ASSESSMENT OF KNOWLEDGE AND PRACTICE OF LABORATORY STAFF ON BIOSAFETY PRECAUTION IN CLINICAL LABORATORY AT SELECTED GOVERNMENT TERTIARY HOSPITALS

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Master of Hospital Administration (MHA)

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This thesis has been approved by the Board of Examiners.

Chief Examiner

Examiner (1) **Examiner (2)**

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ABSTRACT

A cross sectional study was conducted to assess the knowledge and practice of laboratory staff on biosafety precautions in clinical laboratory of Yangon General Hospital (YGH), North Okkalapa General Hospital, Yangon Specialty Hospital, Yangon Children Hospital, Central Woman Hospital (Yangon) and New Yangon General Hospital (NYGH) from September to December, 2019. Total 96 staff including officer, laboratory technician (1), laboratory technician (2) and laboratory technician (3) were participated in quantitative study. For qualitative study, one pathologist, one microbiologist and four laboratory staff were participated. Most of respondents were ≤40 years and female staff were more dominant. Most of staff were diploma holders and about half of respondents were more than five years services. Most of the staff (65.6%) were no on job training about biosafety precautions. In this study, 60 percent of given marks of the knowledge and practice scores were used as line of demarcation to separate good and poor. Among them, (85.4%) had good knowledge and 80.2% were practicing good practice. In this study, most of the staff had knowledge about personal protective equipment (PPE) but less used this knowledge in practice like using of apron, goggles. Knowledge level had statistically significant association with age and there was also statistically significant association between age and also rank with practice level. This association explored that the younger age had better knowledge and better practice than the older age. Qualitative study pointed that old age staff less followed the guideline because of their experience in practice. Moreover, trainings and continuing medical education (CME), supported and supervised by top level authorities were required to improve their knowledge and practice and supplies of the necessary equipment for safety were also important. Regulatory mechanism was needed to let them apply their knowledge in practice. In this study, the laboratories of hospitals had just completed the biosafety level 2, and so, there should be further supply of facilities for higher biosafety level.

CONTENTS

LIST OF ABBREVIATION

AFD	French Development Agency
CME	Continuing Medical Education
CWH	Central Women Hospital
HCW	Health Care Worker
IPC	Infection Prevention and Control
KII	Key Informant Interview
LAI	Laboratory Acquired Infection
LSP	Laboratory Standard Precaution
MoHS	Ministry of Health and Sport
NYGH	New Yangon General Hospital
NOGH	North Okkalapa General Hospital
PPE	Personal Protective Equipment
SOPs	Standard Operations Procedures
SPSS	Statistical Package for Social Science
WHO	World Health Organization
WYGH	West Yangon General Hospital
YCH	Yangon Children Hospital
YGH	Yangon General Hospital
YSH	Yangon Specialist Hospital

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CHAPTER (1)

INTRODUCTION

1.1 Background Information

Biosafety is an important issue in worldwide laboratory settings. Clinical laboratories' workers, especially those who are working in microbiology laboratories, are more susceptible to laboratory-acquired infections.

Diagnostic laboratories located in public health centers, clinics and hospital institutions and dealing with infectious materials are a high-risk area for staff working in it. The hazards such as infectious aerosols, spills, needles stick injuries, cuts from sharp objects, broken glass, chemical and radioactive materials, centrifuge accidents and fire that can cause infectious to the staff. Therefore, biosafety precautions in diagnostic laboratories become a crucial issue that should be followed (Elduma, 2012).

Biosafety means that "a safety method for managing infectious agents in laboratory environment where they are handled and maintained." The exposure to the risk factors inside the laboratory is decreased by implementation of biosafety precautions. The four main biosafety levels for laboratories designated as; level-1 basic, level-2 containment, level-3 and maximum containment is level-4 (Elduma, 2012).

Biosafety is also an important element of a quality management system as it is a measuring tool for compliance with accreditation and certification standards. As far as safe handling and containment of infectious microorganisms and hazardous biological material is concerned, biosafety has become the code of practice in microbiological and biomedical laboratories (Muhammad et al., 2018).

1.2 Problem statement

Laboratory acquired infections are a common problem all over the world and there are many cases that have been reported., The first serious surveys of laboratory associated infections were published by Sulkin and Pike in 1949.Laboratory acquired tuberculosis infection was considered high among health care providers, including medical laboratory staff. Similarly, data from England and Wales showed that laboratory technical staff is at a 7.5 times increased risk of acquiring tuberculosis compared to the general population. Therefore, biosafety conception in laboratory practice is of ultimate importance for managing hazardous agents in the laboratory

environment; and as such it must be given high priority at all times (Khabour et al., 2018a).

Compliance with universal precautions in health care facilities was reported as low rate for certain types of personal protective equipment such as protective eye wear, face mask and protective clothing in a study conducted in Maryland State, United States of America. So, in diagnostic laboratories, biosafety precautions become a crucial issue that should be followed. These precautions included the practices, safe equipment and facility, protection of laboratory staff and public environment from exposure to infectious substances (Elduma, 2012).

1.3 Justification

Biosafety is an important part in laboratories worldwide, especially in developing countries where standard operating procedures (SOPs) are lacking. There are different sources and actions in laboratories that can cause biological and chemical hazards.

World Health Organization (WHO) reported that about 3 million health care workers (HCW) all over the world experience per- cutaneous exposure to blood borne viruses; 2.5% of HIV cases and 40% of Hepatitis B and C cases among health workers during work and handling laboratory (Al-Abhar et al., 2017).

Clinical laboratory staff, who is exposed on a daily basis to various hazards and risks from human samples, infectious aerosols, spills, broken glass, cuts from sharp objects, needle stick injuries, chemical agents, centrifuge accidents faced with numerous occupational hazards and their health and safety may be severely jeopardized if appropriate protective practices are not possessed (Khabour et al., 2018a).

If laboratory staff does not know the biosafety precaution and does not abide by the biosafety precautions, this may lead to biological and chemical hazards, even death. (e.g., exposure to blood borne virus such as HIV, Hepatitis B and C).

Moreover, there are limited studies exploring the knowledge and practice of laboratory staff on biosafety precaution in Myanmar. Hence, this study is conducted with the aim to assess knowledge and practice of laboratory staff on biosafety precaution, to assess the compliance of the selected government tertiary hospitals, this may raise awareness on biosafety precaution and this study may be utilized as a support to prevent occupation hazards related to lack of biosafety precaution to a certain extent.

CHAPTER (2)

LITERATURE REVIEW

Biosafety is an important issue in worldwide laboratory settings. Workers in clinical laboratories, especially those who are working in microbiology laboratories, are more susceptible to laboratory-acquired infections. Biosafety is also an important element of a quality management system as it is a measuring tool for compliance with accreditation and certification standards. As far as safe handling and containment of infectious microorganisms and hazardous biological material is concerned, biosafety has become the code of practice in microbiological and biomedical laboratories for the past 2 decades. Although biosafety performance has significantly increased in some regions, there is still a need to improve biosafety practices in developing countries, especially diagnostic laboratories in Africa, where biosafety performance has been compromised because of poor administrative controls and unavailability of biosafety facilities (Muhammad et al., 2018).

2.1 Development of guideline for prevention and control of infection

The South-East Asia and Western Pacific Regional Offices of the World Health Organization (WHO) have jointly developed the guidelines to provide comprehensive information to health care workers in the prevention and control of transmissible infections. These are built on current infection control guidelines, which have recently been developed by WHO. In the integrated management of hospital-associated infections prevention and control, the guidelines have been prepared specifically to assist infection control practitioners (for both curative and preventive activities such as good environmental practices like proper administration of health care wastes, water quality control, etc.) and to ensure that health care administrators understand the significance of infection control programs.(WHO, 2004) Infection control practices can be grouped into following categories

(1) Standard precautions

(2) Additional (transmission-based) precautions.

Transmission of infections in health care facilities can be prevented and controlled through the application of basic infection control precautions. It can be grouped into standard precautions, which must be applied to all patients at all times,

regardless of diagnosis or infectious status and additional (transmission-based) precautions which are specific to modes of transmission (airborne, droplet and contact) (WHO, 2004).

Treating all patients in the health care facility with the same basic level of "standard" precautions involves work practices that are essential to provide a high level of protection to patients, health care workers and visitors. These are hand washing and antisepsis (hand hygiene), use of personal protective equipment when handling blood, body substances, excretions and secretions, appropriate handling of patient care equipment and soiled linen, prevention of needle stick/sharp injuries, environmental cleaning and spills-management and appropriate handling of waste (WHO, 2004).

At recruitment, Employees' health should be reviewed, including immunization history and previous exposures to communicable diseases (e.g. tuberculosis) and immune status. Some previous infections like varicella-zoster virus may be assessed by serological tests. Immunization against hepatitis A and B, influenza, measles, mumps, rubella, tetanus, and diphtheria is recommended for staff. Immunization against varicella, rabies may be considered in specific cases. The Mantoux skin test will document a previous tuberculosis (TB) exposure (WHO, 2004).

2.2 What is biosafety?

Biosafety aims to protect all those who are exposed, directly or indirectly to infectious agents while handling laboratory specimens. Biosafety level of risks with organisms depend on the basis of risks to laboratory staff, spread in the community, pathogenicity and availability of effective prophylaxis and treatment. Risk group are

(1) Harmless or pose a minimal hazard to laboratory staff and community,

(2) Organisms pose moderate potential hazard for laboratory staff but limited risk for community. Effective preventive measures and treatment are available,

(3) Organisms cause serious human disease and pose serious hazards to laboratory staff. These organisms are transmitted through aerosol but do not readily spread from one infective individual to another. They are low risk for the community. Effective prophylaxis and treatment are normally available.

(4) Organisms pose severe human disease and are high risk for laboratory personnel. These organisms readily spread from one infected individual to another in the community. There is no effective treatment or prophylaxis, and maximum containment facilities during handling are required.

Biosafety level is divided into four levels depending on risk of organisms.

Biosafety level (1) - The organisms which are not known to cause disease in healthy adult humans and conduct on open benches with no special containment equipment

Biosafety level (2) - Work involving agents of moderate potential hazard to staff and environment, staff take universal precaution and follow good microbiological techniques and procedure which create infectious aerosols are performed in biological safety cabinets

Biosafety level (3) - Work with agents that may cause serious or potentially lethal disease as a result of exposure by inhalation and all procedures are conducted within biological safety cabinets by wearing protective clothing

Biosafety level (4) - Organisms that cause life-threatening disease ,apart from level (3), include airlock entry, shower exit and special waste disposal facilities, class III biosafety safety cabinets, positive pressure suits, double-ended autoclaves and filtered air are essential safety requirement (National Health Laboratory, 2016).

Workers usually are faced with numerous occupational hazards and their health and safety may be severely jeopardized if appropriate protective practices are not possessed. Among such workers are the clinical laboratory staff, who is exposed on a daily basis to various hazards and risks (Khabour et al., 2018).

2.3 Why is the standard laboratory practice important?

Since 1980s, fundamental guidelines have been applied in activities associated with blood borne pathogens. Moreover, Harding and Byers reported that 45% to 51% of laboratories associated infections took place in clinical, diagnostics and research laboratories. Standards precautions such as gloves wearing, hands washing, safety glasses and face shield is highly recommend in diagnostic laboratories (Elduma, 2012).

For prevention of unintentional exposure to pathogens and toxins or their accidental releases, laboratory biosafety has been described as the containment principles, technologies, and practices implemented. In different parts of the world, several laboratory-associated infections have occurred involving both known and previously unknown agents. Use of protective clothing and safety gadgets alone may not guarantee the safety of the laboratory personnel. For protection of the laboratory workers from the risk of laboratory associated infections, there should always be a combination of policies and systems. Improper containment and poor disposal of biomedical wastes is a potential hazard to health care workers, patients, and the community at large. Reports have also associated good room ventilation with reduced risks of acquiring airborne infection in hospital settings (Oladeinde et al., 2013).

Regular trainings and capacity building are required for all health care workers to ensure that they follow the laid down standard operating procedures and thus avoid any mishap. Delays in such trainings and improper supervision results in their reverting back to their old habits (Ahmed, Shahid and Mustufa, 2013).

WHO mentioned that "Laboratory biosafety" is the term used to describe the containment principles, technologies, and practices that are implemented to prevent unintentional exposure to pathogens and toxins or their accidental release. "Laboratory biosecurity" means that institutional and personal security measures designed to prevent the loss, theft, misuse, diversion, or intentional release of pathogens and toxins. Surveillance of laboratory-acquired infection (LAI) is, therefore, an efficient marker to evaluate the effectiveness of biosafety and to optimize the risk assessment (Pastorino, Lamballerie and Charrel, 2017).

2.4 Sources of laboratory acquired infection

The 10 diseases responsible for >50% of LAI were brucellosis, Q fever, viral hepatitis, typhoid fever, tularemia, tuberculosis, dermatomycoses, Venezuelan equine encephalitis, psittacosis, and coccidioidomycosis. 85% of LAI were caused by Mycobacterium tuberculosis, Coxiella burnetii, hanta viruses, arbo viruses, hepatitis B and C viruses, Brucella spp., Salmonella spp., Shigella spp., and Cryptosporidium spp. From 2004 to 2010, only 11 LAIs were reported to CDC for microorganisms listed as Biological Select Agents and Toxins six cases due to Brucella spp., four cases due to Francisella tularensis, and one case due to Coccidioides immitis in the USA. Current practices have also minimized worker's pathogen exposition and improvements in containment equipment, engineering controls, and safety training contributed greatly to this reduction. About 80% of LAIs are caused by inhalation (particularly by aerosols) or direct contact between contaminated surfaces (gloves and hands). The other sources of infection are percutaneous inoculation (needle stick injuries, broken glass injury, and/or animal bites or scratches) and LAIs due to smoking, eating, or accidental aspiration through a pipette has now disappeared because of banishment of these practices (Pastorino, Lamballerie and Charrel, 2017) .

2.5 Challenges for getting higher biosafety level

Depending on the severity of the natural disease, the route of infection, and the therapeutic and preventive arsenal, the WHO has recommended to classify microorganisms according to four general risk groups (RG1–RG4). It must be manipulated in laboratory enforcing the same containment level (CL) when a specific

RG is attributed to a given microorganism. A set of biocontainment measures to isolate dangerous biological agents in an enclosed laboratory facility is defined as the containment level (Pastorino, Lamballerie and Charrel, 2017).

At the European level, there is currently no harmonization for guiding CL-3 laboratories construction. Some countries (France, United Kingdom, Germany, etc.) have adopted regulations, rules, or guidelines, and there are several ISO/EN standards available in the EU that can be applied for containment laboratory planning, construction, and operation. In addition, European standards have been developed for biosafety equipment, e.g., autoclaves, biosafety cabinets (BSCs), and personal protective equipment (PPE), but regular oversight and recertification are guided by national specifications (Pastorino, Lamballerie and Charrel, 2017).

In Myanmar, the government has embarked on a five-year project to renovate the National Health Laboratory (NHL) to improve Myanmar's ability to investigate infectious diseases and respond to public health threats. "The new bio-safety level 3 laboratory and high-quality equipment will strengthen the NHL's position as the ministry's national reference laboratory and help it play a crucial role in public health nationally and regionally," The project was approved by the Pyithu Hluttaw (Lower House) in March 2018. A credit facility agreement was signed by the Ministry of Planning and Finance and AFD in June 2018.The AFD provided a soft loan of €22 million (K36.86 billion/US$24.07 million) for the project, and the EU provided a grant of €5 million. The project will include the construction of a 3000-square-metre building to house the bio-safety level 3 laboratory and the renovation of the NHL and the Mandalay Public Health Laboratory. It will also include the training of NHL staff in general laboratory practices and research, and improvement of the lab's environment and social performance. All three laboratories are expected to be fully operational by 2024 (Merieux Foundation, 2019).

The concessional loan granted by AFD to the Myanmar Ministry of Health and Sports will be used to construct and rehabilitate the buildings of the NHL in Yangon and Mandalay. "The project will provide Myanmar with a Biosafety Level 3 (BSL3) national reference laboratory in Yangon. It will also improve laboratory conditions in Mandalay, and will strengthen our national capacities in diagnostics, surveillance, preparedness, and response. This will have a very positive impact on public health in Myanmar." The project is the result of more than 6 years of fruitful collaboration between the Institute Pasteur, the Mérieux Foundation, the NHL, and the Ministry of

Health and Sports. The Mérieux Foundation has also been working with the MoHS, renovating and equipping three laboratories in Mandalay, Dawei, and Yangon, together with training and transferring technology to their staff. In the National Health Laboratory Project, the Mérieux Foundation's local teams, in Yangon and Mandalay, will provide expertise in helping health authorities build laboratory systems and networks that provide quality diagnostic services and disease surveillance (Merieux Foundation, 2019).

2.6 Related international studies on biosafety precautions

Respondents were rated as having a good practice level of LSP, 59% had a fair practice level, and 9% had poor practice. Receiving a biosafety manual and biosafety training were significantly associated with better level of LSP practice limited number of studies had investigated the knowledge of and compliance of laboratory staff to standard biosafety precautions. Biosafety is compromised primarily in low-resource countries such as Yemen. his study showed fair to poor biosafety knowledge and practices among laboratory staff as well as weak commitment to biosafety policies as reflected by the low percentage of laboratory staff who received a biosafety manual and training. This underlines the need to strengthen biosafety program and policies particularly in public laboratories (Abhar et al., 2017).

