.5%
Cracked and chipped glassware always discarded and not reused	270	73.6%
Use safe receptacles for broken glass	262	71.4%
Sharps disposal containers easily available and being used	288	78.5%
Total	2232	67.5%
Good bio risk management practise	**67.5%**	

5.7. Assessment of Factor Affecting to Biorisk Management Practice

Based on the result of bivariate analysis, factors that affect the bio risk management practices of laboratory personnel showed statistically significant association with managerial aspect for laboratory ,recorded document of safety prates, written procedure for the clean-up of spills, decontaminate wastes before disposal, waste disposable proceed, and washing hand before live in laboratory, proper biosafety precaution and procedure and safely store flammable liquid($p<0.05$) with the outcome variable of bio risk practise. However, our data did not show a significant association between the Socio demographic characteristics, availability of Sharpe disposable needle containerand store laboratory cote, close the same looker, practise of material decontamination with the outcome variable of .bio risk management prates

When adjusted odds ratios were computed among these variables, significant associations were found between , written procedure for the clean-up of spills, safely store flammable liquid and waste disposal protocol land appropriate bio safety precaution with bio risk management practise result with $p<0.05$.

Those laboratory personal who use proper biosafety precaution and procedure were 2.2 6times more likely to have good laboratory bio risk management practise than those do not follow appropriate biosafety precaution and procedure (AOR=2.226;CI 1-24-3.69) with P =0.00

Those laboratory who use appropriate waste disposal protocol were 3 times more likely to have good bio risk management practice than those do not have (AOR=3.01; CI 1.24-4..11) with P =0.001

Laboratory personnel who perform a written procedure for the clean-up of spills were 2 times more likely to practice than those with non-practice of performing clean-up of spills (AOR=2.03 CI 1.13 - 4.12) with P =0.00 and laboratory personnel who store safely flammable liquid were 1.35 times more practice than those who did not store safely(AOR=1.35; CI 1.04-2.32.) with P =0.031 (Table 7).

Table 7 Factor Affecting to Biorisk Management Practise of Laboratory Personnel at Governmental and Privet Hospital, in Addis Ababa, April, 2019 (N=367)

Invariables		Dependent Variable		COR(95% CI)	PV	AOR (95 CI)	PV
		Poor Practice (fre.)	Good Practice (fre)				
Sex	Male	59(30.7%)	133(60.9%)	✓			
	Female	95(54.9%)	78(45.1%)	0.27(1.67-3.08)	0.001	0.23(0.10-0.49)	0.20*
Engineering Aspect	Poor E	88(57.1%)	53(24.9%)	✓			
	Good E	65(42.2%)	160(75.1%)	2.45(1.86-3.24)	0.001*	0.56(0.23-0.52)	0.30
Management Aspect	Poor M	84(54.5%)	41(19.2%)	✓			
	Good M	70(45.5%)	172(80.8%)	2.45(1.86-3.24)	0.001*	0.52(0.23-1.14)	0.10
Practice of Material Decontamination	No	42(27.3%)	20 (9.4%)	✓			
	Yes	112 (72.7%)	193 (90.6%)	0.48(0.28-0.81)	0.04	0.59(0.22-1.61)-0.811)	0.311
Appropriate Biosafety Precaution	No	75(48.7%)	13(6.3%)	✓			
	Yes	79(51.3%)	200(93.9%)	2.38(1.78-3.15)	0.001*	2.26(1.24-3.69)	0.001*
Waste Disposable Protocol	No	59 (38.3%)	59 (4.7%)	✓			
	Yes	95(61.7%)	203(95.3%)	2.14(1.67-2.72)	0.001*	3.0(1.29-4.11.)	0.001*
Record and Document	No	95(61.7%)	58(377%)	✓			
	Yes	29(13.7%)	181(85.4%)	2.41(1.83-3.19)	0.001*	0.13(0.58-12.6)	0.97
Safely Store Flammable	No	59(383%)	20(9.4%)	✓			
	Yes	95(61.7%)	193(90.6%)	0.34(0.20-0.56)	0.001*	1.35(1.04-.2.32)	0.001*
Use Disposable Needle	No	64(41.6%)	51(23.9%)	✓			
	Yes	90(58.4%)	162(76.1%)	0.79(0.55-1.15)	0.23		
Sharp disposable contender	No	53	196(92%)	✓			

available	Yes	54	159(74%)	1.79(1.41-2.28)	0.001*	1.63(0.66-4.00)	.0.29
Recap needle	No	88	66(42%)	✓			
	Yes	90	123(57.7%)	0.02(0.76-1.37)	0.88		
Lab coat and clos the same looker	No	91	63(40.9%)	✓			
	Yes	81	132.(61.9%)	0.89(0.66-1.20	0.45		
Washing hand before living laboratory	No	30	124(80.5%)	✓			
	Yes	17	196(92%)	0.10(0.03-0.34)	0.001*	0.48(0.16-1.45)	0.196
Washing hand after handling biohazard material	No	29	123(80.9%)	✓			
	Yes	3	210(98.6%)	0.57(0.31-1.03)	0.06		
Written prosper for cline up of spill	No	56	98(63.6%)	✓			
	Yes	21	192(90%)	2.33(0.18-0.61)	0.001*	2.03(1.13-4.12)	0.031*

Note:* is shows there is significantly association between variable and COR is credode ratio AOR, adjusted ode ratio this sine is shows reference categorical

5.8. Cooperation of Governmental and Private Hospital Laboratory towards Bio risk Management Practise

Frome 285 governmental study participant 31.2% side that Cracked and glassware always discarded and not reuse,73.3% study participant side that Sharp disposable container easily available and81.4% of them HBV vaccinated.

which is in private hospital from 82 participant 9.75% side that Cracked and glassware always discarded and not reuse,96.3% study participant side that Sharp disposable container easily available and 37.8% of them HBV vaccinated.

Significance difference is seen in private and governmental hospital regarding availability of sharp disposable container, HBV vaccination, regular biosafety training and cracked and glassware always discarded and not re use.

There is no significant different between private and government hospital regarding Access to biological safety cabinets (BSC)and other essential equipment ensured, Availability of chemical waste contenderandCentrifuge and buckets and rooters regularly inspectedBriefly shows table 8

Table 8. Comparison of Government and Private Hospital towards Bio risk Management Practices of Laboratory Personnel at Governmental and Privet Hospital, in Addis Ababa, April, 2019 (N=367)

Variable		Government	Private	P value
Access to biological safety cabinets(BSC)and other essential equipment ensured	yes	140(79.9%)	42(78.4%)	0.834
	No	145(78.4%)	40(23.1%)	
Use of disposable needle	yes	198(69.5%)	28(34.1%)	0.626
	No	87(30.5%)	54(65.9%)	
Cracked and glassware always discarded and not reuse	Yes	89(31.2%)	8(9.75%)	0.001
	No	196(68.8%)	74(89%)	
Sharp disposable container easily available	yes	209(73.3%)	79(96.3%)	0.001
	No	76(26.6%)	3(3.6%)	
Regular training in biosafety	Yes	153(53.6%)	20(24.4%)	0.001
	No	132(46.3%)	62(75.6%)	
HBV vaccination	Yes	232(81.4%)	31(37.8%)	0.001
	No	53(18.6%)	51(62.2%)	
Availability of chemical waste contender	Yes	202(70.8%)	56(68.3%)	0.75
	No	83(29.1%)	26(31.7)	
Centrifuge and buckets and rooters regularly inspected	yes	200(70.1%)	62975.6%)	0.436
	No	85(29.8%)	20(24.3%)	

Observation Cheek List towards Biorisk Management Practice

Based on the result of observation checklist that the majority of study participants had Bio risk management practise practicing among those gowns or uniforms worn at all times during the laboratory work practice, Policies for the safe handling of sharps instituted.

