International Journal of Community Medicine and Public Health
Mukiti AM et al. Int J Community Med Public Health. 2025 Mar;12(3):1181-1190
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20250597

Original Research Article

Compliance with occupational safety and health practice among medical laboratory staff at Kenyatta National Hospital, Nairobi city county, Kenya

Augustine Mutisya Mukiti[1]*, Peterson Warutere[2], Scholastica Mathenge[3]

[1]Department of Hematology and Blood Transfusion, Kenyatta National Hospital, Nairobi, Kenya
[2]Department of Occupational Safety and Health, Kenyatta University, Nairobi, Kenya
[3]Department of Human Pathology, Kenyatta University, Nairobi, Kenya

Received: 22 August 2024
Revised: 20 January 2025
Accepted: 21 January 2025

***Correspondence:**
Dr. Augustine Mutisya Mukiti,
E-mail: mutisya204@gmail.com

ABSTRACT

Background: This study sought to assess compliance with occupational safety and health among medical laboratory workers in Kenyatta national hospital in Nairobi city county, Kenya. The study focused on potential hazards, occupational safety and health compliance and health system factors associated with compliance to occupational safety and health among medical laboratory workers.
Methods: The study used analytical cross-sectional design. The study used a sample size of 148 respondents. Data was collected using semi-structured questionnaires and key informant interview schedules. Descriptive data was analyzed using statistical package for social sciences version 25.0 with the aid of Microsoft excel program to generate frequency tables. The study employed chi-square tests to establish the association between study variables.
Results: The findings showed that there was association between years worked and exposure to biological hazards (χ^2 (1) = 4.167, p<0.05) respectively. There was no association with age, (χ2 (2) = 8.001, p<0.05), education level, (χ^2 (1) = 8.06, p<0.05) and years worked (χ^2 (2) = 9.248, p<0.05) and exposure to physical hazards. Staff workload was significant factor influencing compliance (χ^2 = 155.376, p<0.001), and significant relationship between the provision of personal protective equipment and occupational safety and health compliance (χ^2 = 155.030, p<0.001).
Conclusions: The hospital has made significant efforts in implementing various health and safety programs which can be adopted across different departments. This includes programs such as safety audit, safety trainings and occupational health surveillance.

Keywords: Compliance, Health practice, Medical laboratory staff, Occupational safety

INTRODUCTION

Joint estimates by world health organization (WHO) and international labor organization (ILO) on work-related burden of disease and injury show that about two million deaths globally occur as a result of work-related causes.[1] The health sector in particular also experiences a piece of the occupational health-related burden of disease and injury due to workplace hazard and exposure. Health care workers (HCWS) are potentially exposed to infectious materials as corporal fluids and contaminated medical devices and surfaces.[2] They include physicians, paramedics, nurses, dentists, laboratory scientists, students and assistants whose role is related directly with health care. The hospital environment presents healthcare employees with various occupational hazards. Each year about three million healthcare workers experience

percutaneous exposure to body fluids and blood borne pathogens.[3]

Medical laboratory staff are confronted with numerous occupational health and safety hazards.[4] The hazards faced may be physical, chemical, biological ergonomic and psychosocial. Mainly, the hazards and risks exposed to the workers include spills, exposures to infectious human body fluids, cuts arising from sharp objects, needle stick injuries, chemical agents, carcinogenic agents, infectious agents, musculoskeletal disorders (MSD), latex allergies, violence, stress, centrifuge accidents among others.[5] Safety in the laboratory settings can be enhanced through practicing good laboratory practices and also use of proper safety equipment.[6]

Inexplicably, huge number of work-related mortalities occur among employees in South-East Asia, western pacific, and Africa. The work-related disease burden is probably substantively larger due to loss of heath to various other occupational risk features. Further, consequences of covid-19 pandemic added another aspect to this burden with many laboratory staff contracting the virus with a significant number losing their lives.[7] In sub-Saharan Africa, sharps and injuries contribute to the highest cases of occupational accidents among healthcare workers at 30%, and 2.5% rate of other pathogenic related causes such as hepatitis B virus, salmonellosis, and brucellosis.[8] Poor safety regulations compliance and standards in hospital laboratories poses higher risks of microbial, chemical, and physical hazard. This is a significant challenge on compliance with occupational safety and health (OSH) practices among medical laboratory staff.