A cross sectional study conducted by Jitendra Zaveri and Jigna Karia at 2012 at various private hospital of Ahmedabad City, India, which concluded that the knowledge and practice about universal precautions among laboratory technicians were poor because almost all of the participants aware of being infected but only few aware of universal precautions. All the participants wear gloves during laboratory work but only one fourth put on face masks and about three fourth wore white lab coat. Only 17.5% had knowledge about post exposure prophylaxis and few (8.5%) had been immunized against hepatitis B vaccine. Moreover, the author recommended that the ultimate responsibility for safety of laboratory and staff depended on continuous commitments of superintendent that was the most significant factor influencing the practice to do infection control (Zavery, 2012).

Another cross- sectional study done by Henok Birhadu at tuberculosis testing laboratory in Addis Ababa, Ethiopia, explored that 67.5% of laboratory staff had satisfactory knowledge and the rest had low level. All staff had knowledge about personal protective equipment. Some participants had no knowledge that yellow plastic container is used for disposing potentially infected waste. Level of knowledge had

statistically significant association with education status. Regarding practice level, nearly half were satisfactory practice and the majorities were poor practice (Birhanu, 2014). The study on knowledge, attitude and practice of laboratory safety measures among paramedical staff of laboratory service found that before training about laboratory safety measures, 41% of participant responded correctly more than 70% of knowledge questions and after training, 90% of participant responded correctly more than 70% of knowledge questions. So this study concluded that the induction training on laboratory safety was very important and motivated the improving the laboratory safety measures (Goswami et al., 2011).

2.7 Related Myanmar studies on biosafety precautions

A cross-sectional descriptive study conducted at September 2010 to identify the knowledge, perception and practice of infection control measures among house officers. About half of the respondents needed to know that hand hygiene was necessary between procedures on the same patient. Poor practices were found in all area of infection control measures. Most of respondents about 62% washed hand after gloves off but only 14.4% of them washed before gloves (May-Soe-Aung, 2010). A study on knowledge and compliance of universal precautions among medical doctors and nurses at Yangon Orthopedic Hospital find almost all of respondents knew that hand washing should be done before wearing the gloves and after wearing the gloves. But only 68.1% of respondents revealed that they always practice hand washing after removal of gloves. More than half of respondents had the knowledge on wearing surgical mask and apron and the correct knowledge on needle recapping. Nearly half of respondents though squeezing of blood from site of needle stick injury reduced the risk of HIV infection. About half of respondents knew that sodium hypochlorite was used to clean up blood spill. Among all respondents, most of respondents had hepatitis B immunization. But only some of respondents rechecked their anti HBs antibodies status. About 89% of respondents recapped needle after used (Kaung-Htet-Thu, 2012). In a study of knowledge and practice of laboratory staff about standard precaution for infection prevention and control measure in clinical laboratory at Yangon General Hospital, Central Women Hospital, Yangon Children Hospital and New Yangon General Hospital, 59.8% had poor knowledge and in practice, 94.8% were poor and only 5.2% were good about standard precautions for IPC. In this study, most of the staff had knowledge about personal protective equipment (PPE) but did not use this knowledge in practice. Knowledge level had statistically significant with age and service year

(P<0.001). There was also association between age and practice (P<0.005). This association explored that the younger the age, the lesser the service year, the better knowledge they had whereas the older the age, the more practice on the standard precautions for IPC (Zaw-Win-Naing, 2016).

2.8 Conceptual Framework

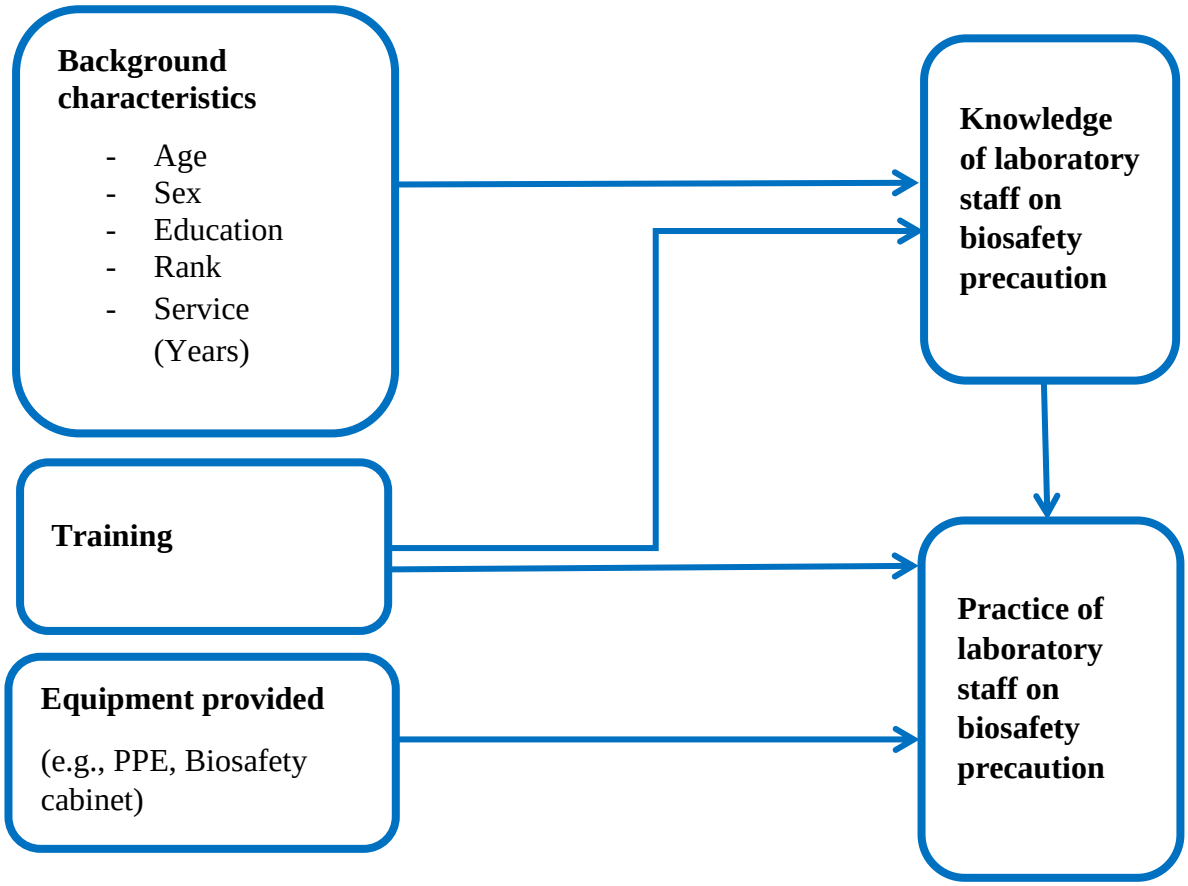

Figure 2.1 Conceptual Framework of assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals

CHAPTER (3)

OBJECTIVES

3.1 General Objective

To assess knowledge and practice of laboratory staff on biosafety precaution in clinical laboratories at selected government tertiary hospitals

3.2 Specific Objectives

1.To assess the knowledge and practice of laboratory staff about biosafety precaution in clinical laboratories at selected government tertiary hospitals

2. To assess the association between the background characteristics and knowledge and practice on biosafety precaution

3. To assess the compliance with biosafety precaution SOP at the facility and individual level.

4.To explore the challenges for compliance with standard biosafety precaution

CHAPTER (4)

RESEARCH METHODOLOGY

4.1 Study Design

Cross-sectional hospital-based study using mixed method was done.

4.2 Study Area

Clinical laboratory department at selected government tertiary hospitals (Yangon General Hospital, Yangon Specialist Hospital, Central Women Hospital, Yangon Children Hospital and New Yangon General Hospital North Okkalapa General Hospital)

4.3 Study Period

From August to November 2019

4.4 Study Population

Laboratory staff and clinical laboratory at selected government tertiary hospitals

4.5 Sample size determination

$\mathbf{n = z^2 pq/d^2}$ (Daniel & Cross, 2013) where,

n = Minimum required sample size

d = absolute precision required on either side of the proportion if confidence level=95%,

z =1.96

p = Assumed proportion of laboratory technician followed the biosafety precaution

= 0.5

q= 0.5

d= Margin of error= 0.1

Minimum required sample size n was calculated as follow:

$\mathbf{n=z^2 pq/d^2}$

$= (1.96)^2 *(0.5)*(0.5)/(0.1)^2$

=96

Minimal required sample size is **96.**

4.6 Sampling Procedure

For quantitative data, laboratory staff from Yangon General Hospital, Yangon Specialist Hospital, Central Women Hospital, Yangon Children Hospital and New Yangon General Hospital North Okkalapa General Hospital were recruited consecutively until the required sample size was fulfilled.

For qualitative data,

In-depth interview was taken with four technicians from selected hospitals who had at least 6-month experience at that hospital.

Key informant interview was taken with one pathologist and one microbiologist from selected hospital who had at least 6-month experience at that hospital.

4.7 Data collection methods and tools

Quantitative data: For objective (1) and (2), data collection was done by using self-administered with structured questionnaires which was modified from Dr Zaw Win Naing's Master Thesis "Knowledge and practice of laboratories staff about standard precautions for infection prevention and control measures in clinical laboratory staff" done at 2016. Pre-test was done at West Yangon General Hospital. Questionnaires included three parts which were background characteristics, assessment of knowledge and practice of the respondents on biosafety precaution. Correct statement was given 1 as a score and incorrect statement / not answer was given 0. For objective (3), checklist for facility level and individual level were used. Checklist was adopted from the biosafety checklist of the University of MEMPHIS and WHO laboratory biosafety manual (third edition). For facility level, presence of items related to biosafety precaution were checked and for individual level, the routine activities of staff were checked for following the biosafety precaution guideline or not. It was taken about two days for observation at each hospital.

Qualitative data: For objective (4), In-depth interview with four technicians and key informant interview with pathologist and microbiologist from selected hospitals were done using interview guideline. For all interviews, voice recording with note taking was done with their permission and all the recordings were transcribed into text by verbatim, including non-verbal expressions of the respondents. Field notes was written at the end of each interview. All the field notes and transcripts were read thoroughly.

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4.8 Data management and analysis

4.8.1 Quantitative data

Completeness of questionnaires was checked after completing self-administered questionnaires every day. Data from the questionnaires was entered into the computer after careful checking the coding by data checking system using the Epi Data program, preparation of properties of data for all variables and minimizing of errors, to avoid missing data, to ensure skip pattern, to ensure possible range pattern.

After data entry is completed, data was exported to SPSS version16, the data cleaning process for errors, missing and outliers was done carefully. Data analysis was done by SPSS version 16.

In exploratory data analysis, the final cleaning of data was done by looking for previously unrecognized illogical errors and any inconsistencies. After preliminary data analysis for further data cleaning and exploratory data analysis for data distributions, descriptive statistics on respondents' characteristics, socio-demographic characteristics was calculated. The summary measures (means, standard deviations, maximum, minimum) for continuous variables and frequency and percent for categorical variables were calculated.

4.8.2 Qualitative data

The research team read all the notes and transcripts thoroughly from the beginning to the end to familiarize the data and context within which data was collected. Then themes were identified based on the existing theory and literature search.

If necessary, themes were identified from the data via through and repeated reading. A coding system was set up, including themes, sub-themes and codes. Coding was done and data analysis was done using thematic analysis.

4.9 Ethical consideration

The study was conducted according to the guidelines issued by the University of Public Health Ethical clearance obtained from Institutional Review Board of the University of Public Health (2019/MHA/13)

At the entry of the study, an introduction to the study and its purpose as well as an explanation about the selection of the research subjects and the procedure was thoroughly explained to the participants. In addition, the possible benefits such as gaining new knowledge from this study and the freedom to withdraw were explained.

Free and written informed consent was obtained from the respondents only after knowing about the study in a clear and manifest way.

The opportunity for the participants to ask questions regarding the research was provided. The place for data collection was chosen appropriately in a private setting. No name was mentioned and the coding system was used in data collection. The privacy and confidentiality of the collected information from the research participants was strictly safeguarded.

The investigators conducted all analyses and patient identifiers were not present to anybody. Investigators and supervisors were access all data.

After complete data analysis, a report on the findings and results of the study was written. The investigators were published the finally approved version of the report that had been critically revised for important intellectual content. The personal identifiers were not published.

CHAPTER (5)

FINDINGS

Table 5.1 Background characteristics of respondents (n=96)

Background characteristics	Number	Percent
Age (years)		
≤40	74	77.1
>40	22	22.9
Sex		
Male	19	19.8
Female	77	80.2
Education		
M.Med.Tech	5	5.2
B.Med.Tech	19	19.8
Diploma	58	60.4
Other	14	14.6
Rank		
Officer	9	9.4
Lab Technician (1)	21	21.9
Lab Technician (2)	36	37.5
Lab Technician (3)	30	31.2
Total duration of government service (Years)		
≤ 5 years	45	46.9
> 5 years	51	53.1
Exposed of biosafety precaution training in current post		
Yes	33	34.4
No	63	65.6
Number of training on biosafety precaution (Infection prevention and control training) (within one year)		
1 time per year	27	81.8
2 or more times per year	6	18.2

Two- thirds of the respondents were under 40 years of age. The majority of respondents were female and most of laboratory technician (60.4%) hold diploma in medical laboratory degree followed by 19.8% of B.Med.Tech degree. Most of laboratory staff were technician 2 (37.5%) and technician 2 (31.2%). About half of respondents (53.1%) were more than five years in government service. Most of respondents (65.6%) did not have training on biosafety precaution in their current position. Among them (81.8%) had training for one time within one year.

Table 5.2 Knowledge level of the respondents on biosafety precaution (n=96)

Biosafety precaution knowledge	Number	Percent
Knowledge that their respective laboratory has biosafety precaution for infection prevention and control measure	80	83.3
Knowledge that hand washing is important for infection prevention and control measure	93	96.6
Knowledge that spill of infected body fluid or blood is decontaminated by sodium hypochlorite	73	76.0
Infected non reusable waste before disposal is treated by*		
Chlorine	39	40.6
Autoclave	33	34.4
Incineration	18	18.8
Infected reusable waste is treated by*		
Chlorine	52	54.2
Autoclave	60	62.5
The container used to collect specimen in TB patient before disposal is treated by*		
Sodium hypochlorite	39	40.6
5% phenol	32	33.3
Chlorine	3	3.1
All laboratory staff need vaccination like hepatitis B vaccine as special job requirement	94	97.9
All laboratory staff require regular medical check-up.	88	91.7

*Multiple response

Table 5.2 Knowledge level of the respondents on biosafety precaution (n=96) (contd;)

Biosafety precaution knowledge	Number	Percent
Knowledge that after being injured with sharp instrument or needle, the injury should be washed with water	63	65.6
Do not reduce the risk of transmission by squeezing of the blood from needle pricked injury site	66	68.6
When coughing, cover mouth and nose is important for infection prevention and control in laboratory	93	96.9
Knowledge that used syringe's needle should not recap	53	55.2
Knowledge that used syringe's needle should not bend.	87	90.6

Majority of respondents (83.3%) knew that their laboratory had biosafety precaution for infection prevention and control. Nearly all respondents (96.6%) knew that hand washing is important for infection prevention and control. Most of respondents (76%) knew that the spill of infected body fluids or blood should be decontaminated by using sodium hypochlorite.

Less than half of respondents (40.6%) answered that chlorine was used to treat infected non reusable waste before disposal and followed by using autoclave (34.4%). More than half of the respondents (62.5%) had knowledge on using autoclave for treating reusable waste and only 40% of respondents knew using sodium hypochlorite for treating container used to collect specimen in TB patient followed by one third of the respondents knew using 5% phenol.

Nearly all respondents (97.9%) had knowledge for hepatitis B vaccination, (91.7%) had knowledge to do regular medical check-up, (96.9%) had knowledge to cover mouth and nose during coughing and (90.6%) had knowledge not to bend the used syringe's needle. However, most of respondents (65.6%) washed the injury with water after being injured with sharp instrument, (68.6%) thought that squeezing of blood from needle pricked injury site which could not reduce the risk of transmission and (55.2%) had knowledge not to recap the syringe's needle.

Figure 5.1 Knowledge about personnel protective equipment (n=96)

Vast majority of respondents had knowledge to use gloves, coats and mask. Most of respondents had the knowledge to use apron and goggles.

