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Biosafety Measures in Laboratory Services of a Tertiary Care Hospital

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ABSTRACT

Objective*: To study the Biosafety Measures undertaken in a laboratory of a tertiary care hospital.*

Material and Methods: *A prospective study for a period of one year was conducted. The study encompassed collection of data regarding Biosafety measures in central laboratory of SKIMS using the following methods.*

1. Observational study

2. Study of records.

Results: *Study revealed that in 81% of observations "hand washing "was vigorously practiced. In 88.5% of observations use of "laboratory coats" was followed by the staff working in the central laboratory. Mouth pipetting was not common as in only 33% of observations it was practiced. There was only 0% use of goggles, masks and face shields when required. There were no biosafety cabinets. In most of the observations (98.8%) the working staff desisted from eating and drinking within working area. There was neither any protocol available for incident reporting in case of accidental needle pricks or spills nor any compliance for the same 64.5% of lab. Staff was fully immunized against HBV. The findings revealed that in most of the areas subjects to testing revealed gross contamination.*

Conclusion*: In 81% of observations "hand washing "was vigorously practiced. In 88.5% of observations use of "laboratory coats" was followed by the staff working in the central laboratory. There were no biosafety cabinets available in the central laboratory. In most of the observations (99.8%) the working staff desisted from eating and drinking within the working area. There were neither any protocol available for incident reporting in case of accidental needle pricks or spills nor any compliance for the same .64.5% of lab. Staff was fully immunized against HBV. There exists a standard policy for disinfection of various lab equipment and laboratory area.*

KEY WORDS: *Biosafety,Hand Washing,Laboratory Coats,Biosafety Cabinets*

INTRODUCTION

Health and safety in clinical laboratories is becoming an increasingly important subject as a result of emergencies of highly infectious diseases such as hepatitis and HIV/AIDS. This is even more so in developing countries where health and safety have traditionally been regarded as low priority issues. [1]

A laboratory is a place of specialized work, research, clinical or diagnostic procedures and also a place for teaching and terming. There are different types of laboratories and great number of hazards which may be found in them. Codes of practice and Guidelines are documented which specify safe practices for particular task or occupations[2].

The emphasis is on employee training and education, use of safety equipment and the responsibility of employees to provide a work site that is maintained in a clean and sanitary condition. A laboratory safety programme, should consists of commitment by top management, establishment of safe work place, collection responsibilities of management, supervisors and laboratory workers to support the programme, establishment of appropriate on Job training and development and implementation of efficient and comprehensive infection programme.[3]

The goal for all clinical laboratories is to provide the safest possible working conditions for all employees. In order to accomplish this it is necessary to understand the possible risks involved in working with clinical specimens such as microbial cultures or chemical reagents and the procedures required preventing laboratory infections or exposure to a chemical hazard. It is also necessary for top-level management of the laboratory to be aware of the levels of risk to their employees [4].

Rules and regulations covering the use, management and disposal of hazardous and carcinogenic chemicals in the laboratory have been in place for some time. The national fire protection agency NFPA codes, as well as occupational and safety health administration (OSHA) regulations are useful source of national regulations. Prior to 1989, criteria for working safely with biological materials consisted of a series of guidelines and recommendations emanating from the centers for disease control (CDC), the national institute of health (NIH), or certain professional groups such as ASM. A great concern for the safety and protection of laboratory regulations, Prior to 1989, criteria for working safely with biological materials consisted of a series of guidelines and recommendations emanating from the centers for disease control (CDC), the national institute of health (NIH), or certain professional groups such as ASM. A great concern for the safety and protection of laboratory and healthcare workers was generated by the sudden appearance of human immunodeficiency virus (HIV) as the agent responsible for acquired immune deficiency syndrome (AIDS) [4]

METHODOLOGY

The study was carried out in Sher-i- Kashmir Institute of Medical Sciences (SKIMS) established in 1982 besides teaching and research, offers quality medical services in various surgical and

medical super specialties. The Institute for purpose of patient care services has a modern hospital having about 575 beds with all required clinical, engineering and support services. The Institute has a strong back up of specialized laboratories which include clinical biochemistry, hematology, immunology and molecular medicine, microbiology including parasitological, clinical pharmacology and clinical pathology. In addition to departmental laboratories SKIMS hospital has a Central Laboratory located at ground floor of the hospital building. It caters to departments of Accident/ Emergency, Outpatient and Inpatients departments and provides services for 24 hrs x 365 days for conducting biochemistry hematology and cytology. The Central Laboratory was established in the year 1998 after 15½ years of the commissioning of the first phase of the SKIMS Hospital, as a measure of improvement in the investigative services.