Regarding presence of eye wash facility, toilet and emergency shower, emergency exits, a first aid box and hand washing sinks near to the laboratory, of all laboratories surveyed. It was observed that public hospital laboratories were significantly more likely to have Eye Wash facility, toilet emergency shower, emergency exits, a first aid box and hand washing sinks than private ones. And majority of observed laboratory biohazard signs on door entrances and were posted authorized persons were allowed to enter the laboratory working areas butaccess to laboratory area is not restricted spicily in governmental hospital laboratory were observed, only few laboratories have had separated room formiro biology but almost all laboratory have separated phlebotomist room.

6. DISCUSSION

This study assessed bio risk management practices of 14 Governmental and 14 Privet hospital laboratory staffs in Addis Ababa .Among 367 studied laboratory personnel, the majority of the studied personnel had finished undergraduate degrees and higher (63.8% to 72.o%)this study is similar to the study done in Bangkok majority of the studied personnel had finished undergraduate degrees and higher (55% to 63.6%).(14).

The study found that 59% of these laboratories do not have any association with any professional organization and no formal or informal training for Biosecurity was available. This finding is in comparable with the study in kirsch Out of these 60 labs. 82% to 83% of these laboratories do not have any association with any professional organization this may be different in sample size(15)..

In this study an occupational health program was not implemented in 48% of these laboratories similar study conducted in India and kirsch which is 43.4% and 45 % respectively (15, 16).

In this study Appropriate biohazard signage was found in only 64.2% of the laboratories there is wide variation between this study and study conducted by Bankoll, Hetal, in Nigeria and in kirsch Appropriate biohazard signage was found in only 3.85 and 8.3% of the laboratories respectively this grater difference may be due to implementation stepwise laboratory standard process towards accretion(15,17)

This study has discovered that bio risk management practice of laboratory personnel in the laboratory services were 57 % which were strongly comparable study with the study conducted in Bangkok and Pakistan were 57.7 % and 66.4% (20, 21). However, our finding was lower than with the finding in Islamabad, Pakistan with personal protective barrier level of 80.9% (22). This may be due to better awareness about the biohazard practice from exposure to the potential harms .

Of the total number, 245 (66.8) lab staff always wear lab-coat in all labs procedures, 68 (18.5) sometime do that and 29 (7.9%) never wear it during work time. finding is almost similar to study conducted in Khartoum **s**tate a total of 190 laboratories were surveyed total number, 112 (58.9%) lab staff usually wear lab-coat in all labs procedures, 72 (37.9) sometime do that and 6 (3.2%) never wear it during work time(18).

In this study eating and drinking inside the labs, practiced hand washing before and after each laboratory procedures. Drinking water was available in 28.9%, 90.7%, and 64.9% respectively. This funding is almost similar to study conducted in Khartoum **s**tate, eating and drinking inside the labs, only 6 (3.2%) of lab staff do that usually .117 (61.6%). And 166 (87.4%) labs indicated that they practiced hand washing before and after each laboratory procedures. Drinking water was available in 3.2%, 61.6, 90.5% labs (18).

This study found that 19 (67.8.1%) of laboratories appointed biosafety officers among 28 laboratories. This study is in comparable to study done by Henry in Kenya 60.2% presence of a trained biosafety officer, however this study is higher than the study conducted in Sudan 32 (16.8%) laboratory safety officer and in Nigeria there is no biosafety officers among 80 diagnostic laboratories. This great difference in our case may be due to implementation Stepwise laboratory Standard process towards accreditation (17, 18, and 19)

In this study 27.7% are not received immunization for infectious disease. This study showed that there was good practice of immunization service in the studied laboratory personnel of the hospitals when compared with the studied conducted by Jyotsna V , Pipat L and Henry Mogaroetal were 21% , 42.9% 38% are not immunized respectively (20,21 ,19).

According to this study, 15.3% of the study participants said that there is no written procedure for the clean-up of spills. This finding is similar with study conducted in Sudan and Pakistan (18), 18.4%. While it is different from the study Conducted by Sadia N. etal and Arif etal, which were 33.7% and 31.7% because of the study done in health center (21, 22).

89.3% of laboratory's were posted authorized persons should be allowed to enter the laboratory working areas but 37% of laboratory access controlled spicily in private hospital laboratory this result is similar with study conducted in Kenya which is laboratory access controlled 24.7% and Private laboratories were more likely than their public (19)

This study also indicated that 21% of laboratories have separated phlebotomist room and it is more likely in private than public hospitals, which is similar to in Kenyaon 20.4%, have phlebotomy room, Private laboratories were more likely than their public (19).

It is also indicated that hand washing sinks emergency exits, SOPs is, available among (46.4%), (89.2%) and, 89.4% of the laboratories respectively. It was observed that public hospital laboratories were significantly more likely to have hand washing sinks , emergency exit and SOP than private ones,

which is comparable with study done in Kenya with Hand-washing sinks (71.7%), emergency exits (15.9%), availability of equipment SOPs (86.7%),. However, in Kenya Private laboratories were more likely to have hand washing sinksemergency exits, SOPs is, available than their public. (19).

In this study there is significance association between Practice of clean-up of spills, Practice safely store filmable liquid, use of west disposable protocol and appropriate biosafety precaution and procedure and factors that affect bio risk management practice.

7. Strengths and Limitation of the study

7.1 Strengths of the study

The study has tried to cover majority of public and private hospital in Addis Ababaand Majority of laboratory personal to make it representative

7.2. Limitation of the study

Study don only in Addis Ababa

Study not include qualitative data it is only quantitative

8. Conclusion

From this study personal protective equipment usage is 57% which is smallest amount hence, a minimum requirement to achieve a bio risk management practice among study laboratory personnel.

Regarding factors associated with practice, there is significance association between Practice of clean-up of spills, Practice safely store filmable liquid, use of west disposable protocol and appropriate biosafety precaution and procedure factors that affect bio risk management practice.

Significance difference is seen in private and governmental hospital regarding availability of sharp disposable container, HBV vaccination, regular biosafety training and cracked and glassware always discarded and not re use. And regarding personal protective barrier governmental laboratory was more likely have good practice than private regarding equipment and maintenance private laboratory is more likely good practice than governmental

9. Recommendation

Based on the finding from this study, we recommend the following important points since the biosafety practice of protective barrier is minimum, and also it is too much in private hospital, laboratory professionals should adhere with standardized laboratory safety practice..

As indicated in the finding, there is significance relationship between bio risk management practise , recorded cline up of spill and splash, safe storing inflammable material and proper use of waste disposable protocol the biosafety officer should aware the importance of these practice for all laboratory professionals.

