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Awareness and Knowledge of Laboratory Acquired Infections Among Private Medical Laboratory Workers Across Local Government Areas of Lagos State, NigeriaAdejumo, B.I.G.*¹, Unachukwu, G.I.¹, Okungbowa, M.A.¹, Dimkpa, U.² and Adebowale, O.M.³

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Abstract

Acquired infections occupy a significant position among all the occupationally acquired infections worldwide. Awareness, nature and mode of acquiring these infections will help both the private medical laboratory workers and policy makers on preventive measures towards reducing these infections. This aim of this study is to determine the level of awareness and knowledge of infections among the private medical laboratory workers in Lagos State, Nigeria. A total of 164 participants, aged between 15-60 years enrolled for this study. They comprised of 67 males and 97 females. The level of awareness and knowledge was determined using questionnaires and other statistical instruments. Majority of the respondents had good awareness and knowledge of infections (97.6%), routes of infections (77.4%), safety symbols (59.8%) and safe laboratory procedures (43.3%). The overall mean score of knowledge of infections (9.59) and routes of infections (6.60) were rated as good, while those of safety symbols (4.99) and safe laboratory procedures (4.62%) were rated as fair. The level of awareness and knowledge of laboratory acquired infections is high in this study. However, there is need for government and all the stakeholders in the health sector to be involved in training and retraining of laboratory workers so as to be current with principle of best practice that is obtainable worldwide.

Keywords: Infections, Awareness, Knowledge, Medical Laboratory.

Introduction

According to Udoh (2014), the medical laboratory is a dangerous place to work because majority of the samples sent from patients to the laboratory contain harmful and infective agents capable of infecting other people that come across them. Large dose of specimens of sufferers of infections such as hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV (Izegbu *et al.*, 2006; Odusanya, 2003; Nwanisi and Olatunji, 1999) as well as tuberculosis (TB), typhoid fever and other enteric pathogen; staphylococcus, other parasitic infections (Leyten *et al.*, 2006; Wagenworf *et al.*, 2006) are being exposed to laboratory workers daily.

Entry, development and multiplication of infectious agents such as bacteria, fungi and virus into the healthy body of man and animals (Alakija, 2000) or an intentional causing of a disease in people, animals and plants by introduction of germs, air, water, clothing and insects can be described as an infection (The World Dictionary, 2007). Laboratory acquired infection mainly comes from cross infection and are often transmitted by contact of aerosols (air borne droplets), from snap - closing specimen containers, pipetting or dispensing infection fluids and centrifuging infectious materials from open centrifuge spillage of infectious fluid (A1 - Dwain, 2007). Pathogens can also gain entry into the body through needle puncture, cuts, scratches, insect bites, sores or other open skin lesions (Cheessbrough, 2005).

Documented reports have shown that the prevalence of laboratory-acquired infections is

more often related to the non-compliance to universal precautions and standard practice (Izegbu, 2006; Lunding *et al.*, 1998; Adebamowo and Ajuwon, 1997), poor perception of the risk of infection (Izegbu, 2006; Odunsanya, 2003) and lack of infectious control awareness among health care workers Abubakar (2007), which are common in sub-Saharan Africa and developing countries, including Nigeria (Sadoh *et al.*, 2006).

To the best of our knowledge, there is no documentary evidence of any research carried out on the awareness and knowledge of infections among the staff of private medical laboratories in Lagos state in particular and Nigeria in general. The relevance of this study therefore cannot be overemphasized since non-compliance to infection control procedure has been shown to place Nigerian health care workers at significant health risk (Brusa Ferro *et al.*, 1997) and can be attributable to lack of knowledge and awareness of these infections. Apart from reducing and preventing infections among workers, the knowledge of compliance of infection control would reduce the cost of hospital bills spent by the infected workers. The aim of this study is to understand the level of awareness and knowledge of laboratory acquired infections among the private medical laboratory workers across the local government areas of Lagos state and to relate the result of the data generated to the control and management of these infections in this region.

Methodology

Study population

A total of 164 participants, aged between 15-60 years enrolled for this study. They comprised of 67 males and 97 females. The participants were randomly selected from medical laboratories across the local government areas of Lagos. Each participant signed an informed consent after explaining the study protocol. A structured questionnaire was administered to each participant to obtain their demographic information. The study was approved by Ethics and research committee of the Institutional Review Board (IRB) of The Nigerian Institute of Medical Research (NIMR) Yaba, and Guild of Medical Laboratory Directors of Lagos state.