Kenya has witnessed a growing number of laboratory facilities due to demand in medical testing and a growing number of health facilities and clinics. A study in Kajiado County on occupational health and safety in laboratories reveals a low level of compliance to safe practices.[9] The Kenya occupational health and safety act (OSHA) is an act of parliament to secure the safety, health, and welfare of people at work and those not at work from risks arising from or in connection with the activities of persons at work.

Work-related diseases and injuries strain health systems, reduce productivity and can have a catastrophic impact on household incomes.[10] Compliance with occupational health and safety practices among medical laboratory staff is of critical importance in promoting the health, safety, and wellbeing of the workers.

Medical laboratory staff are exposed to a variety of hazards that can be directly caused by the equipment used and procedures they perform. The dangers associated with non-compliance to the laid down occupational health and safety practices include direct illnesses, accidents, and even death.[11]

Medical laboratory workers are at an increased risk of infection due to blood-borne pathogens than the general population. Exposure to blood-borne pathogens is likely to cause hepatitis B virus, hepatitis C virus and HIV/AIDS.[12] Exposure to airborne pathogens in the laboratory setup is possible as a result of procedures handled such as sputum samples which will lead to tuberculosis and flu.[13] Chemical exposures is possible in laboratory setups such as formaldehyde used in the preservation of specimens for pathology, ethylene oxide, glutaraldehyde, and peracetic acid used for sterilization.[14]

The laboratory environment presents ergonomic risks such as awkward postures which are likely to cause musculoskeletal disorders among workers.[15] Further, medical laboratory workers are at an increased risk of psychological related effects due to stress as a result of long working hours, trauma in handling sick patients when collecting samples, and also physical, mental, and emotional abuse when handling patients who can be violent or verbally abusive.

At KNH, medical laboratory staff are exposed to accidental contact with biological wastes, chemical fumes, noise from equipment use, heavy workload and insufficient training on safety and health at work place. To evaluate the factors associated with compliance to occupational safety and health practice among medical laboratory staff in Kenyatta national hospital in Nairobi city county, Kenya. The study was guided by the following objectives: 1) To identify the potential occupational exposure hazards associated with medical laboratory staff at Kenyatta national hospital in Nairobi City County, 2) To determine the level of compliance with occupational safety and health practice among medical laboratory staff in Kenyatta national hospital in Nairobi City County, 3) To assess health system factors associated with compliance to occupational safety and health practice among medical laboratory staff in Kenyatta national hospital in Nairobi City County.

METHODS

The study adopted an analytical cross-sectional design. The study was conducted in Kenyatta National Hospital which is the largest teaching and referral hospital in east and central Africa. There are 10 laboratories for carrying out diagnostic tests for patient samples ranging from histology, blood transfusion unit, hematology, parasitology, microbiology, CCC lab, ICU lab, KPCC lab, biochemistry lab and immunology lab. The study population comprised of medical laboratory staff working in Kenyatta national hospital.

The study included medical laboratory staff who had worked at Kenyatta National Hospital (KNH) for at least one year and those who consented to participate and excluded medical laboratory staff who were on leave during the data collection period.