Since Significance difference is seen in private and governmental hospital regarding availability of sharp disposable container, HBV vaccination, regular biosafety training and cracked and glassware always discarded and not re use the concerned bodies should be see equally to implement good bio risk management practise.

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Annex 1.

Standard operating procedure (SOP) for Clinical laboratory safety

Procedure name

- LABORATORY BIOSAFETY MANUAL

Purpose

This procedure is written to provide safety responsibilities, guidelines and contact information for the employees / visitors in the Laboratory. The goal is to promote and protect the health and wellbeing of every person working in the Laboratory.

Abbreviations

SOP – Standard Operating Procedures, PPE-personal protective equipment, MSDS - Material Safety Datasheets, OHS – Occupational Health & Safety,
TB – Tuberculosis.

Equipment

This procedure applies to all equipment necessary to function safely and efficiently in the Laboratory.

Supplies

This procedure applies to all supplies necessary to function safely and efficiently in the Laboratory.

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Code of practice

This code is a listing of the most essential laboratory practices and procedures that are basic to GMT. In many laboratories and national laboratory programmes, this code may be used to develop written practices and procedures for safe laboratory operations.

Each laboratory should adopt a safety or operations manual that identifies known and potential hazards, and specifies practices and procedures to eliminate or minimize such hazards. GMT are fundamental to laboratory safety. Specialized laboratory equipment is a supplement to but can never replace appropriate procedures. The most important concepts are listed below.

Access

- The international biohazard warning symbol and sign (Figure 1) must be displayed on the doors of the rooms where microorganisms of Risk Group 2 or higher risk groups are handled.
- Only authorized persons should be allowed to enter the laboratory working areas.
- Laboratory doors should be kept closed.
- Children should not be authorized or allowed to enter laboratory working areas.
- Access to animal houses should be specially authorized.
- No animals should be admitted other than those involved in the work of the laboratory.

Personal protection

- Laboratory coveralls, gowns or uniforms must be worn at all times for work in the laboratory.
- Appropriate gloves must be worn for all procedures that may involve direct or accidental contact with blood, body fluids and other potentially infectious materials or infected animals. After use, gloves should be removed aseptically and hands must then be washed.
- Personnel must wash their hands after handling infectious materials and animals, and before they leave the laboratory working areas.
- Safety glasses, face shields (visors) or other protective devices must be worn when it is necessary to protect the eyes and face from splashes, impacting objects and sources of artificial ultraviolet radiation.
- It is prohibited to wear protective laboratory clothing outside the laboratory, e.g. in canteens, coffee rooms, offices, libraries, staff rooms and toilets.
- Open-toed footwear must not be worn in laboratories.
- .Eating, drinking, smoking, applying cosmetics and handling contact lenses is prohibited in the laboratory working areas.
- Storing human foods or drinks anywhere in the laboratory working areas is prohibited.
- Protective laboratory clothing that has been used in the laboratory must not be stored in the same lockers or cupboards as street clothing.

Procedures

- .Pipetting by mouth must be strictly forbidden.

. Materials must not be placed in the mouth. Labels must not be licked.

- All technical procedures should be performed in a way that minimizes the formation of aerosols and droplets.

- . The use of hypodermic needles and syringes should be limited. They must not be used as substitutes for pipetting devices or for any purpose other than parenteral injection or aspiration of fluids from laboratory animals.
- . All spills, accidents and overt or potential exposures to infectious materials must be reported to the laboratory supervisor. A written record of such accidents and incidents should be maintained.
- A written procedure for the clean-up of all spills must be developed and followed.
- Contaminated liquids must be decontaminated (chemically or physically) before discharge to the sanitary sewer. An effluent treatment system may be required, depending on the risk assessment for the agent(s) being handled.
- Written documents that are expected to be removed from the laboratory need to be protected from contamination while in the laboratory.

Laboratory Working Areas

- The laboratory should be kept neat, clean and free of materials that are not pertinent to the work.
- Work surfaces must be decontaminated after any spill of potentially dangerous material and at the end of the working day.
- All contaminated materials, specimens and cultures must be decontaminated before disposal or cleaning for reuse.
- . Packing and transportation must follow applicable national and/or international regulations.
- . When windows can be opened, they should be fitted with arthropod-proof screens.

Biosafety Management

- It is the responsibility of the laboratory director (the person who has immediate responsibility for the laboratory) to ensure the development and adoption of a biosafety management plan and a safety or operations manual.

- The laboratory supervisor (reporting to the laboratory director) should ensure that regular training in laboratory safety is provided

- . Personnel should be advised of special hazards, and required to read the safety or operations manual and follow standard practices and procedures. The laboratory supervisor should make sure that all personnel understand these. A copy of the safety or operations manual should be available in the laboratory.

- There should be an arthropod and rodent control programme.
- Appropriate medical evaluation, surveillance and treatment should be provided for all personnel in case of need, and adequate medical records should be maintained.

Laboratory Design and Facilities

In designing a laboratory and assigning certain types of work to it, special attention should be paid to conditions that are known to pose safety problems. These include:

- Formation of aerosols
- Work with large volumes and/or high concentrations of microorganisms
- . Overcrowding and too much equipment
- . Infestation with rodents and arthropods
- . Unauthorized entrance
- . Workflow: use of specific samples and reagents

Design Features

- Ample space must be provided for the safe conduct of laboratory work and for cleaning and maintenance.
- Walls, ceilings and floors should be smooth, easy to clean, impermeable to liquids and resistant to the chemicals and disinfectants normally used in the laboratory. Floors should be slip-resistant.
- Bench tops should be impervious to water and resistant to disinfectants, acids, alkalis, organic solvents and moderate heat.
- Illumination should be adequate for all activities. Undesirable reflections and glare should be avoided.
- Laboratory furniture should be sturdy. Open spaces between and under benches, cabinets and equipment should be accessible for cleaning.
- Storage space must be adequate to hold supplies for immediate use and thus prevent clutter on bench tops and in aisles. Additional long-term storage space, conveniently located outside the laboratory working areas, should also be provided.
- Space and facilities should be provided for the safe handling and storage of solvents, radioactive materials, and compressed and liquefied gases.

- Facilities for storing outer garments and personal items should be provided outside the laboratory working areas.
- Facilities for eating and drinking and for rest should be provided outside the laboratory working areas.
- Hand-washing basins, with running water if possible, should be provided in each laboratory room, preferably near the exit door.
- Doors should have vision panels, appropriate fire ratings, and preferably be self-closing.
- At Biosafety Level 2, an autoclave or other means of decontamination should be available in appropriate proximity to the laboratory.
- Safety systems should cover fire, electrical emergencies, emergency shower and eyewash facilities.
- First-aid areas or rooms suitably equipped and readily accessible should be available
- In the planning of new facilities, consideration should be given to the provision of mechanical ventilation systems that provide an inward flow of air without recirculation. If there is no mechanical ventilation, windows should be able to be opened and should be fitted with arthropod-proof screens.

- A dependable supply of good quality water is essential. There should be no cross connections between sources of laboratory and drinking-water supplies. An ant backflow device should be fitted to protect the public water system.
- There should be a reliable and adequate electricity supply and emergency lighting to permit safe exit. A stand-by generator is desirable for the support of essential equipment, such as incubators, biological safety cabinets, freezers, etc., and for the ventilation of animal cages.
- There should be a reliable and adequate supply of gas. Good maintenance of the installation is mandatory.
- Laboratories and animal houses are occasionally the targets of vandals. Physical and fire security must be considered. Strong doors, screened windows and restricted issue of keys are compulsory. Other measures should be considered and applied, as appropriate, to augment security.