The study utilized a pre – tested 24 items questionnaire to obtain information about awareness and knowledge of infections. The questionnaire was pre – tested in a sample (N = 25) of participants in three of the selected medical laboratories and necessary adjustments were made to suit the study aims and objectives. The section A of the questionnaire provided information on the demographic characteristics of the participants, including age, gender, marital status, occupation and level of education of the participants. Section B of the questionnaire contained 5 items with specific questions about awareness and knowledge of different infections that can be acquired in the laboratory, laboratory caution signs, eating in the laboratory, and route of acquiring infections in the laboratory. A thorough review of the entire questionnaire was done by senior research colleagues to ascertain its validity.

Data Analysis

Categorical data were expressed as percentages. Data for age of participants was expressed as mean \pm standard deviation. Correlation analysis involving non- parametric variables was done using Spearman's Rank Order Correlation test. The test of association between socio-demographic factors were done using Chi square test. The test of statistical significance was set at $p < 0.05$. SPSS/IBM Statistical Software (version 20.0) was used to carry out all statistical analysis.

Results

Table 1 summarizes the demographic characteristics of the study population. A total of 164 respondents participated in the study. Majority (49.4%) of the participants were from the age group 20-29 years, followed by those aged 30-39 years (19.5%), 40-49 years (14.6%) and 15-19 years (8.5%). The mean age (\pm SD) of the study population was 33.5 ± 12.98 years. The females had greater percentage (59.1%) of the study population while the percentage of the males was 40.9%. A greater percentage (60.4%) of the participants were single, followed by those who were married (37.8%), while those separated from their spouses constituted the lowest percentage (1.8%). The lab scientist constituted a greater percentage (35.4%) of the

study population, while the nurses and messengers had the smallest percentage (1.2%). Majority (36.6%) of the respondents were those with 1-4 years of job experience, while those with 10-14 years of experience constituted the least percentage (5.5%) of the participants. Greater percentage (57.3%) of the participants

had tertiary education, while those with secondary education constituted the smallest percentage (16.5%) of the study population. Majority of the respondents were staff of diagnostic labs (45.1%), followed by medical labs (34.1%), while staff from routine check labs were the lowest (1.2%).

Table 1. Demographic and clinical characteristics of the study population

Characteristics of Respondents		Frequency	Percent
Age Groups (Years)	15-19	14	8.5
	20-29	81	49.4
	30-39	32	19.5
	40-49	24	14.6
	50-59	8	4.9
	≥60	5	3.0
Gender	Females	97	59.1
	Males	67	40.9
Marital Status	Married	62	37.8
	Single	99	60.4
	Separated	3	1.8
Staff Cadre	Lab. Scientists	58	35.4
	Lab Technicians	37	22.6
	Data Processors	6	3.7
	Lab Assistants	12	7.3
	Nurses	2	1.2
	Receptionists	33	20.1
	Safety Officers	8	4.9
	Messengers	2	1.2
	Cleaners	6	3.7
	Work Experience	<1	45
1-4		60	36.6
5-9		26	15.9
10-14		9	5.5
≥ 15		24	14.6
Educational Status	Secondary	27	16.5
	Tertiary	94	57.3
	Post-Graduate	43	26.2
Test Before Employment	Yes	81	49.4
	No	25	15.2
	Silent	55	33.5
	Post-Employment Testing	3	1.8
Type of Laboratory	No Response	16	9.8
	Diagnostic Lab	74	45.1
	Medical Lab	56	34.1
	Medical/ Diagnostic Labs	4	2.4
	Reference	6	3.7
	Research	6	3.7
	Routine	2	1.2

Table 2: Assessment of Respondents' Knowledge of Infections That Can Be Contacted in the Laboratory

Rating of Knowledge	Knowledge Score Range	Number of Respondents	Percentage	Mean Score	Standard Deviation
Poor	0-3	0	0	0	-
Fair	4-7	4	2.4	5.5	1.0
Good	8-10	160	97.6	9.70	0.71
Overall	0-10	164	100	9.59	0.97

Note: Score = 2, if response to knowledge of infections (hepatitis B, hepatitis C, HIV, and tuberculosis is 'Yes' and zero if the response is 'No'. Score = 2, if the response to the question 'no infection can be contacted in the Lab' is 'False' and zero if the response is 'True'.

The data on knowledge of infections indicated that majority of the respondents were aware that Hepatitis B virus (98.2%), HIV (97.6%), Hepatitis C (94.5%), and Tuberculosis (91.5%) can be contacted in the laboratories. Majority (98.2%) of the respondents also indicated that the statement 'no infection can be contacted in the laboratory' is false. Of the 164 participants, in the study, data indicated that majority (97.6%)

had good knowledge of infections, 2.4% had fair knowledge and none (0%) had poor knowledge of infections contactable in medical laboratories (Table 2). The mean scores \pm SD of the different levels of knowledge is also shown in the table. The overall mean score of knowledge of infections by the respondents (9.59) is rated as good.

