Original article

Safety in Laboratories: Indian Scenario

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Abstract

Health and safety in clinical laboratories is becoming an increasingly important subject as a result of emergence of highly infectious diseases such as Hepatitis and HIV. A cross sectional study was carried out to study the safety measures being adopted in clinical laboratories of India. Heads of laboratories of teaching hospitals of India were subjected to a standardized, pretested questionnaire. Response rate was 44.8%. only 60% of laboratories had person in-charge of safety in laboratory. Seventy three percent of laboratories had safety education program regarding hazards. In 91% of laboratories staff is using protective clothing while working in laboratories. Hazardous material regulations are followed in 78% of laboratories. Regular health check ups are carried among laboratory staff in 43.4% of laboratories.

Safety manual is available in 56.5% of laboratories. 73.9% of laboratories are equipped with fire extinguishers. Fume cupboards are provided in 34.7% of laboratories and they are regularly checked in 87.5% of these laboratories. In 78.26% of laboratories suitable measures are taken to minimize formation of aerosols.

In 95.6% of laboratories waste is disposed off as per bio-medical waste management handling rules. Laboratory of one private medical college was accredited with NABL and safety parameters were better in that laboratory. Installing safety engineered devices apparently contributes to significant decrease in injuries in laboratories; laboratory safety has to be a part of overall quality assurance programme in hospitals. Accreditation has to be made necessary for all laboratories.

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Introduction

There are different types and a great number of hazards which may be found in laboratories. Codes of practice and guidelines are documented which specify safe practices for particular task or occupations [(1)]. Health and safety in clinical laboratories is becoming an increasingly important subject as a result of emergence of highly infectious diseases such as Hepatitis, HIV. This is even more so in developing countries where health and safety have traditionally been regarded as low priority issues [(2)]. The emphasis is on employee training and education, use of safety equipment and the responsibility of employers to provide a work site that is maintained in clean and sanitary condition. A laboratory safety program should consist of commitment by top management, establishment of safe work place, collective responsibilities of management, supervisors and laboratory workers to support the program, establishment of appropriate on the job training and development and implementation of effective and comprehensive infection program [(3)].

A study was carried out to study the safety measures being practiced in various clinical laboratories of India.

Methodology

A cross sectional study was carried out in which the heads of laboratories of teaching hospitals of India who are recognized or permitted by Medical Council of India (MCI) were subjected to a standardized, pretested questionnaire. MCI is a regulatory body The questionnaires were mailed to the participants.

Result

Response rate was of 44.8%. The status of laboratories from which questionnaire were obtained properly filled is shown in Table 1

Table 1: The status of laboratories

Affiliation	Percentage
Medical Institutions	13 %
Deemed University	4.3%
Medical College (Govt)	69.5%
Medical College (Private)	4.3%
Associated Hospital of Medical College	8.6%

Around 8.6% medical establishments had bed strength less than 300, 52.1% had bed strength from 500 to 1000 and 39.1% had bed strength greater than 1000.

Laboratory of one private medical college was accredited with NABL (ISO 17025) New Delhi; while as laboratory of one medical college was under quality control scheme with above mentioned college.

Sixty percent of laboratories had In charge of Safety and among them he/she was known to laboratory staff in 92.8% of laboratories. 73.9% of laboratories had safety education program regarding chemical hazards, microbiological hazards, physical hazards and other measures of

personnel protection. In 91% of laboratories staff is using protective clothing while working in laboratories. Hazardous materials regulations are followed in 78% of laboratories. Noise and ventilation regulations are followed in 78% of laboratories. Laboratory personnel are currently immunized in 60.8% of laboratories. Regular health check ups are carried among laboratory staff in 43.4% of laboratories. Safety manual is available in 56.5% of laboratories. There is a recognized mechanism for reporting all laboratory accidents in 52% of laboratories. Written instructions for safe handling and disposal of specimens, glassware and biological media are available in 91% of laboratories. Written instructions for handling of spills of contaminated material are available in 86.9% of laboratories and among these the instructions are known to laboratory staff in 95% of laboratories. Decontaminating solution is being used for specific purpose in all the laboratories. 73.9% of laboratories are equipped with fire extinguishers and laboratory personnel are familiar with the operation of fire extinguishers in only 58.8% of these laboratories. 73.9% of laboratories have first aid equipment and among these laboratories only 70.5% staff has been trained in using this first aid equipment. In 43.4% of laboratories regular check ups are carried out regarding measures to be taken in case of emergency. Volatile and flammable chemicals are sorted in designated areas in 73.95% of laboratories and these areas are suitably ventilated in 94% of laboratories. Staff is instructed in safe handling of acids in 95.6% of laboratories. Fume cupboards are provided in 34.7 % of laboratories and they are regularly checked in 87.5 % of these laboratories. All the specimens are treated as potentially hazardous in all the laboratories. Mouth pipetting is prohibited in 95.6% of laboratories and suitable devices to avoid mouth pipetting are available in all these laboratories. In 78.26% of laboratories suitable measures are taken to minimize formation of aerosols. Documented procedures are available for disinfection of instruments and work space in 73.91%of laboratories. Containers for sharps are designated for the purpose in adequate number in 65.2% of laboratories. Gas cylinders are handled according to regulations in 86.9% of laboratories. Staff is informed about hazardous nature of Ultra Violet light and radioactive materials in 65.2% of laboratories. In none of the laboratories eating and drinking is allowed in work areas. In 95.6% of laboratories waste is disposed off daily in a way that poses no direct or residual hazard to community. Contaminated and potentially infectious material is adequately sterilized before disposal; or cleaning in 82.65% of laboratories. Laboratory design features are creating a hazard in 17.3% of laboratories. In 69.5%of laboratories procedures are evaluated to see if solutions containing different reagents are disposed properly. In only 56.52%of laboratories warning signals or sign boards are posted about potential hazards. Lab. Safety parameters were better for laboratories which were accredited or were under quality control scheme.