The sample size was calculated using Fisher's formula for populations larger than 10,000 and then adjusted for a population less than 10,000 using Cochran's correction formula. The sample size for this study was determined to be 140 participants, with an additional 10% added to account for attrition, resulting in a total of 154 participants. The study used a proportionate sampling technique across various medical laboratories at KNH

Data collection was done using semi-structured questionnaires and key informant interview (KII) guides. The study was done in four months (May 2024 to August 2024). Data was cleaned, coded and entered into Microsoft excel to ensure consistency and completeness. Management of was done with the aid of statistical package for social sciences (SPSS) version 22.0. Descriptive data was presented as percentages, charts, frequency tables and graphs. Inferential statistics was done using chi-square tests calculated at 95% confidence interval and a margin of error of 0.05 to determine the association between variables. Qualitative data from KIIS was triangulated with quantitative data as direct quotes.

The researcher sought approval and authorization from Kenyatta university graduate school, obtained an ethical clearance from Kenyatta national hospital-university of Nairobi ethics and review committee (KNH-UON ERC) and sought a research permit from the national council for science, technology, and innovation (NACOSTI). The researcher also sought research authorization from KNH management and the respective medical laboratory departments before data collection. The respondents were required to consent before study participation. Privacy and confidentiality for data obtained was observed. Study results were disseminated through publication of research findings in appropriate journals for reference and also sharing the research findings with Kenyatta university graduate school and KNH research department.

RESULTS

A total of 154 questionnaires were issued. Six of the questionnaires were not returned for analysis. Only 148 questionnaires were correctly filled representing 96% response rate. The 148 is higher than the minimum sample size of 140 hence the requirement on sample size is met.

Socio demographic characteristics of the study respondents

The analysis showed that, 87(58.8%) of the respondents were male and 61 (41.2%) were female. More than half, 82 (53.25%) of the respondents were aged between 41 and 50 years, 18 (11.69%) were aged between 21 and 30 years while 23 (14.94%) were aged between 50 to 60 years. In assessing the level of education, 58 (37.7%) had a diploma level of education whereas 26 (16.88%) had higher diplomas, 61 (39.61%) had bachelor's degree and 9 (3.89%) had post graduate training. Majority, 101 (91.8%) of the respondents were employed on permanent basis. Analysis of marital status showed that 101 (65.58%) were married, 33 (22.3%) were single, 9 (5.8%) were separated 7 (4.55%) were widowed while 4 (2.60%) were divorced. The findings also showed that majority, 141 (95.56%) were Christians.

Biological hazards

The respondents, when asked about sources of biological hazards identified infectious wastes such as discarded diagnostic samples, swabs, bandages, cultures, autopsies samples, wastes from patients in isolation wards and disposable equipment. Respondents further identified pathological wastes such as human tissues, body spill fluids, sharps such as needles, syringes, scalpels as other sources of biological hazards.

The respondents further indicated that contact with these wastes were mainly accidental. The biological hazards contact was correlated against the respondents' demographics in all the laboratories and the below response was obtained. Further analysis indicated that there were significant correlations between; age and contact to infectious waste ($r = 0.566$, $p<0.05$), contact with pathological waste (-0.557, $p<0.01$); Years of experience had correlations with contact to pathological waste ($r=0.561$, $p<0.01$) and sharps contact ($r=0.542$, $p<0.01$). Among the respondents 37 representing 25% were found to have been exposed to contact with biological hazards for not putting on the necessary PPE.

This study findings are comparable with those of Ndejjo et al that focused on occupational health hazards among health staff in the city of Kampala, Uganda whose findings indicated that most of participants reported having contact with biological hazards (39.5%) as compared to 31.5% who experienced contact with non-biological hazards and also that not wearing necessary PPEs.

Biological hazards associated with occupational exposure from equipment use

In order to identify if any organisms were on the working benches, fridges, analytical machines and other working equipment's, swabs were randomly taken across the surfaces and taken for culture. These organisms are pathogenic whereby it has been observed that staphylococcus aureas and serration species cause skin and soft tissue infections. These skin infections may manifest as abscesses, furuncles or cellulitis Cladosporium is highly pathogenic since it is airborne and can cause allergies and Asthma and may also cause fungal infections in the lungs Pseudomonas aeruginosa can cause nosocomial infections and has been found to be easily spread through contaminated equipment and causes pneumonia.

