

## Health and safety in clinical laboratory practice in Ibadan, Nigeria

F.O. Omokhodion

*Occupational Health Unit, Department of Preventive and Social Medicine, University College Hospital, Ibadan, Nigeria.*

### Summary

The economic implications of safety precautions in laboratory practice make compliance difficult especially for laboratories in countries with poor economies. However, economic factors are not the only determinants of a safe work environment. Worker's perception of health and safety also influence compliance with safety guidelines. This study was conducted to determine the attitude and practice of laboratory workers with regard to safety.

A structured questionnaire was administered to laboratory workers in 10 clinical laboratories. The questionnaire inquired about the use of protective equipment, safe work practices and immunization status of workers. Another questionnaire sought information on safety codes, accident records and first aid facilities in each laboratory. Questionnaires were coded and analysed.

Ninety out of 106 laboratory workers (85%) responded to the inquiry. Unsafe work practices such as eating or drinking in laboratories and mouth pipetting of biological samples were practised by 41% and 10% of workers, respectively. Ninety percent of workers used white coats while 64% used gloves when handling biological samples. None of these workers used goggles or face shields in the course of their work. Fifty-one percent had received immunisation against tuberculosis, 73% against tetanus and 16% against hepatitis B. Thirty-seven percent of senior staff and 72% of junior staff did not receive any formal safety training. Accident records and first aid facilities were absent in most laboratories. The commonest health problem reported by workers was low back pain.

The poor coverage of hepatitis B immunization among health care workers in an endemic area is currently a cause for concern among medical and paramedical staff.

There is a need for education programmes to increase awareness on safety. Occupational health workers in this setting face the challenge of promoting safe work practices among workers in the face of the lack of funding and apathy among poorly paid junior workers.

### Keywords:

*Health, safety clinical, laboratory, occupational*

### Résumé

Les implications économique des précautions de sécurité dans les pratiques de laboratoires rend la conformation difficile surtout dans les laboratoires des pays à faibles

economies. Cependant, les facteurs économiques ne sont pas les seuls déterminants du travail dans un environnement sain. La perception des travailleurs à propos de la santé et de la sécurité influence aussi le respect des règles de sécurité. Cette étude a été conduite afin de déterminer l'attitude et la pratique des règles de sécurité chez les travailleurs de laboratoires. Un questionnaire structuré a été administré chez les travailleurs de laboratoires dans 10 laboratoires cliniques. Les questionnaires enquired à propos des équipements protectifs, les pratiques saines de travail et le statut d'immunisation des travailleurs. Un autre questionnaire a cherché les informations à propos du code de sécurité, les cas enregistrés d'accident et les facilités de premiers soins dans chaque laboratoire. Les questionnaires ont été codés et analysés. Quarante-dix sur 106 travailleurs de laboratoire (85%) ont répondu à l'enquête. Les pratiques malsaines telles que manger, ou boire dans les laboratoires, ou le pipetage des spécimens biologiques sont pratiqués par 41 et 10 des travailleurs respectivement. Quarante-dix des travailleurs utilisent les blouses blanches alors 64% utilisent les gants, 90% travaillent avec les lunettes de protection ou les protecteurs de faces pendant leurs travaux. Cinquante-un pourcent ont reçu une immunisation contre la tuberculose, 73% contre le tétanos et 16% contre l'hépatite B. Trente-sept pourcent des cadres supérieurs et inférieurs n'ont reçus aucune formation en matière de sécurité en laboratoire. Les accidents enregistrés et les facilités des soins de santé primaire étaient absents dans la plupart des laboratoires. Les problèmes de santé les plus communs rapportés par les travailleurs ont été les maux de dos. Le taux faible d'immunisation d'hépatite B chez les officiers de santé dans les régions endémiques, est un problème sévère parmi les personnels médicaux et paramédicaux. Un programme d'éducation est nécessaire pour accroître la prise de conscience et la sécurité parmi les travailleurs. Les travailleurs de santé occupent, dans les régions de santé de travail, le défi de promouvoir des pratiques de travail sûres, dans une situation de manque de financement et d'indifférence chez les cadres inférieurs mal payés.

### Introduction

The health and safety of health care workers continues to be an important issue especially in the face of outbreaks of epidemics of incurable and often fatal diseases. Laboratory workers are particularly at risk [1], as they handle and process infected biological specimens in which the infective organisms are frequently unknown.