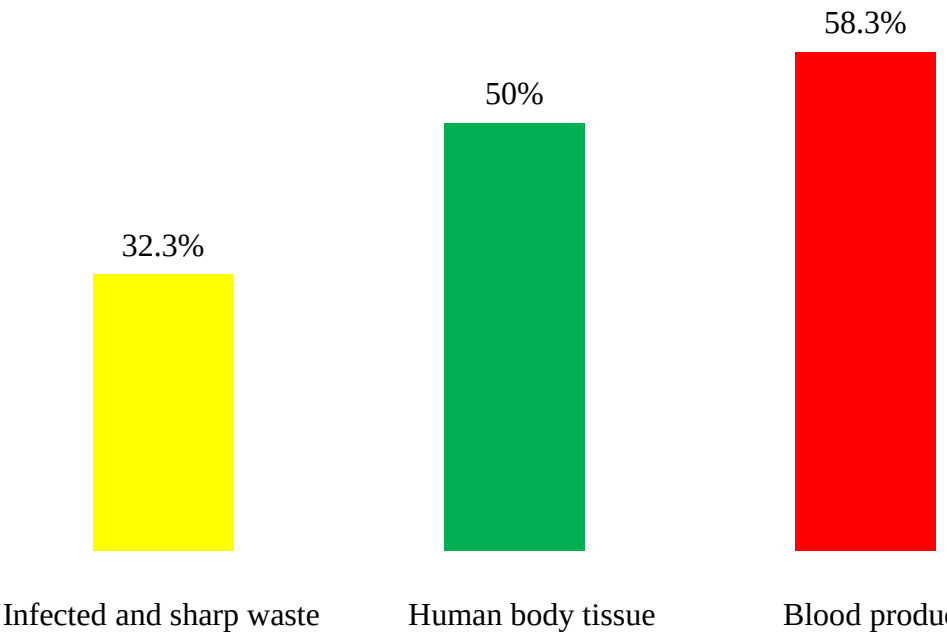

Figure 5.2 Knowledge about use of color bag for hospital waste (n=96)

Half of the respondents correctly knew that the color of waste bag and waste container for human body tissue and blood and blood products. Only few respondents knew that correct color of waste bag and waste container for infected and sharp waste.

Table 5.3 Practice level of the respondents on biosafety precaution (n=96)

Biosafety precaution practice	Number	Percent
Always wash hand before specimen with rubber gloves	68	70.8
Always wash hand after handling specimen with rubber gloves	94	97.9
Use personal protective equipment routinely	89	92.7
Container used to dispose sharp laboratory instruments*		
Sharp container	55	57.3
Safety box	24	25.0
Getting Hepatitis B vaccine for complete course	84	87.5
Getting Hepatitis B vaccine booster dose after five year	69	71.9
Investigate hepatitis B antibody after getting Hepatitis B vaccine for complete course	73	76.0
Not recap used syringe's needle	54	56.2
Not bend used syringe's needle before discard	86	89.6
Experience of injury with sharp instruments or needle or accidental exposed of infected body fluid or blood to eyes or mouth	16	16.7
Reporting laboratory supervisor/ in charge when accident or injury encounter (n=16)	14	87.5
Having training in job or exact written instruction for accident or injury in laboratory	65	67.7
Biohazard signs posted on lab entrance	66	68.8
The biohazard container is closed when not in used	90	93.8
Refrigerators are labeled "Not for Storage of Food for Human Consumption"	67	69.8
Do not eat food, drinking and chewing gum in laboratory	83	86.5
Do not apply cosmetic in laboratory	92	95.8

*Multiple response

Majority of respondents always washed their hand before handling specimen with rubber gloves. Nearly all of respondents always washed hand after handling specimen with rubber gloves. Nearly all respondents (92.7%) of laboratory staff used personnel protective equipment routinely. Among them, most used PPE is gloves and then followed by mask (86.5%) and lab coat (84.4%) used.

About half of respondents (57.3%) used sharp container for sharp laboratory instrument disposal and then followed by using safety box (25%). Majority of respondents had got hepatitis B vaccination.

Only about half of respondents recapped the syringe's needle after being used but most of respondents did not bend the used syringe's needle before discard (89.6%).

Only few respondents had the experience of injury with sharp instruments or needles or accidental exposed of infected body fluid or blood to eyes or mouths (16.7%) and among them only (14.6%) had reported laboratory supervisor or in-charge when accidents or injury encounter .Most of the respondents had training in job or exact written instruction for accidental or injury in laboratory.

Nearly all respondents closed biohazard container when not in used and they did not apply cosmetic in their laboratory. Majority of respondents did not eat food, drink and chew gum during working in laboratory (86.5%). Most of the respondents' laboratory had biohazard signs posted on their lab entrance (68.8%) and their lab refrigerator were labeled "Not for storage of food for human consumption (69.8%).

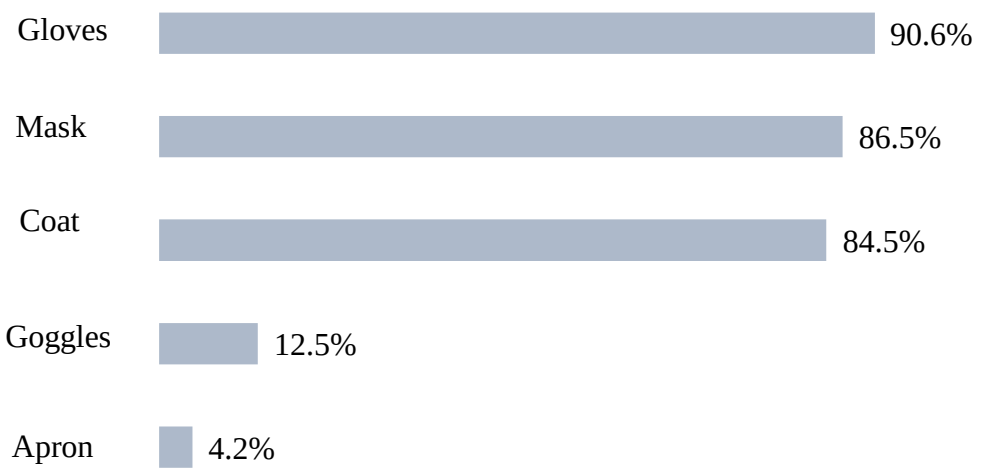

Figure 5.3 Practice on personnel protective equipment (n=96)

Majority respondents used gloves, masks and coat as personal protective equipment routinely. However, only few respondents used goggles and apron as PPE.

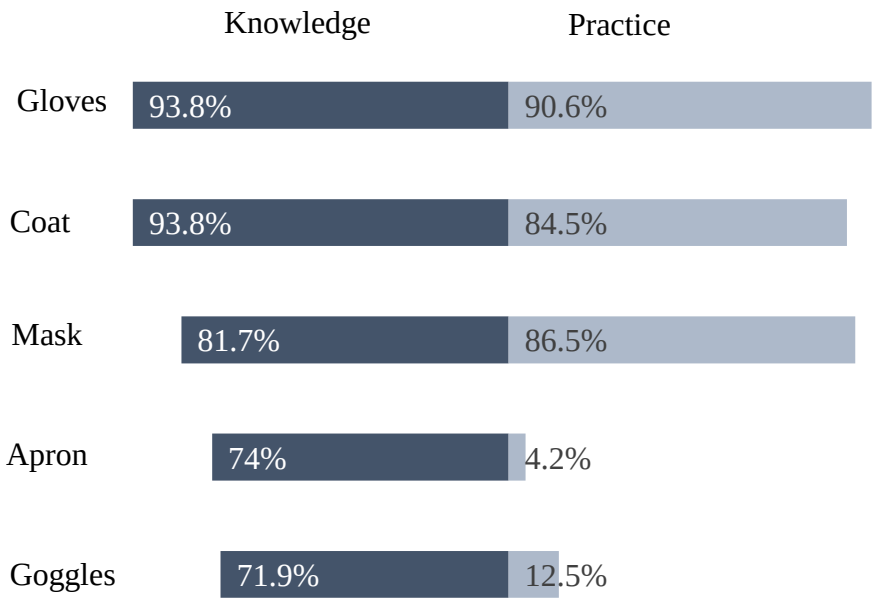

Figure 5.4 Knowledge and practice on using personal protective equipment (n=96)

Compared to those who had knowledge and practice of using personnel protective equipment like gloves, mask, coat, fewer respondents who used goggles and apron in practice were noted.

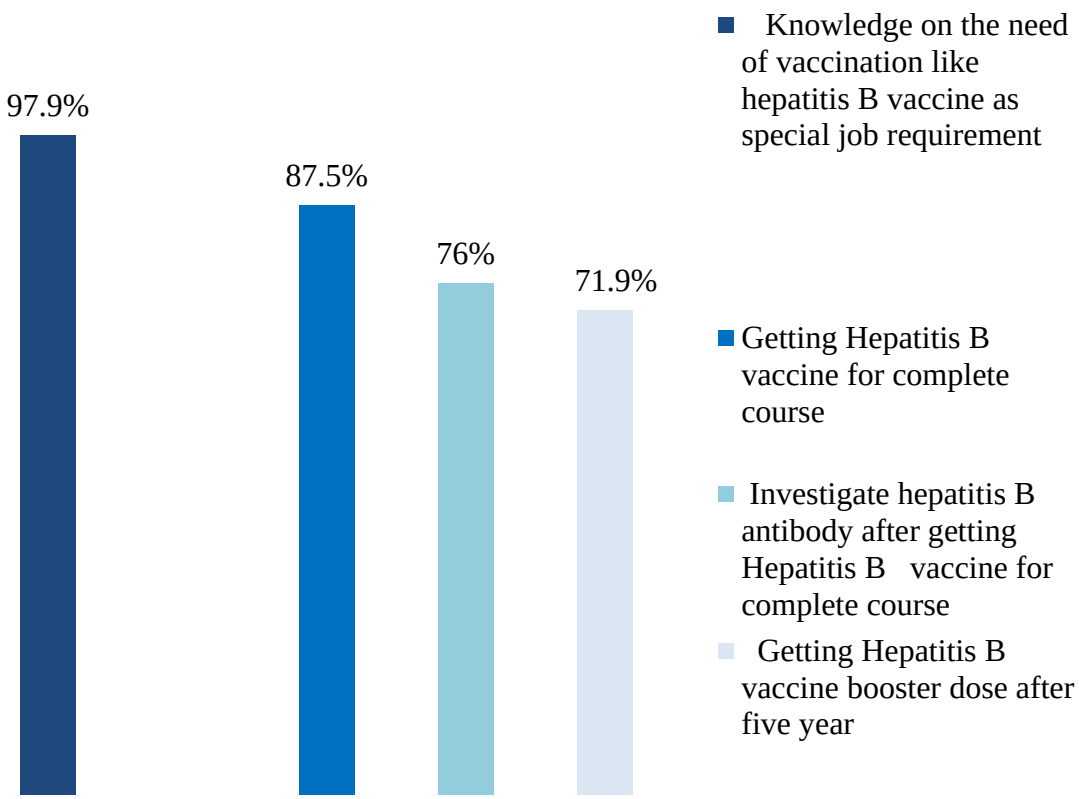

Figure 5.5 Knowledge and practice on Hepatitis B vaccination (n=96)

Compared to those who had knowledge on the need of Hepatitis B vaccination as a special job requirement, fewer respondents who followed getting vaccination, checking Hepatitis B antibody and taking booster if necessary were noted.

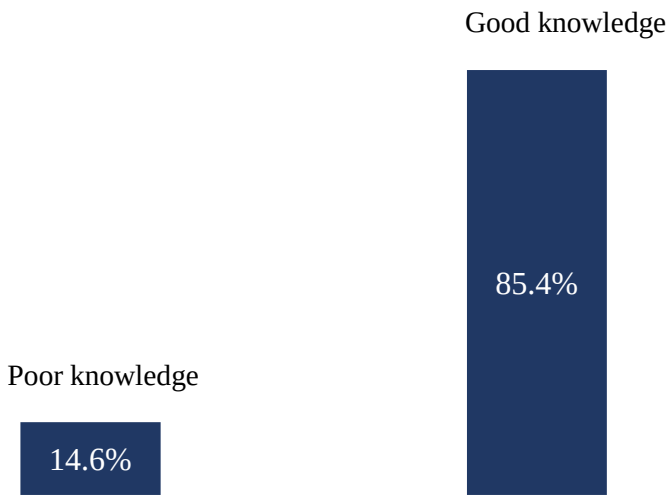

Figure 5.6 Knowledge on biosafety precaution (n=96)

In this study, total score was 30 for knowledge questions. In this study, cut-off level for knowledge was (60%) of total score (cut-off point: 18). Respondents who obtained 18 and above was assumed as having “Good Knowledge”. Respondents who obtained below18 was assumed as having “Poor Knowledge”.

Table5.4 Association between background characteristics and knowledge level (n=96)

Background characteristics	Knowledge level		*p* value
	Poor (n %)	Good (n%)	
Age (years)			**0.009**
≤40	7 (9.5%)	67 (90.5%)	
>40	7 (31.8%)	15 (68.2%)	
Sex			0.556*
Male	3 (15.8%)	16 (84.2%)	
Female	11 (14.3%)	66 (85.7%)	
Education			0.713*
M.Med.Tech	1 (20.0%)	4(80%)	
B.Med.Tech	2 (10.5%)	17 (89.5%)	
Diploma	10 (17.2%)	48 (82.8%)	
Others	1 (7.1%)	13 (92.9%)	
Rank			0.144*
Officer	3 (37.5%)	6 (62.5%)	
Lab Technician 1	3 (14.3%)	18 (85.7%)	
Lab Technician 2	6 (16.7%)	30 (83.3%)	
Lab Technician 3	2 (6.5%)	28 (93.3%)	
Total duration of government service (year)			0.159 *
≤ 5 year	4 (8.9%)	41 (91.1%)	
>5 year	10 (19.6%)	41 (80.4 %)	
Exposed of biosafety precaution training in current post			0.566*
Yes	5 (15.2%)	28 (84.8%)	
No	9 (14.3%)	54 (85.7%)	
Times of received training			0.340*
One time within a year	5 (18.5%)	22 (81.5%)	
Two or more times within a year	0 (0%)	6 (100%)	

*Fisher's Exact test

The knowledge of the laboratory staff whose age under 40 (90.5%) had more good knowledge than that of age over 40 (68.2%) and this association was statistically significant(p=0.009). There was no much difference between the knowledge of male and female, (84.2%) and (85.7%) respectively. The knowledge level of degree holder and that of diploma are not much difference and the majority of the respondents had good knowledge, (80%), (82.8%) and (89.5%).

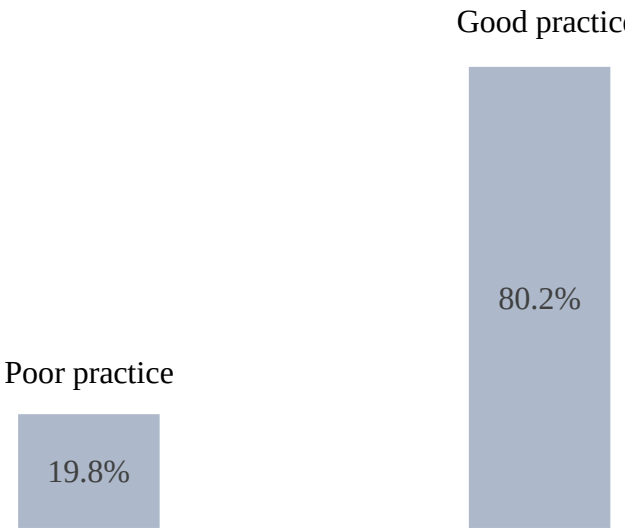

Figure 5.7 Practice on biosafety precaution

In this study, total score was 21 for practice question. In this study, cut-off level for knowledge was (60%) of total score (cut-off point: 13). Respondents who obtained 13 and above was assumed as having “Good Practice”. Respondents who obtained below13 was assumed as having “Poor Practice”.

Table 5.5 Association between background characteristics and practice level (n=96)

Background characteristics	Practice level		*p*-value
	Poor n (%)	Good n (%)	
Age (years)			**0.026**
≤40	11 (14.9%)	63 (85.1%)	
>40	8 (36.4%)	14 (63.6%)	
Sex			0.425
Male	5 (26.3%)	14 (73.7%)	
Female	14 (18.2%)	63 (81.8%)	
Education			0.282*
M.Med.Tech	1 (20.0%)	4 (80.0%)	
B.Med.Tech	2 (10.5%)	17 (89.5%)	
Diploma	15 (25.9%)	43 (74.1%)	
Others	1 (7.1%)	13 (92.9%)	
Rank			**0.028***
Officer	4 (50.0%)	5 (50.0%)	
Lab Technician 1	2 (9.5%)	19 (90.5%)	
Lab Technician 2	10 (27.8%)	26 (72.2%)	
Lab Technician 3	3 (9.7%)	27 (90.3%)	
Total duration of government service (year)			**0.045**
≤5 year	5 (11.1%)	40 (88.9%)	
>5 year	14 (27.5%)	37 (72.5%)	
Exposed of biosafety precaution training in current post			0.409
Yes	5 (15.2%)	28 (84.8%)	
No	14 (22.2%)	49 (77.8%)	
Times of received training			0.660*
One time within a year	4 (14.8%)	23 (85.2%)	
Two or more times within a year	1 (16.7%)	5 (83.3%)	

*Fisher's exact test

Respondents under 40 years of age had more good practice than those over 40 years of age, respectively (85.1%) and (63.6%) which was significant (p=0.026). Female respondents were better practice than male, (81.8%) and (73.7%). The degree holder respondents had better practice level than diploma holder, respectively (80.0%), (89.5%), (74.1%). Respondents at officer rank are less good practice than the other rank, which was significant (p=0.028)

The practice level of respondents with less than and equal five years of government service is significantly better than those with more than five years services, respectively (88.9%) and (72.5%) (p=0.045). The respondents who had been taught in current post regarding using biosafety precaution were better practice than those who had not, respectively (84.8%) and (77.8%). Majority of respondents had received training for one time within one year had good practice (85.2%) but two times within one year had good practice only (66.7%).