Laboratory Equipment

Together with good procedures and practices, the use of safety equipment will help to reduce risks when dealing with biosafety hazards. This section deals with basic principles related to equipment suitable for laboratories of all biosafety levels..

The laboratory director should, after consultation with the biosafety officer and safety committee (if designated), ensure that adequate equipment is provided and that it is used properly. Equipment should be selected to take account of certain general principles, i.e. it should be:

- Designed to prevent or limit contact between the operator and the infectious material
- Constructed of materials that are impermeable to liquids, resistant to corrosion and meet structural requirements.

- Fabricated to be free of burrs, sharp edges and unguarded moving parts
- Designed, constructed and installed to facilitate simple operation and provide for ease of maintenance, cleaning, decontamination and certification testing; glassware and other breakable materials should be avoided, whenever possible.
- Detailed performance and construction specifications may need to be consulted to ensure that the equipment possesses the necessary safety feature

➢ Procedures likely to generate aerosols are performed within a biological safety cabinet. Doors are kept closed and are posted with appropriate hazard signs. Potentially contaminated wastes are separated from the general waste stream.

Essential Biosafety Equipment

➢ Pipetting aids – to avoid mouth pipetting. Many different designs are available.

➢ Biological safety cabinets, to be used whenever:— infectious materials are handled; such materials may be centrifuged in the open laboratory if sealed centrifuge safety cups are used and if they are loaded and unloaded in a biological safety cabinet— there is an increased risk of airborne infection procedures with a high potential for producing aerosols are used; these may include centrifugation, grinding, blending, vigorous shaking or mixing, sonic disruption, opening of containers of infectious materials whose internal pressure may be different from the ambient pressure, intranasal inoculation of animals, and harvesting of infectious tissues from animals and eggs.

➢ . Plastic disposable transfer loops. Alternatively, electric transfer loop incinerators may be used inside the biological safety cabinet to reduce aerosol production.

➢ . Screw-capped tubes and bottles.

➢ . Autoclaves or other appropriate means to decontaminate infectious materials.

➢ . Plastic disposable Pasteur pipettes, whenever available, to avoid glass.

➢ . Equipment such as autoclaves and biological safety cabinets must be validated with appropriate methods before being taken into use. Recertification should take place at regular intervals, according to the manufacturer's instruction

Health and Medical Surveillance

The employing authority, through the laboratory director, is responsible for ensuring that there is adequate surveillance of the health of laboratory personnel. The objective of such surveillance is to monitor for occupationally acquired diseases. Appropriate activities to achieve these objectives are:

➢ Provision of active or passive immunization where indicated

➢ Facilitation of the early detection of laboratory-acquired infections

➢ Exclusion of highly susceptible individuals (e.g. pregnant women or immune compromised individuals) from highly hazardous laboratory work

➢ Provision of effective personal protective equipment and procedures.

Training

Staff training should always include information on safe methods for highly hazardous procedures that are commonly encountered by all laboratory personnel and which involve:

- Inhalation risks (i.e. aerosol production) when using loops, streaking agar plates, pipetting, making smears, opening cultures, taking blood/serum samples, centrifuging, etc.
- . Ingestion risks when handling specimens, smears and cultures
- Risks of percutaneous exposures when using syringes and needles
- Bites and scratches when handling animals
- Handling of blood and other potentially hazardous pathological materials
- . Decontamination and disposal of infectious material.

Waste Handling

Waste is anything that is to be discarded. In laboratories, decontamination of wastes and their ultimate disposal are closely interrelated. In terms of daily use, few if any contaminated materials will require actual removal from the laboratory or destruction. Most glassware, instruments and laboratory clothing will be reused or recycled. The overriding principle is that all infectious materials should be decontaminated, autoclaved or incinerated within the laboratory.

The principal questions to be asked before discharge of any objects or materials from laboratories that deal with potentially infectious microorganisms or animal tissues are:

- Have the objects or materials been effectively decontaminated or disinfected by an approved procedure?

- . If not, have they been packaged in an approved manner for immediate on-site or transfer to another facility with incineration capacity?
- Does the disposal of the decontaminated objects or materials involve any additional potential hazards, biological or otherwise, to those who carry out the immediate disposal procedures or who might come into contact with discarded items outside the facility?

Decontamination

Steam autoclaving is the preferred method for all decontamination processes. Materials for decontamination and disposal should be placed in containers, e.g. auto cleavable

Plastic bags, that is colour-coded according to whether the contents are to be autoclaved and/or incinerated.

Handling and Disposal Procedures for Contaminated Materials and Wastes

Identification and separation system for infectious materials and their containers should be adopted. National and international regulations must be followed. Categories should include:

- Non-contaminated (non-infectious) waste that can be reused or recycled or disposed of as general, "household" waste
- Contaminated (infectious) "sharps" – hypodermic needles, scalpels, knives and broken glass; these should always be collected in puncture-proof containers fitted with covers and treated as infectious
- Contaminated material for decontamination by autoclaving and thereafter washing and reuse or recycling

Source:

- World Health Organization, Laboratory Biosafety Manual, 2004

Annex IIa. Participant Information sheet (English version*)*

Information sheet for participants of the study entitled biorisk management Practice and associated factors in Hospital laboratory Addis Ababa, Ethiopia.

Addis Ababa University, College of Health Science, Department of Medical laboratory Science

Addis Ababa, Ethiopia

Principal Investigator: MuluSeid (BSc)

Advisors: Fatuma Hassen (BA, BSc, MPH), Dr Eyob Abera(MSC, MPH, PhD)Abay Sisay(BSc MSc)

Name of the sponsor: SPHMMC

First of all we would like to thank you in advance for your cooperation and consent in participation in this study. Please read or listen when it is read for you about the general information of the study. If you have any question regarding the study please ask freely.

Background Information

Background" Biorisk management" is the effective management of risks posed by working with infectious agents and toxins in laboratories; it includes a range of practices and procedures to ensure the biosecurity, biosafety, and bio containment of those infectious agents and toxins (1) there for. Biosafety and biosecurity are fundamental bio risk management practices that should be employed in all biological laboratories (2)

Biosafety is the combination of practices, procedures, and equipment that protect laboratory workers, the public, and the environment from the infectious agents and toxins used in the laboratory. Biosafety Equipment includes Personal Protective Equipment, biosafety cabinets, and other specially designed devices. Biosafety also includes practices such as Standard Microbiological Practices and the practices identified for each biosafety level in Biosafety in Microbiological and Biomedical Laboratories (1) and laboratory biosecurity describes the protection, control and accountability for biological agents and toxins within laboratories, in order to prevent their loss, theft, misuse, diversion of, unauthorized access or intentional unauthorized release

Many laboratories around the world face challenges due to varying levels of organizational and financial resources to mitigate bio risks. Many laboratories do not have the institutional guidance to address their safety or security risks, or the programs and management systems in place are *ad hoc* and not fully supported by management (9) many studies in different parts of the world show the outcome in the lack of biosafety practices and indicate the factors that contribute for poor biosafety practices and the practice in developing countries is little. Currently, in Ethiopia there is no legislative guideline enforcing biorisk management in clinical laboratories and no documented studies have been conducted.