Chemical hazards

Respondents were asked to state chemicals that they have been exposed to accidentally in the last one year. They stated majority of the chemicals to be a cleaning agents, disinfectants, drugs, alkalis, acids, solvents and compressed gases. The cleaning agents, disinfectants were found not having material safety data sheets while the rest had MSDS. These study findings indicated that 42.6% of the respondents handled un-marked and un-labeled chemicals at some point in their practice in the last one year, with 11.8% exposed to flammable and combustible liquids, 18.9% were exposed to corrosive chemicals while 26.7 % were exposed to oxidants.

The study established that xylene, chloroform, formaldehydes, alcohols and acids were chemicals which were mainly used in the histology laboratory and emitted vapors. Levels of these fumes were taken once on three different weeks using a vapors monitor.

Table 1: Vapours emitted from chemicals measured using vapour monitors in 8 hour shift.

Vapour	Week 1	Week 2	Week 3	Average	PELs
Xylene	105.7	104.3	107.1	105.7	100ppm
Chloroform	54.2	55.9	53.6	54.6	50ppm
Formalin	1.03	1.00	1.11	1.04	0.75ppm
Ammonia	57.0	56.8	57.4	57.1	50ppm
Nitric acid	2.9	3.1	2.8	2.9	2ppm
Sulphuric acid	1.7	2.0	2.1	1.93	1mg/m3
Absolute alcohol	1076	1073	1082	1077	1000ppm

From these results it was established that the average PELs for the vapors was above the standard OSHA levels for every 8hour shift. Whereas xylene averaged 105.7 the OSHA PEL is 100ppm, chloroform averaged 54.6ppm and PELs is 50ppm. Formalin vapors averaged 1.04 while the PELs are 0.75ppm. Continuous exposure to these vapors can cause irritation of upper respiratory track, tightness of the chest, asphyxia, asthma, wheezing, lung damage, bronchitis, cancer and emphysema.

The study also sought to establish the relationship between chemical hazards in medical laboratories at Kenyatta National hospital and education level. The results indicated that hazards related to corrosives (strong acids and bases) have no significant relationship with education level ($\chi 2 = 4.494$, df =3, $p>0.05$). Similarly, the findings show that experience of hazards related to flammable and combustible liquids and solids is not significantly related to level of education of the medical laboratory staff ($\chi 2 = 2.579$, df =3, $p>0.05$).

The study found out that 23% of respondents observed without personal protective equipment reported having been exposed to chemical hazards. In addition, the study found that not putting on PPEs was associated with vulnerability of chemical hazards ($p<0.0067$) posing a risk factor for the health workers. All laboratories surveyed had different chemicals reagents being used with 20% having chemical which were un-labelled, 31% had chemicals classified as either explosives, oxidizers or organic peroxides, 19% had corrosives, and 12% had flammable and combustible liquids and solids. This implies that all the medical laboratories had chemical hazards.

Handling un-labelled or un-marked chemicals were the main chemical hazards affecting the workers of medical laboratories (18.24%) in this study. This study findings are comparable with those that focused on surveying safety practices in oromia medical laboratories in Ethiopia that revealed that in spite of the fact that all chemicals in medical laboratories were labelled with respect to their chemical properties, it was difficult to assess who had labelled some chemicals.[16]

Physical hazards

The respondents were asked if they had encountered any form of physical injury at their work place. They indicated the major types of physical hazards as pricks 42.8%, Slips and falls at 6.5%, noise at 9.2%, ergonomic injuries at 33.6% and electric hazards at 7.9% as shown in Figure 1.