Table 5.6 Compliance with biosafety precaution SOP at facility level (n=6)

No	Presence of the equipment, furniture and the necessary for biosafety precaution	n (%)
1.	Functional biosafety cabinet	6 (100)
2.	Eye wash station	0 (00.0)
3.	Sharp boxes	6 (100)
4.	Biohazards disposal containers	4 (66.7)
5.	Emergency exists	5 (83.3)
6.	Fire Distinguisher	6 (100)
7.	Fire alarm system	1 (16.7)
8.	Laboratory safety manual	6 (100)
9.	Self-closing doors	4 (66.7)
10.	Warning and accident prevention sign	4 (66.7)
11.	Accident filing book	6 (100)
12.	First aid box	6 (100)
13.	Guidelines for disposing medical wastes	6 (100)
14.	biohazard signs posted on lab entrance	3 (50.0)
15.	refrigerators labeled “Not for Storage of Food for Human Consumption	3 (50.0)
16.	Freezer and storage areas lockable	6 (100)
17.	Instruction for hand washing	6 (100)
18.	Hand sanitizer dispensers	4 (66.7)
19.	Basin	6 (100)
20.	Comfortable working temperature	6 (100)

Functional biosafety cabinets were present at all laboratories of all studied hospitals. Almost all biosafety cabinets were type 2 biosafety level cabinets. The laboratory of all hospitals had sharp boxes, fire distinguisher, laboratory safety manual, accident filing book, first aid box, guidelines for disposing medical wastes, freezer and storage area lockable, instruction for hand washing, basin and also comfortable working temperature.

Most of the laboratories had biohazards disposal containers, emergency exits, self- closing doors, warning and accident prevention sign and hand sanitizer dispensers. About half of laboratory had biohazards signs posted on lab entrance and refrigerators labeled "Not for storage of food for human consumption. Although almost all hospitals had fire distinguisher, only one hospital had fire alarm system. There was no eye wash station at all hospitals.

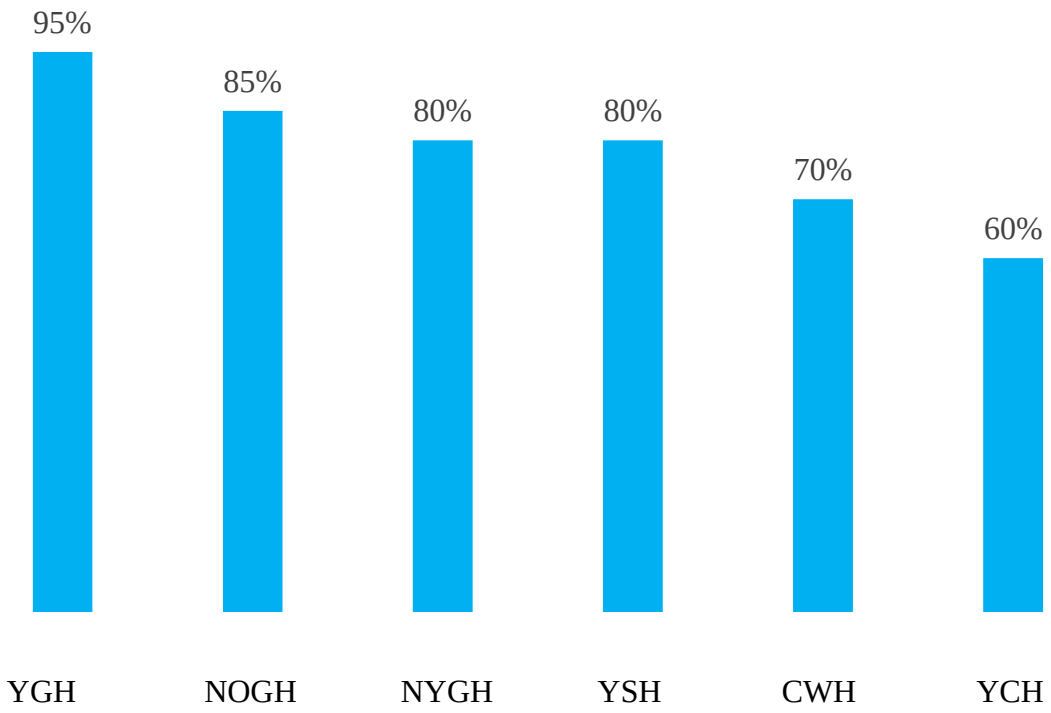

Figure 5.8 Biosafety facilities assessment among hospitals (n=6)

In the assessment of the compliance with biosafety precaution SOP at facility level of each hospital, presence of the equipment, furniture and the necessary for biosafety precaution was assessed. Majority of the hospitals were well equipped and also had biosafety facilities.

Table 5.7 Compliance with biosafety precaution SOP at individual level (n=56)

No	Practice of laboratory technicians	n (%)
1.	Wear lab coat	24 (42.9)
2.	Take off lab coat during resting time outside the lab	16 (28.6)
3.	Use of mobile phone in the lab	0 (00.0)
4.	Use of head cover during work	0 (00.0)
5.	Use of gloves for all purposes (Wear gloves when in contact with blood, body fluids, secretions, excretions, mucous membranes and contaminated items.)	56 (100)
6.	Change torn (damaged) gloves immediately	0 (00.0)
7.	Use of medical mask when necessary	37 (66.1)
8.	Put on eye goggles	0 (00.0)
9.	Wash hands promptly after contact with infective material	51 (91.1)
10.	Wash hands immediately after removing gloves.	51 (91.1)
11.	Clean up spills of infective material promptly.	0 (00.0)
12.	Eat food or drink or chew gum in laboratory	1 (01.8)
13.	Use of cosmetic in lab	0 (00.0)

On assessment of practice of laboratory staff on biosafety precaution at individual level, nearly all staff wore gloves for all purposes, washed hands promptly after contact with infective material and immediately after removing gloves. Most of staff used mask when necessary during working. About half of staff wore laboratory coat during working but few staff took off coat during resting time outside the lab. Only one staff had eaten food in laboratory during working. Laboratory staff from all studied hospitals did not use head-cover and put on eye goggles during working. No one use mobile phone and cosmetic in the lab. Cleaning up spills of infective material had not seen on assessment day.

Qualitative Findings on challenges for compliance with standard biosafety precaution

Table 5.8 Characteristics of Respondents of In-depth Interview

No	Age (Years)	Educational	Rank	Total Service (year)	Service year at current rank (years)
1	27	B.Med.Tech	Grade 2	2	2
2	38	M.Med.Tech	Grade 1	15	1
3	53	Diploma	Officer	26	6
4	48	M.Sc (physics)	Officer	29	6

Table 5.9 Characteristics of Respondents of Key Informant Interview

No	Age (Years)	Education	Rank	Total Service (Years)	Service year at Current Rank (Years)
1	43	M.B.,B.S, M.Med.Sc (Pathology)	Senior Consultant Pathologist	16	2
2	42	M.B.,B.S, M.Med.Sc(Microbiology)	Consultant Microbiologist	15	4

1. Source of biohazards

Four out of six respondents said that the main source of biohazard area is microbiology department because staff in this department had contact not only human body fluid but also airborne infection such as sputum AFB, H1N1 etc. One respondent said that there was no auto-pipette in lab and so, they sucked jaundice serum manually and also chemical in 1997. Nowadays, there was no need to contact with chemicals because most of the reagents are ready to use. However, some of the hospitals had no auto-machine and they still had contact with chemical. One respondent told that staff could get accidental injury at their work (e.g., needle prick injury).

" Infectious material တွေဆိုတော့ ဇီဝအန္တရာယ်လေ၊ ပန်ထမ်းအချင်းချင်းလဲကူးနိုင်သလို ကိုယ့်အိမ်ကလူတွေပါကူးနိုင်လို့ ကြောက်ရတယ်။"

"Infectious materials are the biohazards. It can transmit not only from one staff to another but also to their family members…."

[42- year old, Consultant Microbiologist]

" တချို့ chemical တွေ ဥပမာ phenol တို့ဆို corrosive ဖြစ်နိုင်တယ်လေ၊ ကျောင်းသားတွေဆို potassium cyanide ကိုဖျော်ရတယ် တချို့ stain တွေဆို acidတွေ အရမ်းပါတယ်လေ acidပါတဲ့ reagent တွေလည်းဖျော်ရတယ်လေ ဒါက ထိရင် chemical accident "

"Some chemical like phenol can cause corrosive. Students use potassium cyanide for stain which contains many acid and they also make acid containing reagent that can cause chemical accident…."

[48- year old, Lab officer]

2. Lack of practice

Nearly all respondents had knowledge about biosafety precaution especially personal protective equipment but four out of six respondents had lack of practice because of the inadequate equipment supply, no instructions at their work and also said that old age staff were less likely to follow the guideline than young.

" headcoverတို့ မျက်မှန်တို့ကတော့ မသုံးဖြစ်ပါဘူး mask ကတော့ လိုအပ်ရင်သုံးတယ်ပေါ့။ PPE ကတော့ ပုံမှန်ဂတ်လေ့မရှိဘူး..."

“We don’t use head-cover, goggles routinely. Mask is used if needed but not wear PPE dress routinely…”

[53- year old, Lab officer]

Attitude

“အသက်ကြီးတဲ့ သူတွေကတော့သိပ်မဂတ်ကျဘူး gloveတောင် သိပ်မဂတ်ချင်ကြဘူး ဂတ်ဖို့ကို အတင်းပြော နေရတယ်၊ လက်အိတ်ဂတ်တယ် လက်အိတ်ဂတ်ပီး ဖုန်းကိုင်တယ် ဘောပင်ကိုင်တယ် “

“Old age staff do not want to wear gloves and pushed them to wear. They use their phone, pen during working with gloves.”

[43- year old, Consultant Pathologist]

“PPE ကို အငယ်တွေကပိုသုံးတယ်၊ အကြီးတွေ ကတော့ သိပ်မလိုပါဘူးလေဆိုပီး မသုံးကြတာ”

“Young agers more use PPE than elder. Elders think no need to use….”

[53- year old, Lab officer]

3. Availability of equipment and PPE

Four out of six respondents mentioned that there needed to be more facilities for safety precaution. One respondent told that they had biosafety cabinet class 1 which is out of date and also mentioned that their biosafety level was completed for level 1. Four out of six respondents wanted to get more enough basic needs such as liquid soap, hand gel.

“airborne infection precaution အနေနဲ့ဆို ventilation ကောင်းတဲ့နေရာဖြစ်ရမယ်ပေါ့၊ mask တွေသုံးနိုင်ရမယ်ပေါ့၊ တကယ်တမ်းဆိုရင်တော့ negative pressure တွေဘာတွေနဲ့ biosafety level မြင့်တဲ့ဟာတွေ သုံးနိုင်ရင်ပိုကောင်းမယ်ပေါ့…”

“There should be good ventilation at working place for prevention of airborne infection and also have to use mask. Negative pressure ventilation should be used as far as possible for higher biosafety precaution….”

[38- year old, Lab officer]

"PPE ဆိုလဲ လုံလုံလောက်လောက်မရှိဘူး ။ Ward ထဲနဲ့ယှဉ်လိုက်တော့ ward ထဲက လူတွေကလူနာနဲ့ပိုထိတွေ့တယ်ဆိုပြီးတော့ ပိုပြီးတော့လိုတယ် ဆိုပြီး general concept က အဲ့လိုရှိနေတာ labကလူတွေက အဲ့လောက်မလိုဘူး ဆိုတဲ့ အတွေးမျိုးကလည်းရှိကြတာ sharp container နဲ့ထည့်ဖို့ဆို sharp containerမလုံလောက်ပြန်ဘူး"

"We don't have enough PPE. Some people think that there is less need PPE in laboratory compared to the ward staff because ward staff have more contact with patients. There is also no enough sharp container…"

[43- year old, Consultant Pathologist]

4. Waste disposal

Four out of six respondents said that they disposed waste according to guideline and they also disposed different biomedical waste according to their section. Two out of six respondents told that they used fully auto-machine, so the chemical waste came out from machine was already detoxified and less biohazard. They disposed that chemical waste by their container and the rest were washed with water and drained into septic tank.

"guideline တွေချထားတယ် SOPတွေဆွဲထားတယ် hazardous လား non-hazardous လား sharp လား non-sharp လား infectious non infectiousလားခွဲတယ် blood နဲ့contamination ဖြစ်တဲ့ဟာဆို autoclaveလုပ်ပီးမှပစ်တယ်။"

"We set up guideline and SOP for waste disposal. We separate hazardous or non- hazardous, sharp or non-sharp, infectious or non-infectious. We dispose blood contact items after being autoclaved…."

[43- year old, Consultant Pathologist]

"test tube တွေ သွေးပုလင်းတွေပစ်ရမဲ့နေရာ သပ်သပ်ရှိတယ် စာအုပ်နဲ့မှတ်ထားတယ် တစ်နေ့ဘယ်လောက်ပစ်တယ်ပေါ့၊ ကျွန်တော့် section ဆို ကျွန်တော် လက်မှတ်ထိုးတယ်"

"There is separate place for test tube and blood bottle disposal and record how many disposed per day and I signed it for my section…"

[53- year old, Lab officer]

5. Challenges

Almost all respondents wanted to get safety precaution completely and also wanted to use the facility without any hardship Four out of six respondents mentioned that to get more awareness about biosafety precaution by giving frequent training to the staff. One respondent said that she would like to give training to her staff but she could not give them because of her workload.

Financial barrier

One respondent said that she needs more complete biosafety level. She wanted to use PPE without worry.

"safety level ကျတော့လည်း မြှင့်နိုင်ဖို့ အတွက်က ဘတ်ဂျက်က လိုမှာပေါ့။"

"Need budget to raise the safety level ...."

[38 -year old, Lab officer]

"လက်အိတ်တွေကိုစွတ်လိုက်ချွတ်လိုက်နဲ့ အဆင်မပြေဘူးပေါ့နော် တကယ့် routine မှာကျ အဆင်မပြေဘူး။ ချွတ်လိုက်လဲလိုက်လုပ်ပြန်တော့လဲ လက်အိတ်တွေကုန်တာများတယ်ဆိုပီး အပြောခံရပြန်ရော"

"It's not ok that we wear and remove the gloves repeatedly and also not ok in routine. Due to loss of so many gloves, we were told that..."

[38- year old, Lab officer]

"အမှိုက်အိတ်ကလည်း မလုံလောက်ဘူး အိတ်အမည်းပဲ အများဆုံးသုံးဖြစ်တယ်

"We can't get enough waste bags. We mostly use black color bag..."

[42- year old, Consultant Microbiologist]

Lack of facility

Four out of six respondents mentioned that there are no enough facilities in their pracice

"ကျွန်တော်တို့သူများနိုင်ငံသွားရင် အခန်းထဲမဂင်ခင် ဖိနပ်လဲ၊ သူဂတ်စုံဂတ်ပီးမှ ဂင်ရတာ၊ ကျွန်တော်တို့ ဒီမှာဆို ဖိနပ်၊ ဂတ်စုံရှိတဲ့နေရာရှိ မရှိတဲ့နေရာမရှိဘူး..."

“We must change our suit and boot before enter their lab. Here, suit and boot may or may not be present in every lab….”

[53- year old, Lab officer]

“posting ကျရင် နယ်မှာကျမှာလေ၊ နယ်မှာက fully autoတွေမသုံးနိုင်ဘူးလေ chemicalတွေက ကိုယ့်ဟာကိုဖျော်ရမှာ”

“can be posted in rural area. In rural area, they cannot use fully auto-machine, so they have to prepare chemical by self.”

[48- year old, Lab officer]

“ပစ္စည်းကတော့လုံလုံလောက်လောက်ရပါတယ်။ ဌာနမှာကတော့ biosafety caution sign မရှိဘူး ၊ အပြင်လူမဝင်ရ ဆိုင်းပုဒ်တောင်မရှိဘူး”

“We got enough PPE but no biosafety precaution sign and even no entry sign board”

[42- year old, Consultant Microbiologist]

Burden

One respondent told that it could be burden if the staff was infected. If the uncured infection such as HIV, SARS was infected, the staff would have more losses.

“Biohazard ကူးခံရရင် သူ့အတွက်လဲ burden ဖြစ်တယ် သူ့မိသားစုအတွက်နဲ့ ဓာတ်ခွဲခန်းအတွက်လည်း burden ဖြစ်တယ် မိသားစုအတွက် ဌာနအတွက် ပြီးတော့နိုင်ငံတော် အတွက်လည်းနစ်နာတယ်လေ။”

“If he was infected with biohazard, there would be burden to him, his family, his department and also for his country “

[43- year old, Consultant Pathologist]

6. Suggestion

Five out of six respondents wanted to obtain more training frequently to have update information and also needed basic facilities support and psychosocial support.

Training

They thought that training is the important part to follow the safety precaution guideline.

"Training ကတော့ NHL မှာပေးတယ် လူတိုင်းတော့ မတက်ရဘူးပေါ့ representative တစ်ယောက်သွားတက်ရတယ် Health education တို့ CME တို့ များများလုပ်ပေးစေချင်ပါတယ် Training တွေ ပိုလုပ်ပေးစေချင်ပါတယ်...."