There is only limited information about Biorisk management practices in a hospital laboratory which worsens the problem of quality laboratory service. Therefore, these studies have been conducted that tried to assess the overall practice of Bio riskmanagement throughout the governmental and selected private Hospital of Addis Ababa, Ethiopia. Moreover, I will also told that the result will be reported timely to physician or the hospital manager about any change of laboratory biosafety practice and biosecurity due to adequate safety practice from pre analytical up to post analytical for appropriate management depending on the quality laboratory service and this study will be used as baseline information to initiate nationwide program of bio risk management practice among laboratory workers.

Aim of the study

The study is design to assess the bio risk management practise and associated factors in governmental and selected private hospitals laboratory Addis Ababa Ethiopia.

Purpose of the study

The study is designed to analyze the biorisk management practice in clinical laboratory and its associated factors in clinical laboratory workers.

Role of participant

The participants are expected to be volunteer for the data collection, which will be collected using structural questioners and observational method with all bio risk management issues.

Risk association with participation

The risk associated with the study for data collection may be discomfort during data collection using questionnaires.

Benefit

The benefit from this study may be of valuable importance for Laboratory Staffs specially who serves in the clinical laboratory department and for the appropriate management and providing adequate quality laboratory service using standard biosafety practice in all laboratory area.

Confidentiality

All the information will be kept confidential.

Participants have the right to keep hold of information. Decide to participate in the study or with draw from the study after with full information of the consent form.

Who to contact

This study protocol is reviewed and approved by College of Health Science, Department of Medical laboratory Science Departmental research and ethics review Committee at Addis Ababa University Graduate Study Program. The purpose of the review by the committee is to make sure that research participants are protected from harm. For more information you can contact the chairman of the committee_____

Assurance of Principal Investigator

I put my signature below to confirm you that I take over the responsibility for the scientific ethical and technical conduct of the research project and for provision of progress reports for all stakeholders of the research project.

Mulu Seid (PI): Signature: _____ Date: _____

Note:-To know more information about the study you can contact any of the following individuals by contacting:

PI Address: Mulu Seid: Department of Medical Laboratory Sciences, Collage of health sciences, Addis Ababa University, Addis Ababa, Ethiopia

Mulu Side (principal investigator):-

Phone number: 0911812007/0911850586 E-mail: muluseid29@gmail.com

Fatuma Hassen (BSc,MPH) .....(Mobile tel.No. 0911418062)

Dr Eyob Abera /MSc, MPH, PhD)……...(Mobile tel.No. 0911637525)

Abaye Sisay (BSc, MSc))……(Mobile tel.No. 0911547032)

Annex IIb. Information sheet (Amharic version)

አዲስ አበባዩ ኒቨርሲቲየ ህክም ና ፋኩልቲ ፣የላቦራቶሪሳይንስዲፓርትመንት

አዲስአበባ፣ኢትዮጵያ

ዋና ተመራማሪ፡- ሙ ሉሰኢድ0911812007

አማካሪዎች፡-

2. ፋጡማሁሴን / ስ.ቁ 0911418062/

3.ዶ/ርእዮብአበራ /ስ.ቁ 0911969579/

4..አባይሲሳይ / ስ.ቁ0911547032/

ምርምሩን የሚያካሂደዉ ተቋም፡- አዲስ አበባ ዩኒቨርሲቲ የህክምና ፋኩልቲ፣ የላቦራቶሪሳይን ስዲፓርትመንት

ጥናቱን ስፖንስር ያደረገው ተቋም፡- አዲስ አበባዩኒቨርሲቲ

1. **የጥናቱዓላማ፡**

በላብራቶሪ ክፍል ወስጥ ሊከሰቱ የሚችሉ ቸግሮችን ለመቀነስ የሚደረጉትን ጥንቃቄወች ላይ ያላቸዉን አሰራር እና ልምድምን እንደሚመስል በላብራቶሪ ባለሙያዎች ላይ ያላቸውን የእውቀት የልምድ እና ዝንባሌምን እንደሚመስል በሚሰሩበት ክፍል እንደናሙና መሰብሰብ፣ በምርመራጊዜ፣ውጤት በሚወጣበት ጊዜ እና በአጠቃላይ በተዛማጅ በሽታዎች በተጨማሪም በተገልጋዩ ላይ የሚሰጠው አስፈላጊው የናሙና አወሳሰድእና ምርመራ የተሻለእንዲሁ ምበምርመራ ጊዜ ላይ አስፈላጊውን የህክምና መከላከያ መሳሪያ እቃ አለማድረግ በላቦራቶሪዉ ወስጥ ለጥንቃቄ የሚያስፈልጉ ኣቃወች መኖራቸው እዲሁም ላቦራቶሬ ክፍሉ ምንያክል ለስራ አመቺ መሆኑን የአገልግሎት መቆራረጥ የመሳሰሉትን በህክምና የላቦራቶሪው አገልግሎት የሚያመጣው የጥራት መጓደል ሴፍቲን እና ሴኪውርቲን በተመለከተ ማየት፡፡

የጥናቱ ዓላማ በህክምና ላቦራቶሪ ውስጥ አስፈላጊውን የመከላከያ መንገዶች ባለማድረግ ሊከሰቱየሚችሉ የላቦራቶሪ አገልግሎት መቀነስን ይታያል፡፡የተለያዩ ጥናቶች እንደሚያመለክቱት በላቦራቶሪ አገልግሎት ተገቢው የህክምና መገልገያ መሳሪያዎች በአግባቡ ጥንቃቄ ባለው በመጠቀም ለማስቀረት ይቻላል፡፡ስለዚህም የዚህጥናት አላማ በላቦራቶሪ አገልግሎት በተመረጡ ሆስፒታሎች በተጨባጭ ለማወቅ እና ለመለየት ነው፡፡

***2.* በጥናቱ ውስጥ የተሳትፎ ሁኔታ**

ለመሳተፍ ከተስማሙ የላቦራቶሪ ባለሙያ ፈቃደኛ ለመሆንዎ ለማረጋገጥ የስምምነት መጠይቅ ያደርግልዎታል፡፡ ከዚያም መሣተፍ እንደሚችሉና እንደማይችሉ ይነግርዎታል፡፡በጥናቱ መሣተፍ ከቻሉ፣ጥናቱ መሠረት የሚያደርግበት መጠይቆች በጤና ባለሙያ ይጠይቅዎታል፡፡የመጠይቁ አወሳሰድ በጤናባለሙያ ማናኛውንም የላብራቶሪ ምርመራ ለማድረግ ከሚወሰደዉ የተለየ አይደለም፡፡

3. **ሊከሰቱ ስለሚችሉ ስጋቶች እና የምቾት መጓደል**

በዚህ ጥናት ተሣታፊ መሆንዎ እንደተ ለመደው ባለሙያ የህክምና ደንብ በሚፈቅደው አግባብ ያለው የመጠይቅ መንገድ በመሆኑ ይህ ነው የሚባል ስጋት የለም፡፡