The methods adopted were:

A prospective study of one year was carried out. The study encompassed collection of data regarding biosafety measures in laboratory services using the following methods.

1. *Observational study*: included daily collection of data regarding biosafety measures in the Central Laboratory by direct observation by the researcher.

The practice of Standard (Universal) Precautions observed by various sections of laboratory i.e., handling blood and its products were studied by observation in terms of Hand Washing, Use of gloves, masks and face shields, needle disposal practices and compared with standards recommended. The compliance was calculated by number of times universal precautions were followed divided the total number of observations made by the researcher.

The availability and functioning of Biosafety cabinets and needle cutters in the laboratory was studied.

Eating, drinking in laboratory, mouth pipetting, open tube centrifugation and any other form of behavior that can be termed as hazardous was identified.

The percentage of workers immunized fully against hepatitis – B was identified.

Existence of protocol for incident reporting, accidents in case of needle prick injuries and percutaneous exposure was identified and provisions for subsequent immunoprophylaxis were observed. Parameters of Sanitation, Housekeeping, and Sterilization were also conducted.

2 *Records*: The data obtained through the observational study was supplemented and cross checked with the daily records and registers/ report register maintained in the Central Laboratory.

RESULTS

Bio-Safety Measures: The practice of universal precautions observed by the various cadres of staff working in the laboratory revealed that in 81% of observation, "hand washing" was vigorously practiced as shown in table 1. The practice of using gloves while handling and processing of

samples revealed that in 79.1% of observations, it was being followed. The use of laboratory coats was 88.5% among the staff working in the central laboratory. Mouth pipetting was not common as in only 33% of observations, it was practiced. In 100 % of observation's open tube centrifugation in (working place) was seen. There was 0% use of goggles, masks and face shields when required. There were no biosafety cabinets available in the central laboratory. In most of the observations (98.8%) the working staff desisted from eating and drinking within the working area. There were neither any protocol, available for incident reporting in case of accidental needle pricks or spills nor was any compliance for the same. 64.5% of lab staff fully immunized against HBV.

Disinfection/Sterilization: - There exists a standard policy for disinfection of various laboratory equipment and laboratory area. The disinfection of glass ware used for sample collection and processing is done by treating with 1% chromic acid for thirty minutes before washing. The washed product is kept at 100^0C for one hour, before being put to use. The standard process for checking the disinfection procedures, being followed in the central laboratory involves regular taking of swabs from disinfected glass ware and various areas of the central laboratory. The findings revealed as shown in table 2, that most of the areas subjected to testing revealed gross contamination.

Sanitation and Waste Disposal Practices: - For cleaning of various working areas of the central laboratory the standard procedure being followed is daily scrubbing with vim powder and water. The phenyl is more commonly used in toilet cleaning. There are regular schedules for scrubbing of walls, defrosting of refrigerators and dusting of equipment. The cleanliness of the central laboratory is maintained predominantly by sanitary attendants from the department of sanitation. The entire process of cleanliness is supervised by sanitary supervisor of the concerned area. There exist no special procedures in case of blood spills except for routine washing with vim and water, although there are written guidelines for the same.

Waste Disposal: - Most of the waste generated in the central laboratory is constituted by remnants of samples broken glassware and domestic waste in the form of paper, boxes etc. There is a liberal availability of color coded dustbins in all the areas/section of the central laboratory. 60% of the observation revealed that the segregation of waste generated was being followed. The liquid waste that is generated is flushed into the main sewerage system without any treatment. The solid waste generated and segregated is transported in color coded bags to incineration site by sanitary attendants. The waste is finally destroyed by incineration.