"Training is given at NHL, but everyone can't attend and only representative can attend. Wish to do more CME and more training…."

[42- year old, Consultant Microbiologist]

"safetyဖြစ်အောင် အကာအကွယ်သုံးဖို့ဆို အလုပ်ရှုပ်တယ်ထင်တာပေါ့နော်၊ အဲလိုဆိုတော့ သေချာလိုက်နာအောင် training လေးတွေပေးသင့်တယ်လို့ထင်ပါတယ်"

"They think that it is busy to use PPE for safety. Therefore, training should be given to follow….."

[27- year old, Lab technician]

Maintenance of equipment

"safety cabinet ကတော့ရှိတယ် regular maintainence လုပ်ဖို့လိုတယ်လေ၊ efficiency ဖြစ်ဖို့လိုတယ်လေ၊ filter တွေစစ်ဖို့လိုတယ်"

"We have safety cabinet but needs regular maintenance, also need to be efficient and also need to check the filter…"

[42 -year old, Consultant Microbiologist]

Support adequate human resources

One respondent said that staff feel workplace stressful due to increased workload. So, they need more human resource.

"ဝန်ထမ်းအင်အားနည်းတော့ အလုပ်တွေပိပီး စိတ်ဖိစီးမှုတွေဖြစ်လာနိုင်တာပေါ့."

"getting depressed due to increase workload…"

[48- year old, Lab officer]

Table 5.10 Summary of challenges for compliance with standard biosafety precaution from qualitative findings

	Themes	Sub-themes	
1.	Sources of biohazards		Mainly from microbiology department No auto-machine From accidental injury
2.	Lack of practice		Due to inadequate equipment supply Due to no instructions at their work
		Attitude	think no need to use
3.	Availability of equipment And PPE	Lack of facility	Need more enough basic needs such as liquid soap, hand gel No enough PPE
4.	Waste disposal		Waste should be disposed according to guideline
5.	Challenges	Financial barrier	Getting the facility/ necessary equipment without any hardship
		Lack of facility	No enough facilities in their practice e.g., caution sign, fire alarm system etc
		Burden	
6.	Suggestion	Training	To have update information the important part to follow the safety precaution guideline
		Maintenance of equipment	
		Support adequate human resources	Feel workplace stressful due to increased workload

CHAPTER (6)

DISCUSSION

6.1 Background characteristics of respondents

Majority of the respondents were under 40 years of age (77.1%). Similar findings was reported in Saudi Arabia study (Khabour et al., 2018a) and(Abhar et al., 2017).The majority of respondents were female (80.2%) but it was quite different from the study of Saudi Arabia and (Ahmed, Shahid and Mustufa, 2013) in which male respondents were the major component of the study. In this study nearly all respondents (95.8%) had more than one year in government service. Similar findings was reported in Pakistan study(Ahmed, Shahid and Mustufa, 2013). Most of respondents (65.6%) did not have training on biosafety precaution in their current position but it was different from the study of Saudi Arabia in which (68%) of respondents reported that they received training previously.

6.2 Knowledge and practice of laboratory staff

Majority of respondents had the knowledge on the awareness of disinfection procedures. Similar findings reported in Saudi Arabia study,(>80%) (Khabour et al., 2018a). Nearly all respondents had knowledge on the prevention of laboratory acquired infection. Similar findings were reported in Pakistan study(Ahmed, Shahid and Mustufa, 2013) . Although they had knowledge on prevention of transmission of infection, the personal protective equipment that they routinely used are gloves, mask and lab coat but not apron and goggles. Similar findings reported in Saudi Arabia study(Khabour et al., 2018a), in which although (89%) of respondents had awareness and knowledge, less than (50%) of respondents used head cover and goggles . Majority of respondents always washed their hand before handling specimen with rubber gloves. Nearly all of respondents always washed hand after handling specimen with rubber gloves and also used personnel protective equipment routinely. Among them, most used PPE was gloves and then followed by mask (86.5%) and lab coat (84.4%) used. Similar findings reported in India study (Goswami et al., 2011), in which all are very much aware about importance of protective devices . Most of respondents (57.3%) used sharp container for sharp laboratory instrument disposal and then followed by using safety box (25%).Similar findings reported in Saudi Arabia study (Khabour et al., 2018b), in

which (97%) of laboratories used sharp boxes. Majority of respondents had got hepatitis B vaccination (87.5%).However, there was lower rate of hepatitis B vaccination in the study of Nigeria (44.4%)(E et al., 2015). The CDC recommendation is to test for antibody after completion of three injections of HBV vaccine, and if negative, give a second three dose vaccine and test again anti-HBs Ag antibodies (Zavery, 2012). Only few respondents had the experience of injury with sharp instruments or needles or accidental exposed of infected body fluid or blood to eyes or mouth (16.7%) and among them only (87.5%) had reported laboratory supervisor or in-charge when accidents or injury encounter. Most of the respondents had training in job or exact written instruction for accidental or injury in laboratory. Nearly all respondents closed biohazard container when not in used and similar findings was reported in Saudi Arabia study (Khabour et al., 2018a). Almost all respondents did not apply cosmetic in their laboratory. However, (64.3%) was reported for not applying the cosmetics in laboratory in the study of Saudi Arabia (Khabour et al., 2018a) . Majority of respondent did not eat food, drink and chew gum during working in laboratory (86.5%). Similar findings was reported in the study of Saudi Arabia (Khabour et al., 2018a). Most of the respondents' laboratory had biohazard signs posted on their lab entrance (68.8%) but in Saudi Arabia study (86%) had bio-hazard warning sign (Khabour et al., 2018a). Their lab refrigerator were labeled "Not for storage of food for human consumption (69.8%) and in India study, (47%) stored their food and drink in their refrigerator (Zavery, 2012)

6.3 Association between background characteristics of the respondents and knowledge on biosafety precaution

The knowledge of the laboratory staff whose age under 40 (90.5%) had more good knowledge than that of age over 40 (68.2%) and this association was statistically significant (p=0.009). The knowledge level of degree holder and that of diploma are not much difference and the majority of the respondents had good knowledge, (80%), (82.8%) and (89.5%) but in Ethiopia study, diploma holders had statistically significant association with low level of knowledge than degree holder (Birhanu, 2014). The proportion of lab officer with good knowledge and practice on biosafety precaution were less than that of other rank and this may be due to the lack of training for them and they could not obtain the updated information on biosafety precaution, and also nearly all officer respondents are over 40 years of age and they assumed themselves that they had so much experience and as a result they tend to neglect the laboratory hazards. The knowledge level of the respondents who had government service less than

and equal five years were higher than that of more than five years. The knowledge of the respondents who had been taught in current post regarding using biosafety precaution is higher than who had not. Similar finding was reported in Yemen study (Abhar et al., 2017), in which there was better knowledge and practice after receiving training in biosafety . The respondents who had received training two times within one year had better knowledge than who had training for one time within one year. Similar finding was reported in Yemen study (Abhar et al., 2017) in which, receiving training in biosafety and receiving a biosafety manual are associated with better biosafety knowledge and practice.

6.4 Association between background characteristics of the respondents and practice on biosafety precaution

Respondents under 40 years of age had more good practice than those over 40 years of age, respectively (85.1%) and (63.6%) which was significant (p=0.026). Proportion of female respondents with good practice were more than that of male, (81.8%) and (73.7%). Similar findings reported in Yemen study (Abhar et al., 2017), in which female was (45%) and male was (31%). The degree holder respondents had better practice level than diploma holder, respectively (80.0%), (89.5%), (74.1%). In Ethiopia study, the practice of diploma holder and degree holder were not much different,(46.8%) and (39.2%) (Birhanu, 2014). Respondents at officer rank are less practice than the other rank because most of officers are older age (>40) and also over ten years services and they were weak to follow the guideline. The practice level of ≤ five year of government service was significantly better than > five year, respectively (88.9%) and (72.5%) (p=0.045). The respondents who had been taught in current post regarding using biosafety precaution were better practice than those who had not, respectively (84.8%) and (77.8%).There was similar finding in Yemen study (Abhar et al., 2017).It is surprising that majority of respondents had received training for one time within one year had good practice (85.2%) but two times within one year had good practice only (66.7%). It may be due to the fact that type of training and quality of training they required were different between two groups. In this study, practice level also depended on the attitude of the respondents rather than receiving the training.

6.5 Compliance with biosafety precaution SOP at the facility and individual level

Functional biosafety cabinets were present at all laboratories of all studied

hospitals. Almost all biosafety cabinets were type 2 biosafety level cabinets. Similar finding was reported in Saudi Arabia study in which nearly all laboratories had biosafety cabinet (92.3%) (Khabour et al., 2018b).The laboratory of all hospitals had sharp boxes, fire distinguisher, laboratory safety manual, accident filing book, first aid box. Similar finding like sharp boxes at nearly all laboratories, but laboratory safety manual (83.6%) were present in Saudi Arabia study (Khabour et al., 2018). All laboratories were with fire extinguisher was in Nigeria study , respectively (100%) and (90.5%)(E et al., 2015).First aid box present in this study was more than in the Nigeria study (42.8%)(E et al., 2015). Most of the laboratories had biohazards disposal containers but which was less than in Ethiopia study, (66.7%) and (81.7%) respectively (Birhanu, 2014). Most of laboratories also had emergency exits, hand sanitizer dispensers. Similar findings were reported but self- closing door was (48.8%) in Saudi Arabia study (Khabour et al., 2018) which is less than this study. About half of laboratory had biohazards signs posted on lab entrance ,which was less than in the Saudi Arabia study (86%) (Khabour et al., 2018b) . Laboratory safety manual was present at all laboratory which is more than in the Ethiopia study (15.9%) (Birhanu, 2014).There was no eye wash station at all hospitals but most of laboratories (80%) had eye wash station in Saudi Arabia study (Khabour et al., 2018a). About half of laboratory had labeled "Not for storage of food for human consumption" at refrigerator. Similar findings was reported in the India study (Zavery, 2012).

On assessment of practice of laboratory staff on biosafety precaution, nearly all staff wore gloves for all purposes, similar finding was reported in the Ethiopia study (100%) (Birhanu, 2014) and in the India study (100%) (Zavery, 2012). About half of staff wore laboratory coat during working but few staff took off coat during resting time outside the lab, similar findings were reported in Saudi Arabia study (Khabour et al., 2018). Only one staff (1.8%) ate food in laboratory during working, which was less than(11.6%) in Saudi Arabia study (Khabour et al., 2018b) , in India study (45.6%) (Zavery, 2012)and (47.6%) in Nigeria study(E et al., 2015) . Laboratory staff from all studied hospitals did not used head-cover and put on eye goggles during working. No one use mobile phone and cosmetic in the lab, few staff used it during work in Saudi Arabia study (24.6%) and (11.1%) (Khabour et al., 2018b) and (31.5%) of cosmetic use in India study (Zavery, 2012). Cleaning up spills of infective material had not seen on assessment day.

6.6 Challenges for compliance with standard biosafety precaution

The main challenges for compliance with standard biosafety precaution were the availability of the equipment, facility and necessary, lack of practice and inadequate training. There were many sources of biohazards in all section of laboratory especially microbiology department and so, in which biosafety cabinets were essential for this department. The role of getting fully auto machine and following the waste disposal guideline was also important for reduction of biohazards. Getting equipment, facility and necessary without any hardship and instruction for guideline was main role for practice on biosafety precaution. Moreover, maintenance of the equipment, giving regular training to the staff, support adequate human resource and reduce workload were also needed to raise the higher biosafety level. In China study, several health-related threats that result from the biologically hazardous materials can be abridged or minimized and controlled by the correct implementation of nationally and internationally certified protocols that include proper microbiological practices, containment devices/apparatus, satisfactory facilities or resources, protective barriers, and specialized education and training of laboratory staff.(Peng, Bilal and Iqbal, 2018).In Saudi Arabia study, most of the laboratories were fitted the safety parameters such as functional safety cabinets, eye wash stations, sharps disposal containers, biohazard disposal containers, emergency exists, lab safety booklets, fire distinguishers, fire blankets and so on and also there needed to be corrected the behavior by applying educational and biosafety training programs . Moreover, there was a need for continuous education about the risk of contagious infections and about the most important and innovative ways to maintain a safety environment in medical laboratories (Khabour et al., 2018).

CHAPTER (7)

CONCLUSION

Biosafety is an important issue in worldwide laboratory settings. Laboratory staff were exposed to a number of occupational hazards and danger daily in their routine work, either physical or chemical or biological. Clinical laboratories' workers, especially those who are working in microbiology laboratories, are more susceptible to laboratory-acquired infections. This study highlighted the knowledge and practice of laboratory staff on biosafety precaution in clinical laboratories of YGH, NOGH, YSH, CWH, YCH and NYGH.

According to this study, majority of respondents had knowledge on biosafety precaution, Hepatitis B vaccination as special job requirement and infection prevention and control measure. Most of respondents had knowledge about disinfectant method. However, about half of respondents had wrongly known on concept that squeezing of blood from injury could reduce the infection transmission and used syringe's needle should be recapped.

In reported practice of this study, most of respondents followed the biosafety precaution and had got Hepatitis B vaccination in complete course. About half of respondents had got on job training.

In this study, although most of the respondent had knowledge on biosafety precaution, there was still weak to follow the guideline in practice. Moreover, they also had wrong concept some facts (e.g., about half of respondents had knowledge to recap the syringe's needle after used and also do recapping the syringe's needle after used in practice).

The findings show that the level of knowledge and practice depends on their background characteristics, getting training related to safety precaution, availability of the equipment and facilities, instruction to follow the guideline and their attitude on practice. The younger the age, the better the knowledge they had about biosafety precaution. This association were significant in this study. There was also significantly association between age, rank, service year and safety practice. Good practice was significantly associated with young age, lower rank and less service years.

In this study, by assessing the compliance with biosafety precaution SOP

facility level of each hospital, majority of the studied hospitals were well equipped and also had biosafety facilities but at individual level, although majority of staff used gloves, mask, washed hands promptly after contact, they did not use head-cover and put on eye goggles during working.

According to this study, there are many challenges for laboratory staff such as inadequate supply of equipment, inadequate supply of facilities for proper waste disposal, regular training for updated information, maintenance of the equipment and so on.

In conclusion, the current status of laboratory staff about biosafety precautions will help to develop plans for better coverage of immunization among laboratory staff, better trainings, and regulatory mechanism to follow the biosafety precautions. Moreover, the findings from this study will provide the baseline data and some information to top level authorities to create more safety working environment for laboratory staff.

CHAPTER (8)

RECOMMENDATIONS

According to this study, to improve the knowledge and practice of laboratory staff on biosafety precaution, the following recommendation were drawn

(1) Regular on job training, workshop, symposium and CME should be provided and let all laboratory staff attend.

(2) The adequate supply of equipment, facilities for laboratory biosafety, the maintenance of the laboratory equipment and regular updating the biosafety precaution guideline should be established for sustainability.

(3) Infection control committee should supervise by using standard checklist biannually.

(4) Complete immunization package (e.g., Hepatitis B vaccination) which includes getting the complete course, investigating the antibody test and giving the necessary booster dose regularly, should be established and needs to follow up them.

REFERENCES

Abhar, N. Al, Gunaid, E. Al, Moghram, G., Hababi, A.A. Al, Serouri, A. Al and Khader, Y.S., 2017. Knowledge and Practice of Biosafety Among Laboratory Staff Working in Clinical Laboratories in Yemen. *Journal of ABSA International*, 22(4), pp.168–171.

Ahmed, S.N., Shahid, A. and Mustufa, M.A., 2013. Biosafety Intervention and Follow up Assessment in Laboratory Workers of Karachi, Pakistan. *Pakistan Journal of Medical Research Pak J Med Res Pak J Med Res Pak J Med Res Pak J Med Res Vol*, 5(4), pp.5–5.

Birhanu, H., 2014. Assessment of knowledge, attitude and practice of laboratory personnel towards the biosafety measure for tuberculosis testing laboratory in selected health institutions in Addis Ababa, Ethiopia. (June 2014).

E, S., CJ, E., AO, C., PB, M., V, N., Olusanya and A, O., 2015. A Survey of Biosafety Practices of Clinical Laboratory Personnel in Four Selected Clinical Laboratories. *Medical Safety & Global Health*, 04(02).

Elduma, A.H., 2012. Assessment of biosafety precautions in Khartoum state diagnostic laboratories, Sudan. *Pan African Medical Journal*, [online] 11(February 2012), p.19.Available at:<http://www.embase.com/ search/results? subaction= viewrecord&from=export&id=L365779240%5Cnhttp://www.panafrican-med-journal.com/content/article/11/19/pdf/19.pdf%5Cnhttp://sfx.metabib.ch/sfx_locater?sid=EMBASE&issn=19378688&id=doi:&atitle=Assessment+of+biosaf >.

Goswami, H.M., Soni, S.T., Patel, S.M. and Patel, M.K., 2011. A Study on Knowledge , Attitude and Practice of Laboratory Safety Measures Among Paramedical Staff of Laboratory Services. *National Journal of Community Medicine*, 2(3), pp.470–473.

Kaung-Htet-Thu, 2012. *Knowledge and compliance of universal precautions among medical doctor and nurses*.