4. **ጥቅሞች ማካካሻ** ከላብራቶሪ የተገኘው ውጤት በዚህ ጥናት የተለየ ወይንም ያልተጠበቀ ሁኔታ አስፈላጊውን ምላሽ ይመቻችልዎታል፡፡ በዚህጥናት ተሣታፊ በመሆንዎ የተለየ ጥቅምአያገኙም ነገር ግን ከጥናቱ ጋር በተያያዘ ለሚደረግልዎ አጠቃላይ የጥናቱ ወጪ በተመራማሪው ይሸፈናል፡፡

5. ሚስጥር ስለመጠበቅ

ሁሉም የሰጡን መልሶች በሚስጥር ይጠበቃሉ፡፡ የባለሙያ ኮድየያዘው የመረጃ ቅፅተ ቆልፎ ይቀመጣል፡፡ይህ መረጃ በምንም ዓይነት ከዋናው ተመራማሪ በስተቀር ለማንም አይገለፅም የተሰበሰበው መልሶች ዓላማ ውጪ ለሌላዓላማ አይውልም፡፡የጥናቱ ሪፖርት ይፋ በሚሆንበት ጊዜ የእርስዎስም አይገለፅም፡፡

6. በጥናቱ ያለመሣተፍና እራስየማግለልመብት

በጥናቱ ያለመሣተፍ ሙሉመብት አለዎት፡፡ጥናቱ ከተጀመረ ብኃላ በማንኛውም ሰዓት ራስዎን ከጥናቱ ማግለል ይችላሉ፡፡ ይህን በማድረግዎ ምንም ዓይነት ችግር አይደርስብዎትም፡፡ለሚወስኑት ውሣኔ ማንም ሰው ምክንያቱን እንዲገልፀ አያስገድዶትም፡፡

መረጃስለማግኘት

በማንኛውምጊዜጥያቄዎችመጠየቅከፈለጉከዚህበታችከተጠቀሱትሰዎችአንዱንማነጋገርይችላሉ፡፡

1. ሙሉሰኢድ /ስ.ቁ. 0911812007
2. ፋጡማሁሴን / ስ.ቁ 0911418062/
3.ዶ/ርእዮብአበራ /ስ.ቁ 0911969579/
4..አባይሲሳይ / ስ.ቁ091154703

Annex IIIa. Consent sheet (English version)

Addis Ababa University, College of Health Science,

Department of Medical Laboratory Sciences, Graduate Study Program For participation as a volunteer in the research undertaking. I have been informed about the study, which plans to determine the assessment of bio risk management practice and associated factors in clinical laboratory at governmental and selected private Hospitals, Addis Ababa. The objective and application of the study will explained to me.

I am also informed that all information contained within the questionnaire is to be kept confident. Moreover I have also been well informed of my right to keep hold of information, decline to cooperate and drop out of the study if I want and none of my actions will have any bearing at all and my overall health care and hospital access.

It is therefore with full understand of the situation that I agreed to give the written voluntary to the research to use the data taken from the written questioners; for investigation. I also have had the opportunity to ask questions about the project and have got the clarification to my satisfaction.

Moreover I also told that the result will be reported timely to physician or the hospital manager about any change of laboratory biosafety practice due to adequate safety practice from pre analytical up to post analytical for appropriate management depending on the quality laboratory service. And hence I agreed that I am contributing to the management of my fellows and myself by contributing in this project.

I the invited participant , given all relevant information the purpose of this particular study, participants to be included the study procedure, benefits and risks of the study, consent and confidentiality read and explained to me, I decided to agree or disagreeto participate in this particular study.

Therefore, I kindly request your agreement by indicating any of your response agree or disagree by marking ‘’ √ ’’

Agree Disagree

Signature _____ Signature _____ _____

(Laboratory personnel) (Investigator)

Date 45 If you have any questions about the study, please contact

MuluSeid ;Tel. 0911812007 E-mail= muluseid29@gmail.com

Annex IIIb. Consent form (Amharic version*)*

አዲስ አበባ ዩኒቨርሲቲ፣ ሜዲካል ፋኩልቲ፣የላቦራቶሪ ሳይንስ ትምህርት ክፍል የድህረ ምረቃ መርሀ ግብር የላቦራቶሪ ባለሙያ የፈቃደኝነት መግለጫ ቅጽ ከዚህ በታች እንደተመለከተው በአዲስ አበባ ዩኒቨርሲቲ፣ሜዲካል ፋኩልቲ፣የላቦራቶሪ ሳይንስ ትምህርት ክፍል በህክምና ላቦራቶሪ ክፍል ውስጥ ያለው ናሙና በሚወሰድበት ጊዜ እስከውጤት መውጣት ባለው ጊዜ ሊከሰቱ የሚችሉ ቸግሮችን ለመቀነስ የሚደረጉት ጥንቃቄወች ላይ ያላቸዉን አሰራር እና ልምድምን እንደሚመስል በላብራቶሪ ባለሙያዎች ላይ ያላቸውን የእውቀት፣የልምድ እና ዝንባሌ ምን እንደሚመስል የህክምና መከላከያ ዕቃዎች በመጠቀም የተሻሻለ የላቦራቶሪ አገልግሎት መስጠት ምክንያትን ለማወቅ ጥናት እየተካሄደነው።

የተከበሩ የላቦራቶሪ ባለሙያ

እርስዎ ከዚህ በላይ በተጠቀሰው የጥናት ምርምር ለመሳተፍ እና ማንኛውንም መረጃ ለማግኘት ፈቃደኝነትዎን እንዲያስታውቁን ያስፈልጋል፡፡

በዚህ ጥናት ተሳታፊዎች መጠይቆች የሚደረግላቸው ሲሆን በተጨማሪም የላቦራቶሪ ስራ ላይ የሚደረጉ የጥንቃቄ አሰራር እንዲሁም የጥራት አገልግሎት ለሚደረገው መጠይቅያ ደርጋሉ። በመሆኑም ለላቦራቶሪ ምርመራ ላይ የሚሰጡ የጥንቃቄ አገልግሎት እና አስፈላጊ የሚሆን መጠይቅ የሚሰጡ ሲሆን በወቅቱም ለየትኛዉም አይነት የላቦራቶሪምርመራ ሲሰጡ የሚሰማው ምንም ዓይነት ጉዳት የሌለው መሆኑ፡፡ሆኖም መጠይቁ የሚወሰደው በተመራማሪው ወይም የህክምና ባለሙያዎች ስለሆነ ምንም አይነት አደጋ አይኖረውም። የሚሰጡት ማንኛውም መረጃ በሚስጥር የሚጠበቅ በመሆኑ በማንኛውም መንገድ ለሶስተኛ አካልአሳልፎ አይሰጥም ወይም አይገለጥም።

እርስዎ ከመጀመር ያበጥናቱ ላይ ላለመሳተፍ እንዲሁም መሳተፍጀምረው በመሃል ለመተውመብታቸው ሙሉ በሙሉ የተጠበቀነው። በቅድሚ ያለሚያደርጉት የስምምነት ምላሽ እያመሰገንን ሊሰጡን የፈለጉትን የመስማማት ወይም ያለመስማማት ምላሽዎን በተዘጋጀው የመልስ ሳጥንውስጥይህንን " √ " ምልክት በማድረግ ይግለጹ።

ተስማምቻለሁ አልስማማም

የውል ተቀባይ ፊርማ ---------- የውል ሰጪ ፊርማ ---------- ቀን ----------

ጥናቱን በተመ ለከተማንኛዉ ምአይነት ጥያቄ ቢኖርዎት በሚቀጥለው አድራሻ በነጻነት መጠ የቅይችላሉ።

ሙሉ ሰኢድ, ስልክ. 09118l2007, E-

Annex IV. Questionnaires

Addis Ababa University, College of Health Science

Department of Medical Laboratory Science

For Assessment of Bio risk management practise and Associated Factors in Clinical Laboratory among governmental and private Hospitals in Addis Ababa, Ethiopia.