Table 3: Assessment of Respondents' Knowledge of Possible Routes of Infection in the Laboratory

Rating of Knowledge	Knowledge Score Range	Number of Respondents	Percentage	Mean Score	Standard Deviation
Poor	0-2	17	10.4	1.0	1.0
Fair	3-5	20	12.2	4.10	0.78
Good	6-8	127	77.4	7.74	0.97
Overall	0-8	164	100	6.60	2.44

Note: Score = 1, if response to knowledge of any of the 8 possible routes of infection is 'Yes' and zero if the response is 'No'.

Table 3 shows the assessment of respondent's knowledge of possible routes of infection in the laboratory. Data indicates that majority of the respondents were aware that; needle prick injury (98.2%); mouth pipetting (97.6%); eating, drinking, smoking in the Laboratory (96.3%); inhalation of infections aerosols (86.6%); contamination of open wound (85.4%); not using personal protective equipment (PPE) (85.4%); handling phone while working on samples (73.2%); spending time with patients

(51.8%) were different routes of infections in the laboratory. Majority (77.4%) of the respondents had good knowledge of the routes of infections, 12.2% indicated fair knowledge, while 10.4% showed poor knowledge of routes of infection in medical labs (Table 3). The mean scores \pm SD of the level of knowledge of routes of infections in the laboratories is shown in the Table. The overall mean knowledge score of possible routes of infection (6.60) is rated as good.

Table 4. Assessment of the knowledge of safety symbols of private medical laboratory staff in Lagos metropolis

Rating of Knowledge	Knowledge Score Range	Number of Respondents	Percentage	Mean Score	Standard Deviation
Poor	0-2	42	25.6	0.28	0.61
Fair	3-5	24	14.6	4.75	0.44
Good	6-8	98	59.8	7.09	0.81
Overall	0-8	164	100	4.99	2.99

Note: Score = 1, if response to knowledge of any of the 8 safety symbols is 'Yes' and zero if the response is 'No'.

Data of the knowledge of safety symbols of private medical laboratory staff in Lagos metropolis indicated that most of the respondents had knowledge of safety symbols such as; Wash your hands (98.2%); No smoking (97.6%); Put on your lab coat (97.6%); No eating or drinking (96.3%); No phone calls (96.3%); No mouth pipetting of chemicals (85.4%) and Toxic danger (85.4%). In contrast a low percentage (30.5%) of the respondents had knowledge of the

safety symbol 'No entry'. In Table 4, majority (59.8%) of the respondents had good knowledge of the safety symbols, followed by those with poor knowledge (25.6%), while 14.6% indicated fair knowledge of the safety symbols in medical labs (Table 4). The mean scores \pm SD of the level of knowledge of the safety symbols is shown in the Table. The overall mean knowledge score of the safety symbols (4.99) is rated as fair.

Table 5. Assessment of respondents' knowledge of safe laboratory procedures

Rating of Knowledge	Knowledge Score Range	Number of Respondents	Percentage	Mean Score	Standard Deviation
Poor	0-2	24	14.6	0.66	0.86
Fair	3-5	69	42.1	4.14	0.79
Good	6-8	71	43.3	6.43	0.49
Overall	0-8	164	100	4.62	2.07

Note: Score = 1, if response to knowledge of any of the 8 safe laboratory procedures is 'Yes' and zero if the response is 'No'.

Data for the knowledge of safe laboratory procedures indicated that most of the respondents have knowledge of safe laboratory procedures such as; Daily Cleaning with Hypochlorite (98.8%); Adequate Ventilation (97.6%); Smooth Flooring/Proper Lighting (96.3%); Careful Working (91.5%). In contrast, a low percentage of the respondents agreed that; Non-Use of Inoculating Chamber for culture (14.6%); Broom-Dry Sweeping Laboratory Floor (13.4%); Re-Use of Gloves (8.5%) and Open Bucket Centrifugation (1.6%) were safe laboratory procedures. Furthermore, majority (43.3%) of the respondents had good knowledge of the safe laboratory procedures, followed by those with fair knowledge (42.1%), while 14.6%

indicated poor knowledge of safe laboratory procedures in medical labs (Table 5). The mean scores \pm SD of the level of knowledge of safe laboratory procedures is shown in the Table. The overall mean knowledge score of the safe laboratory procedures (4.62) is rated as fair.

Discussion

Literatures have confirmed that awareness and knowledge of infections go a long way in preventing laboratory acquired infections and improve the outcome of laboratory experiments. The current work therefore examines the level of awareness and knowledge of laboratory acquired infections among the private laboratory workers across the local government areas of Lagos State.