Khabour, O.F., Al Ali, K.H., Aljuhani, J.N., Alrashedi, M.A., Alharbe, F.H. and Sanyowr, A., 2018a. Assessment of biosafety measures in clinical laboratories of Al-Madinah city, Saudi Arabia. *Journal of Infection in Developing Countries*, 12(9), pp.755–761.

Khabour, O.F., Al Ali, K.H., Aljuhani, J.N., Alrashedi, M.A., Alharbe, F.H. and

Sanyowr, A., 2018b. Assessment of biosafety measures in clinical laboratories of Al-Madinah city, Saudi Arabia. *Journal of Infection in Developing Countries*.

May-Soe-Aung, 2010. *Knowledge, perception and practice of infection control measures among house officer*. University of Public Health, Yangon.

Merieux Foundation, 2019. *National Health Laboratory project launched in Myanmar on September 27,2019*. [online] Merieux Foundation. Available at: <https://www.fondation-merieux.org/en/news/national-health-laboratory-project-launched-in-myanmar/>.

Muhammad, F.J., Siddiqui, N., Ali, N. and Kazmi, S.U., 2018. Analysis of Biosafety Performance in Selected Hospital Medical Laboratories in Karachi, Pakistan. *Applied Biosafety*, 23(1), pp.39–46.

National Health Laboratory, 2016. *Instruction for Laboratory aspect of Infection Prevention and Control (IPC)*. National Health Laboratory.

Oladeinde, B.H., Omoregie, R., Odia, I., Osakue, E.O. and Imade, O.S., 2013. Biorisk assessment of medical diagnostic laboratories in Nigeria. *Safety and Health at Work*, [online] 4(2), pp.100–104. Available at: <http:// dx.doi. org/ 10.1016/j. shaw.2013.04.006>.

Pastorino, B., Lamballerie, X. de and Charrel, R., 2017. Biosafety and Biosecurity in European Containment Level 3 Laboratories: Focus on French Recent Progress and Essential Requirements. *Frontiers in Public Health*, 5(May), pp.1–11.

Peng, H., Bilal, M. and Iqbal, H.M.N., 2018. *Improved biosafety and biosecurity measures and/or strategies to tackle laboratory-acquired infections and related risks*. *International Journal of Environmental Research and Public Health*.

WHO, 2004. *Practical Guidelines for Infection Control in Health Care Facilities Practical Guidelines for Infection Control in Health Care Facilities*. India.

Zavery, J., 2012. Knowledge , Attitudes and Practice of Laboratory Technicians Regarding Universal Work Precaution. *National Journal of Medicial Research*, 2(1), pp.113–115.

Zaw-Win-Naing, 2016. *Knowledge and practice of laboratories staff about standard precautions for infection prevention and control measures in clinical laboratory staff about standard precautions for infection prevention and control*. University of Public Health , Yangon.

ANNEXES

Annex (1) Operational definitions of variables

No	Name	Operational definitions	Measurement scale
1.	Age	Completed age	Ratio
2.	Age interval	<40 40-60	Ordinal
3.	Sex	Male Female	Nominal
4.	Year of service	Total year of working in government service	Ratio
5.	Rank	Officer or Technician grade (1) Technician grade (2) Technician grade (3) Technician grade (4)	Nominal
6.	Frequency of training received	Received training course. lecture and symposium about standard precautions	Ratio
7.	Training present or not	No training received Training received	Ordinal
8.	Level of knowledge	Knowledge of participates about standard biosafety precautions by knowledge concerning question. Good knowledge >> 60% and above of total knowledge score Poor knowledge >> below 60% of total knowledge score	Ordinal
9.	Level of practice	Practice of participates about standard biosafety precautions by practice concerning question Good practice >> 60% and above of total practice score Poor practice >> below 60% of total practice score	Ordinal
10.	Biosafety guideline	a set of polices, rules, and procedures necessary to observe by personnel working in various facilities handling microbiological agents such as bacteria, viruses, parasites, fungi, prions and other related agents and microbiological products	Nominal

Annex (2) Informed consent form (Myanmar and English)

Informed consent form (English)

Institutional Review Board

University of Public Health, Yangon

Informed consent form

Name of Investigator – Dr Thida Oo

Title of research – "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals"

Part (A) Informed consent form for self-administered questionnaires

1. Introduction

I am Dr Thida Oo, MHA candidate at University of Public Health, Yangon. I am doing research on "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals"

2. Purpose of the research

This study is to assess the knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals

3. Type of Research Intervention

This research will involve your participation in self-administered questionnaires about thirty minutes.

4. Participant Selection

You are being invited to take part in this research because we feel that you will interest in "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals

5. Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether participate or not.

6. Procedure

I would like to invite you to take part in this research project. If you accept, you have to answer in self-administered questionnaires about thirty minutes. It will be taken at a place which is comfortable for you. The questionnaires will include information about "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals". You do not have to answer any question or take part in the discussion if you feel the issue(s) are too personal or if talking about them makes you uncomfortable.

7. Benefits

Participation in this study will not benefit the participant directly but your participation is likely to help us find out more about how to assess knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals

8. Confidentiality

I will not be sharing information about your participation in this study to anyone outside. The information that I collect from this research project will be kept private.

9. Sharing the Results

The knowledge that I get from research will be only to the persons who have the responsibility for this study. I will then publish the results to be read only by the interested people.

10. Who to contact

If there are any queries before, during and after the study you can directly contact the investigator Dr Thida Oo, Phone – 09444009324 or via email thidaoodr@ gmail.com . This proposal had been reviewed and approved by the Institutional Review Board, University of Public Health, Yangon which is a committee whose task is to make sure that research participants are proteceted from harm. If you wish to find out more about the committee, contact the secretary of the committee at University of Public Health, Yangon, No. 246, Myoma Kyaung Street, Latha Township, Yangon, 11311. Office phone +95 1395213, +95 1395214 ext:23/25.

Part (B) Consent form

I have been invited to participate in research about "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals". I know that I will have to answer the self-administered questionnaires about thirty minutes. I am aware that there may be no benefit to me personally. The questionnaires include assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals. I have read the foregoing information, or it has been read to me.. I consent voluntarily to be a participant in this study.

Name of participant ----------

Signature of participant ----------

Date ----------

Part (C) Informed consent form for key informant interview

1. Introduction

I am Dr Thida Oo , MHA candidate at University of Public Health, Yangon. I am doing research on "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals"

2. Purpose of the research

This study is to assess "the knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals"

3. Type of Research Intervention

This research will involve your participation for key informant interview about fifteen minutes.

4. Participant Selection

You are being invited to take part in this research because we feel that you will interest in "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals"

5. Voluntary Participation

Your participation in this research is entirely voluntary. It is your choice whether participate or not.

6. Procedure

I would like to invite you to take part in this research project. If you accept, you have to answer for key informant interview about fifteen minutes. It will be taken at a place which is comfortable for you. You do not have to answer any question or take part in the discussion if you feel the issue(s) are too personal or if talking about them makes you uncomfortable.

7. Benefits

Participation in this study will not benefit the participant directly but your participation is likely to help us find out more about how to get knowledge and practice on biosafety precaution.

8. Confidentiality

I will not be sharing information about your participation in this study to anyone outside. The information that I collect from this research project will be kept private.

9. Sharing the Results

The knowledge that I get from research will be only to the persons who have the responsibility for this study. I will then publish the results to be read only by the interested people.

10. Who to contact

If there are any queries before, during and after the study you can directly contact the investigator Dr Thida Oo, Phone – 09444009324 or via email thidaoodr@ gmail.com . This proposal had been reviewed and approved by the Institutional Review Board, University of Public Health, Yangon which is a committee whose task is to make sure that research participants are proteceted from harm. If you wish to find out more about the committee, contact the secretary of the committee at University of Public Health, Yangon, No. 246, Myoma Kyaung Street, Latha Township, Yangon, 11311. Office phone +95 1395213, +95 1395214 ext:23/25.

Part (D) Consent form for key informant interview

I have been invited to participate in research about "Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals". I am aware that there may be no benefit to me personally and that I will be paid only for my time spent. I have read the facts thoroughly. I have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Name of participant ----------

Signature of participant ----------

Date ----------

နောက်ဆက်တွဲ(၂) သုတေသနသဘောတူညီချက်ပုံစံ - Informed Consent Form (Myanmar)

သုတေသန နည်းပညာနှင့်ကျင့်ဝတ်ကော်မတီ

ပြည်သူ့ကျန်းမာရေး တက္ကသိုလ် ရန်ကုန်

သုတေသနသဘောတူညီချက်ပုံစံ

သုတေသန လုပ်ငန်းတွင် ပါဝင်ဆောင်ရွက်ရန် သဘောတူညီချက်တောင်းခံခြင်း

ဤသဘောတူညီချက်မှာ ----------ပြည်သူ့ဆေးရုံရှိ ဓာတ်ခွဲခန်းဝန်ထမ်းများအား သုတေသန လုပ်ငန်းတွင် ပါဝင်ဆောင်ရွက်ရန် ဖိတ်ခေါ်ခြင်း ဖြစ်ပါတယ်။

အဓိကသုတေသီအမည် - ဒေါက်တာသီတာဦး

ဌာန - ပြည်သူ့ကျန်းမာရေး တက္ကသိုလ် ရန်ကုန်

သုတေသနခေါင်းစဉ် - Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals

အပိုင်း(က) သုတေသန နှင့်သက်ဆိုင်သောအချက်များ

၁။ မိတ်ဆက်နိဒါန်း

ကျွန်မသည် ဒေါက်တာသီတာဦး၊ ဆေးရုံအုပ်ချုပ်မှုပညာမဟာဘွဲ့သင်တန်းသား၊ ပြည်သူ့ကျန်းမာရေး တက္ကသိုလ်၊ရန်ကုန်မှ ဖြစ်ပါတယ်။ ကျွန်မအနေနဲ့ **Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals** နှင့်ပတ်သက်သော သဘောထားအမြင်အား သုတေသနတစ်ခုဆောင်ရွက်လိုပါသည်။ သုတေသနအကြောင်းကို ရှင်းပြပြီး သင့်အားပါဝင်ရန် ဖိတ်ခေါ်လိုပါသည်။ သင့်အနေနှင့် မရှင်းလင်းသည်များရှိပါက မေးမြန်းနိုင်ပါသည်။

၂။ ရည်ရွယ်ချက်

ဤသုတေသန၏ ရည်ရွယ်ချက်မှာ Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals နှင့်ပတ်သက်၍မည်သို့ရှိမည်ကို လေ့လာလိုပါသည်။

၃။ သုတေသနဆောင်ရွက်ပုံအမျိုးအစား

ဤသုတေသန သည် သင်ကိုယ်တိုင် မေးခွန်းများကို ဖတ်၍ ဖြေဆိုရမည် ဖြစ်ပြီး မိနစ် ၃၀ခန့်ကြာမြင့်မည်ဖြစ်ပါသည်။

၄။ ပါဝင်မည့်သူများရွေးချယ်ခြင်း

သင့်အား ဤသုတေသန တွင်ပါဝင်ရန် ဖိတ်ခေါ်ခြင်းမှာ ဓာတ်ခွဲခန်းဝန်ထမ်းများ၏ biosafety precaution နှင့်ပတ်သက်သောknowledge နှင့် practice တို့အား ပြုပြင်ရေး လုပ်ဆောင်မှုများအပေါ် အထောက်အကူပြုနိုင်မည်ဟု ယူဆ၍ ဖြစ်ပါသည်။

၅။ မိမိဆန္ဒ အလျောက်ပါဝင်ခြင်း

ဤသုတေသန တွင်သင်ပါဝင်ကူညီခြင်း သည် သင်၏ သဘောဆန္ဒအလျောက်သာ ဖြစ်ပါသည်။ ပါဝင်ခြင်း၊ မပါဝင်ခြင်းမှာ သင်၏ ဆန္ဒအတိုင်း ရွေးချယ်မှုသာဖြစ်ပါသည်။

၆။ လုပ်ဆောင်ပုံ

ဤသုတေသနတွင် ပါဝင်ဖို့ သင်သဘောတူမည် ဆိုလျှင် သင်ကိုယ်တိုင် မေးခွန်းများကို ဖတ်၍ ဖြေဆိုရမည် ဖြစ်ပြီး မိနစ် ၃၀ခန့်ကြာမြင့် မည်ဖြစ်ပါသည်။ သင်သည် သီးသန့်နေရာတခု မှာဖြေဆိုရမှာဖြစ်ပါသည်။ မေးခွန်းများဖြေဆိုရာတွင် စိတ်အနှောင့် အယှက်ဖြစ်၍ မဖြေဆို လိုသော မေးခွန်းများရှိပါက သင့်ဆန္ဒ အလျောက် မဖြေဆိုဘဲ ငြင်းဆိုနိုင်ပါသည်။

၇။ အကျိုးကျေးဇူးများ

ဤသုတေသနတွင် ပါဝင်သောကြောင့် သင့်အတွက် တိုက်ရိုက်အကျိုးကျေးဇူးရရှိမည် မဟုတ်ပါ။ သို့သော် သင်ပါဝင်မှုသည် လုပ်ငန်းခွင်ဆိုင်ရာ ပြုပြင်ရေး လုပ်ဆောင်မှု များအပေါ်တွင် အထောက်အကူ ဖြစ်စေပါသည်။

၈။ အချက်အလက်များသိမ်းဆည်းထားရှိခြင်း

ဤသုတေသနမှကောက်ယူရရှိသည့် အချက်အလက်များကို လုံခြုံစွာထား ရှိမှာဖြစ်ပါသည်။ သင့်ထံမှ သိရှိရသည့်အချက်များကို သုတေသနအဖွဲ့မှ တပါးအခြားမည်သူမှ မသိစေရပါ။

၉။ သုတေသနရလဒ်များကို ဖြန့်ဝေခြင်း

ဤသုတေသန၏တွေ့ရှိချက်များကို စိတ်ဝင်စားသူများမှ သိရှိနိုင်စေရန် ရလဒ်များကိုသာ ဖြန့်ဝေမှာဖြစ်ပါသည်။

၁၀။ ဆက်သွယ်ရမည့်ပုဂ္ဂိုလ်

အကြောင်းတစ်စုံတစ်ရာ မေးမြန်းလိုလျှင် ဒေါက်တာသီတာဦး၊ ဖုန်း ၀၉-၄၄၄၀၀၉၃၂၄ကိုဆက်သွယ်နိုင်ပါသည်။ ဤသုတေသန ကို လူပုဂ္ဂိုလ်များအပေါ် သုတေသန ပြုမှုဆိုင်ရာ ကျင့်ဝတ်ကော်မတီ မှ ခွင့်ပြုချက်ရရှိပြီး ဖြစ်ပါသည်။

အပိုင်း (ခ) သုတေသနတွင်ပါဝင်ရန် သဘောတူညီမှုပုံစံ

ကျွန်ုပ်သည် Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals အား လေ့လာသော

သုတေသနတွင် ပါဝင်ရန် ဖိတ်ခေါ်ခြင်းခံရပါသည်။ ဤသုတေသနတွင် ပါဝင်သောကြောင့် ကျွန်ုပ် အတွက် တိုက်ရိုက်အကျိုးကျေးဇူး မရရှိပါ။ ကျွန်ုပ်သည် ကိုယ်တိုင် မေးခွန်းများကို ဖတ်၍ ဖြေဆိုရမည်ဖြစ်ပြီး မိနစ်(၃၀)ခန့်ကြာမြင့်မည်ဖြစ်ကြောင်းနှင့် Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals အား မေးမြန်းမှာဖြစ်ကြောင်း သိရှိရပါသည်။ ဤသုတေသနတွင် ကျွန်ုပ်သည် အထက်ဖော်ပြချက်များကို ဖတ်ရှုပြီးဖြစ်ပါသည်။ မရှင်းလင်းသည့် မေးခွန်းများကိုလည်း မေးမြန်းနိုင်၍ ၎င်းတို့ကို ကျွန်ုပ်သည် ကျေနပ်စွာဖြေဆို ပေးပါသည်။ ကျွန်ုပ် ဆန္ဒ အလျောက် ဤသုတေသန တွင်ပါဝင်ရန် သဘောတူပါသည်။

သုတေသနတွင်ပါဝင်သူအမည် ----------

သုတေသနတွင်ပါဝင်သူလက်မှတ် ----------

ရက်စွဲ ----------

အပိုင်း(ဂ) အသေးစိတ်မေးမြန်းခြင်း အတွက် မိတ်ဆက်စကားပြောရန်

ကျွန်မသည် ဒေါက်တာသီတာဦး၊ ဆေးရုံအုပ်ချုပ်မှုပညာမဟာဘွဲ့သင်တန်းသား၊ ပြည်သူ့ကျန်းမာရေး တက္ကသိုလ်၊ရန်ကုန်မှ ဖြစ်ပါတယ်။ ကျွန်မအနေနဲ့ **Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals** နှင့်ပတ်သက်သော သဘောထားအမြင်အား သုတေသန တစ်ခုဆောင်ရွက်လိုပါသည်။ ( )မှဖြေကြားပေးသော အကြံဉာဏ်များ မှာအလွန်အသုံးဝင်မှာဖြစ်ပါတယ်။ အချိန်ပေးပြီး ဖြေကြားပေးတဲ့အတွက် ကျေးဇူးတင်ပါတယ်။ စိတ်ထဲရှိတဲ့အတိုင်း သိထားတဲ့အတိုင်း ထင်မြင်ချက်များကိုလွတ်လပ်စွာ ဆွေးနွေးပေးစေလိုပါတယ်။ ဆွေးနွေးချက်များကို အသံသွင်းခွင့်ပြုပါ။ ကျွန်မတို့ မကြားလိုက်ရတဲ့ လွတ်သွားသော အကြောင်းအရာများ ကိုပြန်ဖွင့်ပြီး နားထောင်ချင်လို့ဖြစ်ပါတယ်။ အဲဒီဆွေးနွေးချက်ကို စာတမ်းပြုစုမည့် ကိစ္စတွေမှာပဲ အသုံးပြုမှာ ဖြစ်ပါတယ်။