Much of the published work on laboratory acquired infection have identified the role of safety devices, procedures and practices in the control of these infections. Several guidelines on safety in clinical laboratories have been published [2-5]. These safety provisions have economic implications, and consequently, in laboratories

in countries with poor economies, safety measures are usually compromised. This is because such laboratories cannot afford the cost of safety facilities or do not make their procurement a priority. It is an irony however, that communicable diseases which can be acquired in laboratories are more prevalent in these countries where safety provisions are minimal. Infections with *Mycobacterium tuberculosis* and hepatitis B are well known among laboratory staff [1,6]. Laboratory acquired infection with HIV/AIDS occurs less frequently [7] and infections with deadly viruses like Lassa [8] and Ebola [9] have been reported among health care staff. Most infections occurring among laboratory workers in developing countries are not reported to the appropriate authorities and the magnitude of the problem is difficult to quantify. As communicable diseases which can be acquired in laboratories are more prevalent in poorer countries, there is a need to focus on the laboratory workers' perception of health and safety as a modifiable factor in the promotion of safe work practices.

The provision of basic facilities for safe laboratory practice is the responsibility of the employers. Even in poorer countries, government health institutions can be expected to make this provision. The proper use and maintenance of such facilities will often depend on the workers, as the role of laboratory workers in safeguarding their health at work is unquestionable. How this responsibility is discharged in every day laboratory practice will determine the occurrence of laboratory acquired infection among these workers. There is a need to focus on the perception of laboratory workers to health and safety in laboratory practice. This study attempted to determine their attitude and practice of laboratory workers to safety in laboratory practice.

#### Materials and method

A structured questionnaire was administered to laboratory workers in 10 clinical laboratories in a government-owned institution after obtaining permission from the heads of the departments and the consent of workers. The questionnaire inquired about the demographic features of this occupational group, the use of protective equipment, attitudes to various aspects of laboratory practice and the immunisation status of the workers. Another questionnaire was administered to the most senior laboratory technologist in each department. This questionnaire sought information on the use of safety codes, accident records, first aid facilities and other policies on safety. Questionnaires were coded and analysed.

#### Results

Ninety out of 106 laboratory workers responded to the inquiry, a response rate of 85%. Laboratory work is dominated by males who comprised 82% (74) of the population. The modal age group was 41-45 years. Forty percent of the population was below 40 years of age. There were three main job categories: laboratory technologists (55%) who are designated as senior staff, laboratory supervisors (22%) and laboratory attendants (23%) who are designated as junior staff.

With regard to safety practices of laboratory workers, about 37 (41%) admitted that they sometimes ate or drank in the laboratory and 9 (10%), used mouth pipetting for biological samples. White coats and gloves were the most commonly used protective devices. These were used by 90% and 64% of the population, respectively. The tendency to wear white coats increased with increasing level of educational attainment ( $P < 0.01$ ). Only four respondents (4.4%) reported having had 5 accidents in the last three months. These were mainly spillage of acid and other chemicals reported by three workers and cuts by glass slides reported by one worker. One respondent reported a fall on a slippery floor which resulted in injury to the eye lid. Four of the 5 accidents were not reported.

Fifty-three (53%) of the respondents thought that the greatest hazard in laboratory practice was due to harmful organisms while 24 (28%) thought it was due to chemical reagents used. Further analysis (Table 1) showed that the majority of senior staff thought that microorganisms were the greatest hazard. However, of those who thought that chemical reagents were the greatest hazard, junior staff were the majority. Analysis by laboratory specialty indicated that while the majority of workers thought that microorganisms were the greatest hazard, 65% of Morbid Anatomy workers thought chemicals constituted the greatest hazard.

**Table 1:** Perception of hazard among laboratory workers according to job cadre.

Job cadre	Chemicals	Biologic al	Both	Machines	Total
Junior Staff	16(42%)	20 (52%)	1 (3%)	1 (3%)	38
Senior staff	8 (17%)	33 (70%)	6 (13%)	-	47
All	24 (28%)	53 (63%)	7 (8%)	1 (1%)	85

Inquiry about immunisation status showed that only 51% had been vaccinated against tuberculosis, 73% against tetanus and 16% against hepatitis B. Only 17% indicated that they had been immunised against yellow fever. While vaccination rates for tuberculosis and tetanus varied only slightly between departments, hepatitis B vaccination rates were highest among laboratory workers in Paediatrics 66%, Haematology 33% and Virology 30%.

Nine workers (10%) had symptoms of illness which they associated with work exposure. These were mainly backache, catarrh and visual problems.

In response to the inquiry about training on safety, 30 (63%) of the senior staff and 7 (18%) of junior staff reported that they had formal training in this area. This difference was statistically significant  $P < 0.01$ . Further analysis showed that 14 (56%) of the 25 workers employed for less than 10 years had some formal training on laboratory safety while 23 (37%) of the 61 workers employed for more than 10 years had some training in this area (Table 2). This difference was however not statistically significant.