This study showed that majority (97.6%) of the laboratory staff in Lagos had good knowledge of the risk of infections (HBV, HCV, HIV, tuberculosis) in medical laboratories. This finding is comparable to a high level of awareness reported in a previous study (Sagoe 2001) and much better than the level that was reported in another study Iiyasu (2016) among healthcare workers in North-Western Nigeria. The high level of knowledge of the risk of infections may be due to the high level of literacy among the participants, since majority (57.3%) had tertiary education, followed by those with post graduate degree.

To the best of our knowledge, no previous study has assessed the level of knowledge or awareness of routes of infections acquired from medical laboratories. It is established that the most common routes of infection are inhalation (particularly by aerosols), percutaneous inoculation (needlestick injuries, broken glass injury, and/or animal bites or scratches), direct contact between contaminated surfaces (gloves, hands), and mucous membranes as well as through ingestion – for example by smoking, eating, or accidental aspiration through a pipette (Kozajda *et al.*, 2013; Traxler *et al.*, 2013). Since hazardous agents can be transmitted in the laboratory by inhalation, inoculation, or through the skin, among others, it is quite imperative for laboratory staff to know the routes through which these agents are transmitted. Such knowledge will help reduce the potential risks these agents pose to the health of laboratory workers. In this study a greater percentage of the respondents agreed that needle prick injury (98.2%); mouth pipetting (97.6%); eating, drinking, smoking in the laboratory (96.3%); inhalation of infections by aerosols (86.6%); contamination of open wound (85.4%); not using PPE (85.4%); handling phone while working on samples (73.2%); and spending time with patients (51.8%) were different routes of infections in medical laboratories. Overall, the mean score of the respondents' knowledge of possible routes of infection in medical laboratories was rated as good and majority (77.4%) of the respondents had good knowledge of these routes of infections. The high level of awareness of the routes of infections recorded by

the medical laboratory workers in this study may be due to the continuous professional development programs being organized from time to time as a way of retraining and updating the workers knowledge by federal government agencies.

There is paucity of information on the knowledge of laboratory safety among medical laboratory staff in Nigeria. A safety-conscious staff, well informed about the recognition and control of laboratory hazards, is key to the prevention of laboratory acquired infections, incidents and accidents (Goswami *et al.*, 2011). We assessed the laboratory staff familiarity and understanding of chemical hazard warning signs. Frequency distribution of participants' responses indicated that majority agreed they had the knowledge of wash your hand (97.2%), no smoking (97.6%), put on your laboratory coat (97.6%), no eating or drinking (96.3%), no phone calls (96.3%), no mouth pipetting of chemicals (85.4%) and toxic danger (85.4%) symbols. In contrast a low percentage (30.5%) of respondents had knowledge of the symbol 'No entry'. Our data further indicated that the majority of staff (59.8%) demonstrated having good level of knowledge of the safety symbols. However, the overall mean knowledge score of the safety symbols by the lab workers was rated as fair. The present finding is comparable to a previous study by Alzyoud *et al.* (2019). The overall fair level of knowledge may be attributed to improvement in the day to day advocacy being canvassed by the government and all the stake holders in health sector on the dangers posed by laboratory hazards on health workers.

Furthermore, our study indicated that medical laboratory workers were aware of, and knowledgeable of safe laboratory procedures such as; Daily Cleaning with Hypochlorite (98.8%); Adequate Ventilation (97.6%); Smooth Flooring/Proper Lighting (96.3%); Careful Working (91.5%). In contrast, a low percentage of the respondents agreed that; Non-Use of Inoculating Chamber for culture (14.6%); Broom-Dry Sweeping Laboratory Floor (13.4%); Re-Use of Gloves (8.5%); and Open Bucket Centrifugation (1.6%) were safe laboratory procedures. The overall mean

knowledge score of the safe laboratory procedures was rated as fair, but majority (43.3%) of the respondents had good knowledge of the safe laboratory procedures, followed by those with fair knowledge (42.1%), while 14.6% indicated poor knowledge. A previous study Fadeyi *et al.* (2011) has reported poor awareness of safety procedures among laboratory personnel in Nigeria. The overall fair knowledge of safety procedures by medical laboratory workers in Lagos, Nigeria may be a result of high level of advocacy and continuing education, training and re-training programs that the Federal Government through its agencies had embarked on in recent years to reach out to the populace on the dangers of laboratory acquired infections.

Conclusion

Overall, the present study indicated a high to fair awareness and knowledge of laboratory acquired infections among medical laboratory staff in Lagos state, Nigeria. This finding may be attributed to the high level of advocacy embarked by the Federal Government through its agencies in recent years to reach out to the populace on the dangers of laboratory acquired infections. However, there will be need for government and all the stakeholders in health sectors to be involved in training and retraining of these laboratory workers so as to be acquainted with the principles of best practice that is obtainable worldwide.

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Conflicts of interest

None

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