အပိုင်း (ဃ) သုတေသနတွင်ပါဝင်ရန် သဘောတူညီမှုပုံစံ

ကျွန်ုပ်သည် Assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals အား လေ့လာသော သုတေသနတွင် ပါဝင်ရန် ဖိတ်ခေါ်ခြင်းခံရပါသည်။ ဤသုတေသနတွင် ပါဝင်သောကြောင့် ကျွန်ုပ် အတွက် တိုက်ရိုက်အကျိုးကျေးဇူး မရရှိပါ။ ကျွန်ုပ်သည် ဆွေးနွေးရန် မေးခွန်းများကို သေချာစွာ ဖတ်ရှုပြီးဖြစ်ပါသည်။

၄င်းတို့ကို ကျွန်ုပ်သည် ကျေနပ်စွာဖြင့် ဆွေးနွေး ပေးပါသည်။ ကျွန်ုပ် ဆန္ဒ အလျောက် ဤသုတေသန တွင်ပါဝင်ရန် သဘောတူပါသည်။

သုတေသနတွင်ပါဝင်သူအမည် ----------

သုတေသနတွင်ပါဝင်သူလက်မှတ် ----------

ရက်စွဲ ----------

Annex (3)

Questionnaire on knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals

Date _____
Respondent ID _____
Interviewer _____

နံပါတ်	မေးခွန်းများ
(က)	**နောက်ခံကိုယ်ရေး အချက်အလက်များ**
၁။	အသက်(ပြည့်ပြီးနှစ်)
၂။	ကျား/မ
၃။	ပညာရေး (၁) M.Med.Tech (၂) B.Med.Tech (၃) Diploma in medical laboratory technology (DMLT) (၄) အခြား
၄။	ရာထူး (၁) အရာရှိ(သို့) ဓာတ်ခွဲကျွမ်းကျင် (၁) (၂) ဓာတ်ခွဲကျွမ်းကျင် (၂) (၃) ဓာတ်ခွဲကျွမ်းကျင် (၃) (၄) ဓာတ်ခွဲကျွမ်းကျင် (၄)
၅။	စုစုပေါင်းအမှုထမ်းအသက်(နှစ်ဖြင့်) ----------
၆။	ကူးစက်ရောဂါကာကွယ်ခြင်း၊ထိန်းချုပ်ခြင်းနှင့်ပတ်သက်၍ သင်တန်းနှင့် ဟောပြောပွဲများ တက်ရောက်ဘူးပါသလား။ (၁) တက်ရောက်ဖူးပါသည်။ (၂) မတက်ရောက်ဖူးပါ။
၇။	တက်ရောက်ဖူးပါကဘယ်နှစ်ကြိမ်တက်ရောက်ဖူးပါသလဲ။ (တစ်နှစ်အတွင်း) (၁) တစ်ကြိမ် (၂) နှစ်ကြိမ် (၃) အခြား----------
(ခ)	**ဗဟုသုတဆိုင်ရာမေးခွန်းများ**
၁။	ကူးစက်ရောဂါကာကွယ်ခြင်းနှင့်ထိန်းချုပ်ခြင်းအတွက်လိုအပ်သောစံသတ်မှတ်ချက်များသင့် ဓာတ်ခွဲခန်းတွင်ရှိသည်ကိုသိပါသလား။ (၁) သိပါသည်။ (၂) မသိပါ။ (၃) မဖြေပါ။
၂။	လက်ဆေးခြင်းသည် ကူးစက်ရောဂါကာကွယ်ခြင်းနှင့်ထိန်းချုပ်ခြင်းအတွက် အရေးမကြီးပါ။

	(၁) မှန်ပါသည်။ (၂) မမှန်ပါ။ (၃) မဖြေပါ။
၃။	ကူးစက်ရောဂါပိုးရှိသောခန္ဓာကိုယ်တွင်းအရည်များနှင့်သွေးဖိတ်ကျခြင်း ဖြစ်ပါက မည်သည့်အရာဖြင့်ပိုးသန့်စင် ပါသနည်း။ ----------
၄။	ဓာတ်ခွဲခန်းသုံးတစ်ကိုယ်ရည်ကာကွယ်ရေးပစ္စည်းများကိုပြောပြပါ။(အဖြေတစ်ခုမကဖြစ်နိုင်ပါသည်၊ အောက်ပါအဖြေကို ဖြေဆိုသူအားမပြောရပါ။)
၅။	အောက်ဖော်ပြပါအမှိုက်များကို မည့်သည့်အရောင်အိတ်ဖြင့်ထည့်၍ စွန့်ပစ် သနည်း။ ရောဂါကူးစက်စေတတ်သောအမှိုက် ---------- သွေး/သွေးနှင့်ပတ်သက်သောအမှိုက် ---------- လူအသားစနှင့်ခန္ဓာကိုယ်အစိတ်အပိုင်းများ ----------
၆။	ပြန်လည်အသုံးမပြုနိုင်သော ကူးစက်စေတတ်သောအမှိုက်များကို မည်သို့ပိုးသတ်ပြီးမှ စွန့်ပစ်သနည်း။ ဥပမာ အသုံးပြုပြီးသော ပလတ်စတစ်ဆေးထိုးပိုက်နှင့်ရာဘာလက်အိတ် (အဖြေတစ်ခုမကဖြစ်နိုင်ပါသည်) ----------
၇။	ပြန်လည်အသုံးမပြုနိုင်သော ကူးစက်စေတတ်သောအမှိုက်များကို မည်သို့ပိုးသတ်ပြီးမှ စွန့်ပစ်သနည်း။ ဥပမာ ဓာတ်ခွဲခန်းသုံးမှန်ပြား၊ ပိုးမွှားရာတွင် အသုံးပြုသောမှန်ပြား (အဖြေတစ်ခုမကဖြစ်နိုင်ပါသည်) ----------
၈။	တိရိစ္ဆာန်ရောဂါပိုးစစ်သော သလိပ်ခွက်များကို မည်ကဲ့သို့ပိုးသတ်ပြီးမှ စွန့်ပစ်သနည်း။ ----------
၉။	ဓာတ်ခွဲခန်းဝန်ထမ်းအားလုံးသည် ရောဂါကာကွယ်ဆေး အထူးသဖြင့် အသည်းရောင်အသားဝါဘီပိုး ကာကွယ်ဆေးကို အထူး အလုပ် လိုအပ်ချက် အနေဖြင့် ထိုးသင့်သည်။ (၁) သင့်ပါသည် (၂) မသင့်ပါ (၃) မသိပါ
၁၀။	ဓာတ်ခွဲခန်းဝန်ထမ်းအားလုံးသည် ပုံမှန်ဆေးစစ်ရန်မလိုပါ၊ သာမာန်လူများကဲ့သို့ရောဂါဖြစ်မှသာဆေးကုခြင်းနှင့်ဆေးစစ်ခြင်း လိုအပ်ပါသည်။ (၁) ဟုတ်ပါသည် (၂) မဟုတ်ပါ (၃) မသိပါ
၁၁။	ကူးစက်နိုင်သော ဓာတ်ခွဲနမူနာများဖြင့် ထိတွေ့ ထားသော ချွန်ထက်သည့်ပစ္စည်း များ ဥပမာဆေးထိုးအပ်နှင့်ထိခိုက်ဒဏ်ရာရသောအခါ မည်သည့်အရည်ဖြင့်ဆေးသင့်သနည်း။ ----------

၁၂။	အပ်ဆူးသောဒဏ်ရာရလျှင် သွေးညစ်ထုတ်ခြင်းဖြင့် သွေးမှကူးစက်တတ်သောရောဂါများ ဥပမာ အသည်းရောင်အသားဝါဘီ ကူးစက်ခြင်းကိုလျော့နည်းစေပါသည်။ (၁) ဟုတ်ပါသည် (၂) မဟုတ်ပါ (၃) မသိပါ
၁၃။	ချောင်းဆိုးသောအခါ ပါးစပ်နှင့် နှာခေါင်းကိုအုပ်၍ဆိုးခြင်းသည် ဓာတ်ခွဲခန်းအတွင်း ကူးစက်ရောဂါကာကွယ်ခြင်းနှင့်ထိန်းချုပ်ခြင်းအတွက် အရေးမကြီးပါ။ (၁) ဟုတ်ပါသည် (၂) မဟုတ်ပါ (၃) မသိပါ
၁၄။	သုံးပြီးဆေးထိုးအပ်များကို အဖုံးပြန်ဖုံးသင့်သည်။ (၁) ဟုတ်ပါသည် (၂)မဟုတ်ပါ (၃) မသိပါ
၁၅။	သုံးပြီးဆေးထိုးအပ်များကို ကွေး၍ လွှင့်ပစ်သင့်သည်။ (၁) ဟုတ်ပါသည် (၂)မဟုတ်ပါ (၃) မသိပါ
(ဂ)	**လက်တွေ့ ဆောင်ရွက်ခြင်းဆိုင်ရာမေးခွန်းများ**
၁။	ဓာတ်ခွဲခန်းနမူနာပစ္စည်းများကို လက်အိတ်စွတ်၍ မကိုင်တွယ်ခင် လက်ဆေးပါသလား။ (၁) ဆေးပါသည် (၂) မဆေးပါ (၃)မသိပါ
၂။	ဓာတ်ခွဲခန်းနမူနာပစ္စည်းများကို လက်အိတ်စွတ်၍ ကိုင်တွယ်ပြီး လက်ဆေး ပါ သလား။ (၁) ဆေးပါသည် (၂) မဆေးပါ (၃) မသိပါ
၃။	ဓာတ်ခွဲခန်းသုံးကာကွယ်ရေးပစ္စည်းများကို အစဉ်သုံးစွဲပါသလား။ (၁)သုံးစွဲပါသည် (၂)မသုံးစွဲပါ (၃)မသိပါ သုံးစွဲသည်ဟုဖြေလျှင်မေးခွန်း(၄)ကိုဆက်၍ဖြေဆိုပါ။ မသုံးစွဲနှင့်မသိပါ ဟုဖြေဆိုလျှင်မေးခွန်း(၄)ကိုကျော် ၍ မေးခွန်း(၅)အားဆက် ၍ဖြေဆိုပါ။
၄။	နေစဉ်သုံးစွဲနေသောဓာတ်ခွဲခန်းသုံးကာကွယ်ရေး ပစ္စည်းများကိုဖော်ပြပါ။ ---------- ---------- ----------

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၅။	ချွန်ထက်သောဓာတ်ခွဲခန်းသုံးပစ္စည်း များ ဥပမာ ဆေးထိုးအပ်နှင့် ဖန်ကွဲစများကို မည့်သည့်ထည့်စရာဖြင့်ထည့်၍ စွန့်ပစ်သနည်း။(အဖြေတစ်ခုမကဖြစ်နိုင်ပါသည်၊ အောက်ပါအဖြေကို ဖြေဆိုသူအားမပြောရပါ။) ---
၆။	အသည်းရောင်အသားဂါဘီပိုးကာကွယ်ဆေး ဆေးပတ်လည်အောင်ထိုးပြီးပါသလား။ ဆေးပတ်လည်ဆိုသည်မှာ ခုကြိမ်ရက်ချိန်းအတိအကျ ထိုးခြင်းဖြစ်ပါသည်။ (၁)ထိုးပြီးပါသည် (၂) မထိုးပါ (၃) မဖြေပါ ထိုးပြီးပါသည်ဟုဖြေလျှင် မေးခွန်း(၇) ကိုဆက်ဖြေပါ။ မထိုးပါ(သို့)မသိပါ ဟုဖြေလျှင် မေးခွန်း(၉) ကိုဆက်ဖြေပါ။
၇။	အသည်းရောင်အသားဂါဘီပိုးကာကွယ်ဆေး ဆေးပတ်လည်အောင်ထိုးပြီး ၅နှစ်ကြာသောအခါ နောက်တစ်ကြိမ်ထပ်ထိုးပါသလား။ (Booster Dose) (၁)ထိုးပြီးပါသည် (၂) မထိုးပါ (၃) မသိပါ
၈။	အသည်းရောင်အသားဂါဘီပိုးကာကွယ်ဆေး ဆေးပတ်လည်အောင်ထိုးပြီး နောက် တုံ့ပြန်မှာတုပစည်း(Hepatitis B Antibody) ထွက်မထွက် ထပ်မံစစ်ဆေး ပါသလား။ (၁)စစ်ပါသည် (၂) မစစ်ပါ (၃) မသိပါ
၉။	သုံးပြီးသောဆေးထိုးအပ်များကို အဖုံးပြန်ဖုံးပါသလား။ (၁)လုပ်ပါသည် (၂)မလုပ်ပါ (၃) မဖြေပါ
၁၀။	သုံးပြီးဆေးထိုးအပ်များကိုကွေးပြီးလွှင့်ပစ်ပါသလား။ (၁)လုပ်ပါသည် (၂)မလုပ်ပါ (၃) မဖြေပါ
၁၁။	ချွန်ထက်သော ပစ္စည်း များ(သို့) ဆေးထိုးအပ်ကိုင်တွယ်စဉ်ဆူးမိခြင်း(သို့)ရောဂါရှိသောသွေး(သို့) ခန္ဓာကိုယ်တွင်းအရည်များ မျက်စိ(သို့) ပါးစပ်အတွင်းသို့ စင်ဘူးပါသလား။ (၁)ဖြစ်ဖူးပါသည် (၂)မဖြစ်ဖူးပါ (၃)မဖြေပါ ဖြစ်ဖူးပါသည် ဟုဖြေလျှင် မေးခွန်း(၁၁) ကိုဆက်ဖြေပါ။ မဖြစ်ဖူးပါ (သို့) မဖြေပါ ဟုဖြေလျှင် မေးခွန်း(၁၂) ကိုဆက်ဖြေပါ။

၁၂။	ထိုသို့ မတော်တဆမှုဖြစ်လျှင်ဓာတ်ခွဲခန်းအုပ်ချုပ်သူကိုအကြောင်းကြားပါသလား။ (၁) အကြောင်းကြားပါသည် (၂) အကြောင်းမကြားပါ (၃) မဖြေပါ
၁၃။	ဓာတ်ခွဲခန်းအတွင်းမတော်တဆမှု (သို့) ထိခိုက်ဒဏ်ရာ ရခြင်းဖြစ်လျှင် မည်သို့ဆောင်ရွက်ရမည်ကိုလုပ်ငန်းခွင် အတွင်းလေ့ကျင့်ပေးခြင်း(သို့)တိကျစွာ ရေးသားထားသောလမ်းညွှန်ချက်များရှိပါသလား။ (၁)ရှိပါသည် (၂)မရှိပါ (၃) မသိပါ
၁၄။	ဓာတ်ခွဲခန်းဂင်ပေါက်တွင် ဇီဝလုံခြုံမှုအန္တရာယ် ရှိသည်ဟူသော သတိပေး သင်္ကေတကပ်ထားပါသလား။ (၁)ရှိပါသည် (၂)မရှိပါ (၃) မသိပါ
၁၅။	သင်၏ဓာတ်ခွဲခန်းတွင် Biosafety Cabinet ရှိပါသလား။ (၁)ရှိပါသည် (၂)မရှိပါ (၃) မသိပါ
၁၆။	ဇီဝအန္တရာယ်ရှိ ပစ္စည်း များအား အသုံးမပြုချိန်တွင် အဖုံးပိတ်ထားပါသလား။ (၁) ရှိပါသည် (၂) မရှိပါ (၃) မသိပါ
၁၇။	ဓာတ်ခွဲခန်းရေခဲသေတ္တာတွင် စားသုံးမည့်အစားအစာများ သိုလှောင်ရန်မဟုတ် ဟူသော ညွှန်ကြား စာကပ်ထားပါသလား။ (၁)ရှိပါသည် (၂)မရှိပါ (၃) မသိပါ
၁၈။	ဓာတ်ခွဲခန်းအတွင်း အစားစားခြင်း(သို့) ရေ/အရည်သောက်ခြင်း(သို့) ပီကေစားခြင်း များရှိပါသလား။ (၁)ရှိပါသည် (၂)မရှိပါ (၃) မသိပါ
၁၉။	ဓာတ်ခွဲခန်းအတွင်း အလှပြင် ပစ္စည်းများသုံးလေ့ရှိပါသလား။ (၁)ရှိပါသည် (၂)မရှိပါ (၃) မသိပါ

Questionnaire on knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected tertiary hospitals