Table: 1. Practice of Universal Precautions in the Central Laboratory

Precautions	**% Compliance**
1. Hand washing	81
2. Gloves	79.1
3. Laboratory coats/gowns	88.5
4. Masks/goggles/face shields	0
5. Mouth pipetting (seen)	33
6. Open tube centrifugation (seen in working place)	100
7. Availability of biosafety cabinets	0
8. Incident reporting	0
9. Eating, drinking not (seen in working	98.88

Table: 2. Results of Swabs Taken for Culture from Different Sections of the Central Laboratory and Glassware and Cotton

S no.	**Area**	**Culture results**
1	Biochemistry work table	Pseudomonas aerugmosa and bacterial spores.
2	Hematology work table	Staphylococcus and fungal spores
3	Corridor of biochemistry and hematology	Bacterial and fungal spores.
4	Glassware washing room	Staphylococcus occurs and bacterial spores.
5	Office	Bacterial and fungal spores
6.	Store	E.coli bacterial and fungal spores.
7	Sample reception room	Bacterial and fungal spores
8	Refrigerator containing reagents	Bacterial and fungal spores.
9.	Glassware/test tubes	Sterile
10	Cotton used for plugging	Sterile

DISCUSSION

Universal Precautions practiced by various cadres of laboratory staff showed that hand washing, use of gloves and laboratory coats was universal. In 98.8% of observation laboratory staff desisted from drinking and eating within the working area. Haroon et al reports a compliance rate of 62.5% for hand washing, 47.1% for use of gloves and 100% compliance for use of laboratory coats by laboratory staff [5]. Michalsen A. et al, reports 94% compliance with use of gloves, 55% for wearing of protective clothing and 92% compliance for proper disposal of sharps [6].

Disinfection of various laboratory areas and equipment followed a standard policy. The process of disinfection is done by treating glassware with 1% of chromic acid before washing and then subjection the washed product to 100^0C for one hour. Chromic acid is not recommended as disinfect by infection control committee at SKIMS, while glutaraldehyde at a minimum effective concentration (MEC) of 1.5% is accepted. Literature considers glutaraldehyde effective at an MEC of 1.5% and advocates use of 2% solution [7].

The bio safety measures which also involve regular taking of swabs from various areas of the central laboratory, revealed a gross contamination except sterilized glassware and cotton plugs. Gross contamination of various areas of the central laboratory establishes an ineffectiveness of disinfection practices being practiced therein.

There are standard procedures for cleaning of various areas of the central laboratory which include daily cleaning of floors with vim and water. There are regular weekly schedules for cleaning/scrubbing of walls, floor, monthly defrosting of refrigerator and monthly dusting of equipment. The entire process of cleanliness is maintained and supervised by department of sanitation.

There is a proper waste disposal system existing in the central laboratory for disposal of infectious and domestic waste generated in the central laboratory. It is constituted of remnants of samples, broken glassware and domestic waste in the form of paper, boxes etc. there is a liberal availability of colour coded dustbins in all the areas/sections of the central laboratory. 60% of the observations revealed that segregation of waste was being followed. The liquid waste that is generated is flushed into the main sewerage system without any treatment. The solid waste generated and segregated is finally disposed by incineration. Roa S K, M et al; also recommends disposal of hospital waste in a large hospital by the process of incineration [8].

CONCLUSION

A study for a period of one year was undertaken to study the Biosafety measures in Central Laboratory of a tertiary care hospital SKIMS. The study encompassed collection of data regarding Biosafety Measures in the Central Laboratory using following methods.

1. Observational study
2. Study of records

The practice of universal precaution observed by various cadres of staff working in Laboratory revealed that in 81% of observation hand washing

was vigorously practiced. The practice of using gloves while handling and processing of samples revealed that in 79% of observations, it was being followed. The use of Laboratory coats was 88.5% among the staff working in the Central Laboratory. Mouth pipetting was not common as in only 33% of observation, it was practiced. There was 0% use of goggles, masks and face shields when required. There were no biosafety cabinets available in the central laboratory. In most of the observations (99.8%) the working staff desisted from eating and drinking within the working area. There were neither any protocol available for incident reporting in case of accidental needle pricks or spills nor any compliance for the same .64.5% of lab. Staff was fully immunized against HBV. There exists a standard policy for disinfection of various lab. Equipment and laboratory area, the findings revealed that most the areas subjects to testing revealed gross contamination. There are regular schedules for scrubbing of walls, defrosting of refrigerators and dusting of equipment. There exists no special procedures in case of blood spills except for routine washing with vim and water, although there are written guidelines for the same. 60% of observations revealed that segregation of waste generated was being followed the waste is finally destroyed by incineration.

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