Laboratory Personnel ID----------

Name of facility----------General Direction: encircles the answer of your choice and please put a number in the column of "code" for the answer in cases where the responses other than mark are required in the space provided and also more than one answer is possible.

	Section one Socio demographic characteristics' information	**Response**	**ode**
1	Your age group(years)		
2	Sex	➢ Male=1 ➢ Female=2	
3	Your marital sates	➢ Single=1 ➢ Married=2 ➢ Divorced/separated=3	
4	What is your qualification	➢ Diploma = 1 ➢ Degree = 2 ➢ Second degree =3 ➢ Other =4 specify(-----)	
5	How many years have you been working in the medical laboratory fields?		
6	What is your position in this health institution?	➢ lab head= 1 ➢ section/department head= 2 ➢ Quality officer= 3 ➢ Bio Safety officer= 4 ➢ Laboratory staffs= 5 ➢ Other specify= 6	
7	What disciplines do you work?	➢ Microbiology = 1 ➢ Parasitological/Urinalysis = 2 ➢ Clinical Chemistry= 3 ➢ Haematology = 4 ➢ Immunology/Serology=5 ➢ Specimen Collection= 6 ➢ Other specify = 7	

	Section Two: Personal Protective Device towards biorisk management practice Staffed	Response	od
1	Do you use Eye protection(safety glasses, face shields	➢ Never=1 ➢ Rarely=2 ➢ Sometimes=3 ➢ Often=4 ➢ Always=5	
2	Do you use Respiratory protection (face masks, N95 respirators, face shields, hoods, PAPRS	➢ Never=1 ➢ Rarely=2 ➢ Sometimes=3 ➢ Often=4 ➢ Always=5	
3	Do you use Body protection (laboratory coats, uniforms, coveralls, surgical scrubs, rubber boots, Disposable shoe covers).	➢ Never=1 ➢ Rarely=2 ➢ Sometimes=3 ➢ Often=4 ➢ Always=5	
6	Do you wear gloves when hands may contact Potentially infectious material	➢ Never=1 ➢ Rarely=2 ➢ Sometimes=3 ➢ Often=4 ➢ Always=55	
	Section 3 Engineering device to words bio risk management practise		
1	. Is the working space adequate for safe operation?	➢ Yes=1 ➢ No=2	

2	.Is the circulation spaces and corridors adequate for the movement of people and large equipment?	➢ Yes=1 ➢ No=2	
3	Are bench surfaces resistant to solvents and corrosive chemicals and easily to cline	➢ Yes=1 ➢ No=2	
4	Is working temperate is comfortable Or is there any mechanical ventilation system	➢ Yes=1 ➢ No=2	
5	Do you have reliable and adequate electricity supply and emergency lighting	➢ Yes=1 ➢ No=2	
6	Do you have supply of good quality water for drinking	➢ Yes=1 ➢ No=2	
	Section 4 **Administrative control or managerial aspect towards bio risk management practice**		
1	Is there an occupational health service programme relevant to the worker of the laboratory?	➢ Yes=1 ➢ No=2	
2	Isthere first aid box with qualified first-aiders available?	➢ Yes=1 ➢ No=2	
3	Is there any protocol for Exclusion of highly susceptible individuals (e.g. pregnant women or immune compromised individuals) from highly hazardous laboratory work	➢ Yes=1 ➢ No=2	
4	Is there an immunization programme relevant to the work of the laboratory? HBV vaccination program	➢ Yes=1 ➢ No=2	
5	Are proper records maintained of illnesses and accidents?	➢ Yes=1 ➢ No=2	
6	Are warning and accident prevention signs used to minimize work hazards?	➢ Yes=1 ➢ No=2	
8	Are laboratory staff encouraged to report potential exposure	➢ Yes=1 ➢ No=2	
9	Is there any development, adoption of bio risk management plan by the director	➢ Yes=1 ➢ No=2	

10	Do you have a regular training in laboratory biosafety and biosecurity that is provided by the laboratory hade	➢ Yes=1 ➢ No=2	
11	Is there standard operational procedure (sop)	➢ Yes=1 ➢ No=2	
12	Is there written procedure for clean-up of spill	➢ Yes=1 ➢ No=2	
13	Is there any chemical waste contender(labelled keep close and easily available	➢ Yes=1 ➢ No=2	
14	Appointment of biosafety officer with clear written roles and responsibility	➢ Yes=1 ➢ No=2	
15	Is there availability of an eyewash station and spill kit material in laboratory	➢ Yes=1 ➢ No=2	
16	Is there safety operation manual	➢ Yes=1 ➢ No=2	
17	Is there appropriate biosafety precaution and procedures in the laboratory	➢ Yes=1 ➢ No=2	
	5 Infectious /biological material handling and accountability and biosecurity to words Bio risk management practise		
1	Is there any data handling system (computer access) and squirt of data(do you have password)Section	➢ Yes=1 ➢ No=2	
2	is there any policy on visiting personal in your laboratory	➢ Yes=1 ➢ No=2	
3	Do you have any biosecurity training Program	➢ Yes=1 ➢ No=2	
4	Is there any policy and procedure of the potential hazards in laboratory	➢ Yes=1 ➢ No=2	
5	Is there association with any professional Organization in laboratory	➢ Yes=1 ➢ No=2	

6	Is there adequate supplies, including appropriate shipping containers, are available for transport I(triple brakeage used)	➢ Yes=1 ➢ No=2	
7	Anyone sending specimens is aware of the required transport procedures	➢ Yes=1 ➢ No=2	
8	Procedures are in place to ensure materials can be transported safely to and from the laboratory	➢ Yes=1 ➢ No=2	
9	Is the whole building securely locked when unoccupied?	➢ Yes=1 ➢ No=2	
10	Do you have information about biosecurity	➢ Yes=1 ➢ No=2	
11	Are rooms containing hazardous materials and expensive equipment locked when unoccupied?	➢ Yes=1 ➢ No=2	
Section 6 **Equipment and Maintenance to words bio risk management practise**			
1	. Access to appropriate biological safety cabinets (BSCs) and other essential equipment is ensured	➢ Yes=1 ➢ No=2	
2	Ensure equipment has been adequately maintained and validated, preferably with a stockpile of replacement parts	➢ Yes=1 ➢ No=2	
3	Are procedures available for decontaminating equipment prior to maintenance?	➢ Yes=1 ➢ No=2	
4	Are biological safety cabinets and fume cupboards regularly tested and serviced?	➢ Yes=1 ➢ No=2	
5	Are autoclaves and other pressure vessels regularly inspected?	➢ Yes=1 ➢ No=2	
6	Are centrifuge buckets and rotors regularly inspected?	➢ Yes=1 ➢ No=2	
7	Do you use of mechanical pipette to replace mouth pipette	➢ Yes=1 ➢ No=2	