Date ----------

Respondent ID ----------

Interviewer ----------

No	Questions
(A)	Socio-demographic Characteristics
1.	Age (in completed year) --------
2.	Sex (1) Male (2) Female
3.	Education (1) M.Med.Tech (2) B.Med.Tech (3) Diploma in medical laboratory technology (DMLT) (4) Other
4.	Rank (1) Officer (or) Technician Grade (1) (2) Technician Grade (2) (3) Technician Grade (3) (4) Technician Grade (4)
5.	Total duration of government service (years)
6.	Have you been taught in your current post regarding using biosafety precaution? (1) Yes (2) No (if No, skip to section B)
7.	If Yes, how many times do you receive training about biosafety precaution? (Infection prevention and control training) (within one year) (1) 1 time per year (2) 2 times per year (3) Other----------

No	Questions
(B)	Knowledge about biosafety precaution
1.	Do you know that your laboratory have biosafety precautions for infection prevention and control measure? (1) Yes (2) No
2.	Is Hand washing important for infection prevention and control measure? (1) Yes (2) No
3.	How to decontaminate spill of infected body fluid or blood? ----------
4.	Describe personal protective equipment? (Answer may be more than one)
5.	Which color bag is used for disposal of potential infected waste ---------- blood and blood product ---------- human body tissue ----------
6.	Do you know how to treat infected non reusable waste before disposal? (e.g., plastic syringes, disposal plastic pipette tip and rubber glove etc.) (Answer may be more than one)
7.	Do you know how to treat infected reusable waste? (e.g., glass slide, glass culture plate?) (Answer may be more than one)
8.	Do you know how to always treat the container used to collect specimen in TB patient before disposal? ----------
9.	All laboratory staff do not need vaccination like hepatitis B vaccine as special job requirement. (1) Yes (2) No (3) Don't know
10.	All laboratory staff do not require regular medical check-up. (1) Yes (2) No (3) Don't know
11.	When the injury with sharp instrument or needle which exposed to infected sample like HIV positive sample occur, we should wash the injury with ----------

12.	Squeezing of the blood from needle pricked injury site will reduce the risk of transmission of blood borne infection like hepatitis B (1) Yes (2) No
13.	When coughing, cover mouth and nose is not important for infection prevention and control in laboratory (1) Yes (2) No
14.	Used syringe's needle should recap. (1) Yes (2) No
15.	Used syringe's needle should bend. (1) Yes (2) No

No	Questions
(C)	Practice about biosafety precaution in clinical laboratory
1.	Do you always wash hand before specimen with rubber gloves? (1) Yes (2) No
2.	Do you always wash hand after handling specimen with rubber gloves? (1)Yes (2) No
3.	Do you use personal protective equipment routinely? (1) Yes (2) No (if No, skip to No.25)
4.	If you use personal protective equipment routinely, describe the equipment you routinely used? (1) ---------- (2) ---------- (3) ---------- (4) ---------- (5) ----------
5.	Which container do you always use to dispose sharp laboratory instruments like needle and broken pieces of glass? ----------
6.	Did you get hepatitis B vaccine for complete course (i.e;3 times) (1) Yes (2) No (3) Not known (if No, skip to No.9)
7.	Do you get Hepatitis B vaccine booster dose after five year? (1) Yes (2) No (3) Not known
8.	After complete course of hepatitis B vaccination, do you investigate hepatitis B antibody? (1) Yes (2) No (3) Not known
9.	Do you recap used syringe's needle? (1) Yes (2) No
10.	Do you bend used syringe's needle before discard?

	(1) Yes (2) No
11.	Do you have an experience of injury with sharp instruments or needle or accidental exposed of infected body fluid or blood to eyes or mouth? (1) Yes (2) No (if No, skip to No.13)
12.	Do you report laboratory supervisor/ in charge when accident or injury encounter? (1) Yes (2) No
13.	Do you have training in job or exact written instruction how to do when accident or injury encounter in laboratory? (1) Yes (2) No
14.	Are biohazard signs posted on lab entrance? (1) Yes (2) No (3) Not know
15.	Are biosafety cabinets available in your laboratory? (1) Yes (2) No (3) Not know
16.	Is the biohazard container closed when not in used? (1) Yes (2) No (3) Not know
17.	Are refrigerators labeled “Not for Storage of Food for Human Consumption? (1) Yes (2) No (3) No answer
18.	Do you eat food or drink or chew gum in laboratory? (1) Yes (2) No (3) Not answer
19.	Do you apply cosmetic in laboratory? (1) Yes (2) No (3) Not answer

Interview guidelines for key informant interview

အသက် (ပြည့်ပြီးအသက်) - ( ) နှစ်

ကျား/မ -

ဆေးရုံအမည် -

ရာထူး -

ပညာအရည်အချင်း -

အစိုးရန်ထမ်းလုပ်သက် -

ယခုလက်ရှိရာထူးလုပ်သက် -

၁။ သင်၏လုပ်ငန်းတွင် သင်နှင့်အခြားဂန်ထမ်းများအတွက်ဇီဂအန္တရာယ်(biohazard) နှင့် ပတ်သက်၍ အရေးကြီးသည်ဟု သင်ထင်ပါသလား။ အကယ်၍ ထင်ပါက ဘာကြောင့်ပါလဲ။

၂။ ဇီဂလုံခြုံမှုပစ္စည်းများ (ဥပမာ PPE, biosafety cabinet) ရရှိရန်အတွက် အခက်အခဲများ ရှိပါသလား။ အခက်အခဲများ (ရှိ / မရှိ) ပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါရန်နှင့်ဘာကြောင့်ပါလဲ။

၃။ သင်၏ဂန်ထမ်းများ ဇီဂလုံခြုံမှုပစ္စည်းများ (ဥပမာ PPE, biosafety cabinet) သုံးစွဲရန် ညွှန်ကြားရာတွင် အခက်အခဲများ ရှိပါသလား။ အခက်အခဲများ (ရှိ/မရှိ) ပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါရန်နှင့်ဘာကြောင့်ပါလဲ။

၄။ Standard biosafety precaution ရရှိရန်အတွက်မည်ကဲ့သို့သော စိန်ခေါ် မှုများကြုံတွေ့ ရပါနည်း။ ကြုံတွေ့ရပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါ။

၅။ Biomedical waste disposal အတွက်မိမိဌာနအတွင်းတွင် မည်ကဲ့သို့ စီမံခန့်ခွဲပါသနည်း။

၆။ ထပ်မံအကြံပြုချင်တာများရှိပါသေးသလား။ ရှိပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါ။

Interview guidelines for key informant interview

Age (Completed age) yr -

Sex -

Name of Hospital -

Designation -

Education -

Government services -

1. Do you think that your occupation has increased risk of biohazards to your staff and you? If so, why?

2. Do you have any difficulties regarding availability of biosafety equipment (e.g., PPE, biosafety cabinet)? If yes, why? /If no, why?. Please mention about it.

3. Do you have any difficulties to manage your staff for proper use of biosafety equipment (e.g., PPE, biosafety cabinet)? If yes, why?/ If no, why?

4. What are the challenges for standard biosafety precaution? Please mention about it.

5. How do you manage the biomedical waste disposal in your department?

6. Is there any suggestion? Please mention about it.

Interview guidelines for In-depth interview

အသက် (ပြည့်ပြီးအသက်) - ( ) နှစ်

ကျား/မ -

ဆေးရုံအမည် -

ရာထူး -

ပညာအရည်အချင်း -

အစိုးရန်ထမ်းလုပ်သက် -

ယခုလက်ရှိရာထူးလုပ်သက် -

၁။ သင်၏လုပ်ငန်းသည် သင်နှင့်အခြားဂန်ထမ်းများအား ဇီဂအန္တရာယ်(biohazard) နှင့် ပတ်သက်သော ရောဂါများကူးစက်နိုင်သည်ဟု သင်ထင်ပါသလား။ ဘာကြောင့်ထင်ပါသလဲ။

၂။ Biosafety precaution ကိုကြားဖူးပါသလား။ ကြားဖူးရင် Biosafety precaution မှာပါဂင်တဲ့အချက်တွေကိုသင်သိသလောက်ပြောပြပေးပါ။

၃။ သင့်ဌာနနှင့်ဂန်ထမ်းများအတွက် ဇီဂလုံခြုံမှုပစ္စည်း (biosafety equipment)များ သုံးစွဲရန်အတွက် ပစ္စည်းများထောက်ပံ့ပေးမှု လုံလောက်စွာ ရရှိပါသလား။ အခက်အခဲများ(ရှိ/ မရှိ)ပါက ဘာကြောင့်ပါလဲ။ ကျေးဇူးပြု၍ ဖော်ပြပေးပါ။

၄။ ဇီဂလုံခြုံမှုပစ္စည်း(biosafety equipment)များ (ဥပမာ PPE (lab coat , eye goggles, etc, biosafety cabinet) ပုံမှန်သုံးစွဲရန်အတွက် အခက်အခဲများ ရှိပါသလား။ အခက်အခဲများရှိပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါ။

၅။ Standard biosafety precaution လိုက်နာရန် အတွက်မည်ကဲ့သို့သော စိန်ခေါ် မှုများကြုံတွေ့ ရပါနည်း။ ကြုံတွေ့ရပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါ။

၆။ Biomedical waste အမျိုးအစားဘာတွေရှိပါသလဲ။ Biomedical waste များစွန့်ပစ်ရာတွင်မည်ကဲ့သို့သော အခက်အခဲများရှိပါသနည်း။ အခက်အခဲများရှိပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါ။

၇။ ထပ်မံအကြံပြုချင်တာများရှိပါသေးသလား။ ရှိပါက ကျေးဇူးပြု၍ ဖော်ပြပေးပါ။

Interview guidelines for In-depth interview

Age (Completed age) yr -

Sex -

Name of Hospital -

Designation -

Education -

Government services -

1.Do you think that your occupation has increased risk of biohazards to you and other staff? If so, why?

2. Do you know biosafety precaution and please tell me which procedures are included in biosafety precaution?

3. Have your department and staff been provided biosafety equipment (e.g., PPE (lab coat, eye goggles etc.., biosafety cabinet) sufficiently? If yes, why? / If no, why?

4. Do you have any difficulties in using biosafety equipment (e.g., PPE (lab coat , eye goggles etc.., biosafety cabinet) properly? If so, why?

5. What are the challenges for compliance with standard biosafety precaution? Please mention about it.

6. Which type of disposal have been disposed? Do you have any difficulties in the biomedical waste disposal in your department? If so, why?

7. Is there any suggestion? Please mention about it?

Checklist for compliance with biosafety precaution SOP at facility level

Name of hospital ----------

Date of assessment ----------

No	Item	Assessment			Comment
		Yes	No	NR	
1.	Functional biosafety cabinet				
2.	Eye wash station				
3.	Sharp boxes				
4.	Biohazards disposal containers				
5.	Emergency exists				
6.	Fire Distinguisher				
7.	Fire alarm system				
8.	Laboratory safety manual				
9.	Self-closing doors				
10.	Warning and accident prevention sign				
11.	Accident filing book				
12	First aid box				
13	Guidelines for disposing medical wastes				
14.	biohazard signs posted on lab entrance				
15.	refrigerators labeled “Not for Storage of Food for Human Consumption				
16.	Freezer and storage areas lockable				
17.	Instruction for hand washing				
18.	Hand sanitizer dispensers				
19.	Basin				
20.	Comfortable working temperature				

Checklist for compliance with biosafety precaution SOP at individual level

Name of hospital ----------

Date of assessment ----------

Total laboratory staff =		Yes	No	NR	Comment
1	Wear lab coat				
2	Take off lab coat during resting time outside the lab				
3	Use of mobile phone in the lab				
4	Use of head cover during work				
5	Use of gloves for all purposes (Wear gloves when in contact with blood, body fluids, secretions, excretions, mucous membranes and contaminated items.)				
6	Change torn (damaged) gloves immediately				
7	Use of medical mask when necessary				
8	Put on eye goggles				
9	Wash hands promptly after contact with infective material				
10	Wash hands immediately after removing gloves.				
11	Clean up spills of infective material promptly.				
12	Eat food or drink or chew gum in laboratory				
13	Ensure appropriate waste handling.				
14	Use of cosmetic in lab				

Annex (4)

Scoring system for assessment of knowledge and practice of laboratory staff on biosafety precaution in clinical laboratory at selected government tertiary hospitals

(B)	Knowledge about biosafety precaution		
No	Questions		Score
1.	Do you know that your laboratory have biosafety precautions for infection prevention and control measure?	Yes No	1 0
2.	Is Hand washing important for infection prevention and control measure?	Yes No	1 0
3.	How to decontaminate spill of infected body fluid or blood?	5-10% sodium hypochlorite solution chlorine solution	1 1
4.	Describe personal protective equipment?	Gloves Apron Laboratory Coat Face Mask Goggles	1 1 1 1 1
5.	Which color bag is used for disposal of	potential infected waste (yellow) blood and blood product (red) human body tissue (green)	1 1 1
6.	Do you know how to treat infected non reusable waste before disposal? (e.g., plastic syringes, disposal plastic pipette tip and rubber glove etc.)	Chlorine solution Autoclave Incineration Formaldehyde Sterilization	1 1 1 1 1

7.	Do you know how to treat infected reusable waste? (e.g., glass slide, glass culture plate?)	Chlorine solution Autoclave Sterilization	1 1 1
8.	Do you know how to always treat the container used to collect specimen in TB patient before disposal?	Phenol 5-10% sodium hypochlorite solution Chlorine solution	1 1 1
9.	All laboratory staff do not need vaccination like hepatitis B vaccine as special job requirement.	Yes No Don't know	0 1 0
10.	All laboratory staff do not require regular medical check-up.	Yes No Don't know	0 1 0
11.	When the injury with sharp instrument or needle which exposed to infected sample like HIV positive sample occur, we should wash the injury with	Water	1
12.	Squeezing of the blood from needle pricked injury site will reduce the risk of transmission of blood borne infection like hepatitis B	Yes No	0 1
13.	When coughing, cover mouth and nose is not important for infection prevention and control in laboratory	Yes No	0 1
14.	Used syringe's needle should recap.	Yes No	0 1
15.	Used syringe's needle should bend.	Yes No	0 1

The maximum knowledge score is 30

(C)	Practice about biosafety precaution in clinical laboratory		
No	Questions		Score
1.	Do you always wash hand before specimen with rubber gloves?	Yes No	1 0
2.	Do you always wash hand after handling specimen with rubber gloves?	Yes No	1 0
3.	Do you use personal protective equipment routinely? (if No, skip to No.25)	Yes No	1 0
4.	If you use personal protective equipment routinely, describe the equipment you routinely used?	Gloves Coat Mask Apron Goggles Boot	1 1 1 1 1 1
5.	Which container do you always use to dispose sharp laboratory instruments like needle and broken pieces of glass?	Sharp container Safety box	1 1
6.	Did you get hepatitis B vaccine for complete course (i.e;3 times) (if No, skip to No.9)	Yes No Not known	1 0 0
7.	Do you recap used syringe's needle?	Yes No	0 1
8.	Do you bend used syringe's needle before discard?	Yes No	0 1
9.	Do you have training in job or exact written instruction how to do when accident or injury encounter in laboratory?	Yes No	1 0

10.	Are biohazard signs posted on lab entrance?	Yes No Not know	1 0 0
11.	Are biosafety cabinets available in your laboratory?	Yes No Not know	1 0 0
12.	Is the biohazard container closed when not in used?	Yes No Not know	1 0 0
13.	Are refrigerators labeled “Not for Storage of Food for Human Consumption?	Yes No No answer	1 0 0
14.	Do you eat food or drink or chew gum in laboratory?	Yes No Not answer	0 1 0
15.	Do you apply cosmetic in laboratory?	Yes No Not answer	0 1 0

The maximum practice score is 21.

Annex (5)

Gantt Chart

Month	August				September				October				November				December			
Week	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**	**1**	**2**	**3**	**4**
Protocol preparation																				
Protocol defend																				
Pilot study – Preparation for data collection																				
Data collection																				
Data entry and analysis																				
Preparation for Grand Presentation																				
Thesis preparation																				
Submission of Thesis (Draft)																				
Thesis defend																				
Correction and Submission of thesis																				

Annex (6) Curriculum Vitae

Name	Dr Thida Oo
Gender	Female
Date of birth	30.10.1981
Race	Bamar
Religion	Buddhist
Permanent address	Block (97), Aung Myay Tharsan Township, Mandalay
Phone Number	09444009324
E mail address	thidaoodr@gmail.com

Academic qualification

1. Dip.Med.Sc (Hospital Administration),2016, University of Public Health, Yangon
2. M.B.,B.S (2006), University of Medicine, Mandalay

Employment history

1.Assistant Director, Procurement and Distribution Department, Department of Medical Service (14-9-2016 to up to now)

2. Medical officer, Central Medical Store Department, Yangon (1-7-2016 to 13-9-2016)

3. Diploma in Hospital Administration course at University of Public Health (1-1-2016 to 30-6-2016)

4. Medical Officer, Social Security Board Clinic, Sagaing (7-1-2015 to 31-12-2015)

5. Medical Officer, University of Mandalay Technology University Clinic (7-1-2010 to 31-12-2014)

6. Assistant Surgeon, (1000) Bedded, Nay Pyi Taw General Hospital (1-4-2007 to 1-1-2010)