**Table 2:** Training in Laboratory safety

	Formal training	No formal training
Staff cadre		
Junior	7 (18%)	32 (82%)
Senior	30 (63%)	17 (37%)
Total	37	49
Length of Employment		
> 10 years	14 (56%)	11 (44%)
< 10 years	23 (37%)	38 (63%)
Total	37	49

Nearly all (96%) respondents were satisfied with their jobs. Job stress scores were calculated by awarding scores commensurate with the graded responses in the questionnaire. Stress scores increased with educational attainment ( $P < 0.05$ ) but did not vary with age, sex and length of employment. Job satisfaction also increased with educational attainment ( $P < 0.01$ ), but did not vary with age, sex and length of employment.

All 10 laboratories returned the questionnaires on safety policies. Analysis showed that seven laboratories (70%) had a safety code and six (60%) had separate eating areas. Accident records and first aid facilities were absent in most laboratories (Table 3). The use of hazard labels for suspected hazardous material was reported in 4 out of 10 laboratories. Clinical waste was disposed of in open dustbins in all laboratories.

**Table 3:** Safety policies in 10 clinical laboratories

	Safety	No
Safety code	7	3
Accident	1	9
First aid facilities	1	9
Hazard labels	4	6
Separate eating facilities	6	4

### Discussion

Safe laboratory practice is paramount in the prevention of laboratory acquired infection. The results of this survey indicate that there are still some lapses in the observance of safety in clinical laboratories in Ibadan. A similar survey conducted among British laboratories 20 years ago [10] reported several unsafe practices. It is probable that safety standards in laboratories in developing countries today are comparable if not worse than those reported then.

In this survey, 41% of respondents indicated that they ate or drank in the laboratory. The lack of facilities for safe practice is sometimes responsible for unsafe practices. Four out of 10 laboratories did not have separate facilities for eating. The lack of facilities such as protective equipment like goggles, face shields and devices such as pipette aids is a common problem in many laboratories. While the usefulness of white coats and gloves is easily recognised by both employers and employees, the procurement of other safety devices is not regarded as a priority. None of the respondents reported the use of goggles, face shields or masks in the course of their work. The commonest health problem reported by laboratory staff was low backache. The lack of back support in the

design of common laboratory stools is contributory to the occurrence of this problem.

Immunisation coverage for tuberculosis and tetanus were within reasonable limits. As immunisation against tuberculosis is given only to heaf negative persons, the coverage of 51% is not an indicator of the number staff protected. However, immunisation coverage for hepatitis B was very poor. This gives cause for concern as hepatitis B is endemic in the general population. At a cost of about \$12 for a full course, this vaccine is not affordable for healthcare staff even in the best government establishments. There is a need to reduce the cost price of this vaccine to make it widely available to laboratory and clinical staff at risk in endemic countries.

The perception of hazard among the staff differed according to job description. More junior staff than senior considered that chemicals were the most hazardous agents in laboratory practice. This is probably because their work involves the preparation of chemical solutions and other media for processing specimens and the washing up of sample bottles after use. On the whole, 63% of laboratory staff indicated that biological organisms constitute the greatest hazard in laboratory practice. Safety in the handling of microorganisms is a major concern among laboratory staff [11] and other healthcare workers [12]. This issue needs to be addressed in formal training sessions.

Safety training efforts have increased in recent years as shown by the fact that a larger percentage of staff employed within the last 10 years indicated that they had formal safety training compared to staff employed over 10 years ago. There is a need for formal safety training especially among less educated junior staff whose work usually involve the handling of clinical waste.

Safety policies, where present, were scanty. Wearing of white coats was included in the safety code in 5 out of 7 laboratories with safety codes. Hazard labels were in use in 4 laboratories, but these were appended to specimens on reaching the laboratory. Although the use of hazard labels offers limited protection for workers, the absence of such labels is an indication of poor safety consciousness unless it can be shown that all samples are treated as high risk. The absence of accident records is a reflection of the lack of enthusiasm for safety issues. Four out of 5 accidents were not reported to the appropriate authorities. Non-reporting of accidents by healthcare staff has been observed in other studies [13,14]. The use of accident records and the investigation of occupational accidents are known to improve safety awareness [15] and also motivate personnel to take the correct action after the event. Safety policies and accident records are stipulated in the safety guidelines for laboratory staff issued by the Federal Ministry of Health [4]. These guidelines need to be enforced at departmental and institutional levels. However, the lack of enforcement of safety regulations in Nigeria is not peculiar to the healthcare sector.

These findings suggest that laboratory practice in these clinical laboratories is unsafe. The consequences of unsafe practices in hospitals in the developing world has been highlighted by other investigators [8]. There is a need for training seminars for all cadres of laboratory staff. Provisions for basic safety equipment such as gloves, goggles, face shields and pipette aids should be a priority

in health sector budgets. Impenetrable waste disposal facilities for sharps should be designed and constructed locally to minimise the transmission of infection through accidental inoculation. International agencies funding disease control programmes in developing countries should focus attention on and allocate funds to promote and protect the health and safety of healthcare workers.

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