8	Is cracked and chipped glassware always discarded and not reused?	➢ Yes=1 ➢ No=2	
9	Do you use safe receptacles for broken glass?	➢ Yes=1 ➢ No=2	
10	Do you use plastics instead of glass where feasible?	➢ Yes=1 ➢ No=2	
11	Are sharps disposal containers easily available and being used	➢ Yes=1 ➢ No=2	
Section 7 Assessment of factor affecting to bio risk management practise			
1	Is there practice of waste disposable protocol in place of laboratory	➢ Yes=1 ➢ No=2	
2	Is there practice of the policies for the safe handling of sharp in laboratory	➢ Yes = 1 ➢ No=2	
3	Is there practice of a waste disposal protocol in place of laboratory	➢ Yes=1 ➢ No=2	
4	Is there appropriate biosafety precautions and procedures in the laboratory	➢ Yes=1 ➢ No=2	
5	Do you know or have information about biosafety and biosecurity	➢ Yes=1 ➢ No=2	
6	Do you stored the protective laboratory clothe with that of clothe in the same locker	➢ Yes=1 ➢ No=2	
7	Do you recorded and document all laboratory information related with bio safety and security	➢ Yes=1 ➢ No=2	
8	Do you eat and drinking in laboratory	➢ Yes=1 ➢ No=2	
9	Do you monitor your laboratory activates to take an action to avoid accidents in the working area	➢ Yes=1 ➢ No=2	

10	Do you store flammable liquids in proper, ventilated containers that are made of non-combustible materials?	➢ Yes=1 ➢ No=2	
11	Do you have an incident /accident system in the laboratory	➢ Yes=1 ➢ No=2	
12	Do you have any practice to decontaminate(chemically and physically) before discharging to the sanitary sewer	➢ Yes=1 ➢ No=2	
13	Do you have written procedure for the clean-up of all spills	➢ Yes=1 ➢ No=2	
14	Do you decontaminate all cultures stokes and wastes before disposable such as autoclaving	➢ Yes=1 ➢ No=2	
15	Do you seal rotor heads and centrifuge cup regularly	➢ Yes=1 ➢ No=2	
16	Do you remove broken glassware mechanically by manual	➢ Yes=1 ➢ No=2	
17	Do you use disposable needles	➢ Yes=1 ➢ No=2	
18	Do you recap the needle after sample collection	➢ Yes=1 ➢ No=2	
19	Do you have any practice of decontamination for used material in the laboratory	➢ Yes=1 ➢ No=2	
20	Do you wash your hands before leaving the laboratory	➢ Yes=1 ➢ No=2	
21	Do you store food outside the work area of laboratory	➢ Yes=1 ➢ No=2	
22	Do you wash your hands after handling biohazards material	➢ Yes=1 ➢ No=2	
Section 8 Observation check list for bio risk management practise			

1	Persons wash their hands after they handle viable Materials, after removing gloves, and before leaving the laboratory	➢ Yes=1 ➢ No=2	
2	Eating, drinking, smoking, handling, contact lenses and applying cosmetics are not permitted in the work area	➢ Yes=1 ➢ No=2	
3	Food is stored outside the work area in cabinets or refrigerators designated for this purpose only\	➢ Yes=1 ➢ No=2	
4	Polices for the safe handling of sharps are instituted	➢ Yes=1 ➢ No=2	
5	All procedures are performed carefully to minimize the creation of splashes or aerosols.	➢ Yes=1 ➢ No=2	
6	Do you worn laboratory gowns or uniform away from the laboratory lack cafes and rest room/toilet	➢ Yes=1 ➢ No=2	
7	Work surfaces are decontaminated on completion of work or at the end of the day and after any spill or splash of viable material with disinfectants	➢ Yes=1 ➢ No=2	
8	Only authorized persons should be allowed to enter the laboratory working areas.	➢ Yes=1 ➢ No=2	
9	Laboratory coveralls, gowns or uniforms must be worn at all times for work in the laboratory	➢ Yes=1 ➢ No=2	
10	The laboratory should be kept, clean and free of materials that are not pertains to the work	➢ Yes=1 ➢ No=2	
11	After use , gloves should be removed aseptically and hands must then be washed	➢ Yes=1 ➢ No=2	
12	Polices for the safe handling of sharps are instituted	➢ Yes=1 ➢ No=2	
13	Work surfaces must be decontaminated after any spill of potentially dangerous material and at the end of the working day	➢ Yes=1 ➢ No=2	
14	Evidence of proper waste disposal in the laboratory	➢ Yes=1 ➢ No=2	
15	No rash on floor of the laboratory	➢ Yes=1	

		➢ No=2	
16	No chewing games and no eating/drinking/smoking inside the laboratory	➢ Yes=1 ➢ No=2	
17	Is there laboratory be kept neat and clean before and after doing the work using antiseptics.	➢ Yes=1 ➢ No=2	
18	Are the benches, furniture and fittings in good condition?	➢ Yes=1 ➢ No=2	
18	the premises maintained in a clean, orderly and sanitary condition	➢ Yes=1 ➢ No=2	
19	Is there Emergency exit	➢ Yes=1 ➢ No=2	
20	Are there any Structural defects in floors in laboratory	➢ Yes=1 ➢ No=2	
21	Is there a hand-washing sink in laboratory room	➢ Yes=1 ➢ No=2	
22	Is there isolated room for phlebotomist	➢ Yes=1 ➢ No=2	
23	Is there first-aid boxes provided at strategic locations in laboratory	➢ Yes=1 ➢ No=2	
24	Is bio hazard sign is post in your laboratory	➢ Yes=1 ➢ No=2	
25	Entry to lab is restricted and post on the door	➢ Yes=1 ➢ No=2	
26	Can access to laboratory areas be restricted to authorized personnel	➢ Yes=1 ➢ No=2	
27	Is there isolated untie for microbiology	➢ Yes=1 ➢ No=2	
28	Eye wash facility	➢ Yes=1 ➢ No=2	
29	Is there toilet and washing facility	➢ Yes=1 ➢ No=2	
30	Do you post a bio hazard sign at the entrance of laboratory	➢ Yes=1 ➢ No=2	

31	Is there fire extinguishers	➢ Yes=1 ➢ No=2	
32	Facilities for eating and drinking and for rest should be provided outside the laboratory working areas	➢ Yes=1 ➢ No=2	
33	Is there fire extinguisher in laboratory	➢ Yes=1 ➢ No=2	

Declaration

I, the undersigned, declare that this M.Sc. thesis is my original work, has not been presented for a degree in this or any other university and that all sources of materials used for the thesis have been duly acknowledged.

M.Sc. candidate: Mulu Seid (B.Sc.)

Signature:_____

Date of submission:_____

This thesis has been submitted with our approval as advisors.

Advisor: Fatuma Hassen (BA, BSc, MPH, PhD Candidates)

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.

Advisor: Dr Eyob Abera (MSc, MPH, PhD)

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.

Advisor:Abay Sisay (BSc, MSc)

Signature: _____

Date: _____

Place: Addis Ababa, Ethiopia.