Discussion

The objective of safety program depends on the type of the Institution, nature of the work being done and level of technical expertise of the laboratory staff. Only 73.9% of laboratories in our study had on the job training and education program which needs to be established in other laboratories also so that awareness about safety increases among staff members. A study carried out in Nigeria to study knowledge, attitudes and practice of aspects of laboratory safety in pathology laboratories at the university of Port Harcourt Teaching Hospital found gross deficiencies in areas of use of personnel protective equipment, specimen collection and processing and infective waste disposal[2]. Studies conducted in the United States over the past 15

years suggest that the rates of sharp-device injuries to the front line nurses have fallen over the past decade, probably at least in part because of increased awareness and adoption of safer technologies, suggesting that regulatory strategies have improved safety. The much higher injury rate in Germany may be due to slow adoption of safety devices .Sharp injury rates were lowest in United States, where the use of safety engineered deices was highest [4, 5].A study carried out in Australia showed that AIDS task force Code of biosafety practice for laboratories was not followed. Relatively poor practices were identified in the handling and transport of patient samples, disposal of infected waste and the use of equipment not designed for aerosol containment [6]. Hofmann and colleagues projected that only 6.3% and 14.7% of injuries in a German hospital in late 1990s were officially reported[7]. In Taiwan, the incidence rate of needle stick injuries is 0.11 per person-month among healthcare workers including laboratory technicians. Installing safety engineered devices apparently contributes to significant decrease in such injuries across occupation[8]. Fume cupboards in our study were provided in 34.7% of laboratories. The creation of aerosols should be minimized to the greatest possible extent. This usually requires the development of standard operating procedures (SOP) for all laboratory procedures likely to produce aerosols and timely review of these to ensure that personnel are abreast of current technology and take advantage of the latest innovations in safety.

A study obtained data from 431 hospitals (response 59.5%) regarding biosafety in clinical laboratories in Japan. Risk factors identified were lack of biological safety cabinets (BSC's), immature skills and insufficiently skilled equipment operation. The study had concluded that biosafety systems were lacking or inadequate in clinical laboratories[9].Personal monitoring of chemical exposure has to be conducted to correlate with symptom complaints. Internal and external auditing of the present system for occupational health and safety management systems (OHSAS 18001) provides a good insight for continual improvement in minimizing the risk level to the radiographers working in a hospital of Vizag Steels [10, 11]. India, like other developing countries, suffers from weak health care structures and poor regulations [12]. Laboratory safety has to be a part of the overall quality assurance programme in hospitals. Laboratories should be accredited with appropriate accreditation bodies. Accreditation is the formal recognition, authorization and registration of a laboratory that has demonstrated its capability, competence and credibility to carry out the tasks it is claiming to be able to do. It provides feedback to laboratories as to whether they are performing their work in accordance with international criteria for technical competence.[13] A study has been found that laboratories improved as long as data was monitored and shared.[14] There has to be standardization across laboratories and tools of quality assurance and CQI (Continuous Quality Improvement) have to be used to improve safety in laboratories .Govt. of India has authorized NABL (National Accreditation Board for Laboratories) as the sole accreditation body for testing and calibration of laboratories. The objective is to provide third party assessment of quality and technical competence.[15] Practices like having a designated laboratory safety officer, following hazardous materials regulation, availability of a safety manual, availability and use of personnel safety equipment, proper biomedical waste management and will of top management can be instrumental in reducing accidents in laboratories.

Limitation of study: The study was based on questionnaire and response bias has not been taken care of. Moreover as only one laboratory in the response group was accredited reaching

conclusions on comparisons was difficult. We would recommend observational study by independent body for making comparisons regarding safety in laboratories among accredited and non-accredited ones.

Conclusion

Laboratory safety in India has to be a part of overall safety programme in hospitals and all this can be achieved by having a quality control program in hospitals in general and laboratories in particular. Accreditation has to be made necessary and all laboratories should be graded as per their performance against a set of predetermined standards.

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