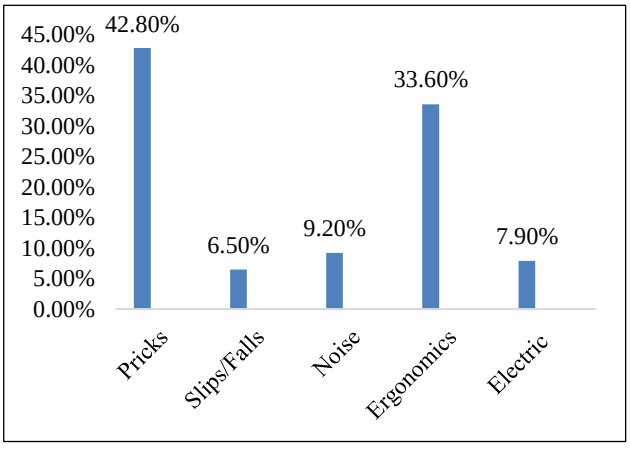

Figure 1: Physical hazards.

Using a sound level meter and noise levels were randomly taken form the laboratory equipment by placing the sound meter at a distance of 2meters from the equipment. The study found that some of the recorded levels exceeded the OELs as stipulated to occupational expected limits per 8-hour shift. From these results the high levels of noise emitted and this could result to mild, severe or total hearing loss depending on the exposure to high noise levels if mitigation measures are not put in place.

Chi-square test between physical hazards and respondent demographics

A chi square test established that there is no significant relationship between pricks from sharp objects and level of education (χ^2= 2.579, df =3, p>0.05). The study also found that exposure to ergonomics was not significant associated with education level (χ^2= 2.579, df =3, p>0.05).

Table 2: Physical hazards and education level.

		Diploma N (%)	Higher Diploma N (%)	Degree N (%)	Post graduate N (%)	Total N (%)	Chi square
Pricks from sharp objects	Yes	16 (27.6)	4 (6.9)	19 (31.1)	1 (33.3)	40 (100)	X^2=1.342 df=3 p-value=0.719
	No	42 (72.4)	22 (93.1)	42 (68.9)	2 (66.7)	108 (100.0)	
Ergonomics (e.g. repetitive motion injuries)	Yes	23 (39.7)	8 (30.8)	27 (44.3)	0 (0)	58 (100.0)	X^2=1.538 df=3 p-value=0.673
	No	35 (60.3)	18 (69.2)	43 (55.7)	3 (100)	90 (100.0)	
Electricity related hazards	Yes	7 (12.1)	3 (11.5)	14 (23)	0 (0)	24 (100.0)	X^2=0.492 df=3 p-value=0.921
	No	51 (87.9)	23 (88.5)	47 (77)	3 (100)	124 (100.0)	
Noise exposure	Yes	11 (19)	2 (8)	19 (31.2)	0 (0)	32 (100.0)	X^2=4.911 df=3 p-value=0.178
	No	47 (81)	24 (82)	42 (68.8)	3 (100)	116 (100.0)	

Further, the study found that exposure to electricity related hazards was not significantly related to the education level of the respondents (χ^2= 0.492, df =3, p>0.05). In addition, the study found that noise exposure was not significantly related to education level (χ^2= 0.492, df =3, p>0.05).

The study further found a weak negative correlation (p>0.05) between exposures to physical hazards with gender and a weak positive correlation (p>0.05) between level of education and the respondent being exposed to physical hazards. Health workers of 21-40 years had higher exposures on all forms of physical hazards reported on, though further analysis indicated a very weak correlation (p>0.05) between age and exposure to physical hazards. Years of experience had a weak negative correlation (p>0.05). These findings imply that gender, age, level of education and years of experience had a weak relationship with exposure to physical hazards.

Findings indicated that all medical laboratories workers were exposed to prolonged use of microscopes, due to lack of adjustable chairs and microscopes without affixed video cameras' which can cause problems with the neck and shoulders as well as eyestrain. The medical laboratory staff were observed to use pipettes that are thumb-operated that can lead to soreness and eventual repetitive use injury instead off trigger operated and/or electric pipette pumps.

These study findings are comparable with those of Gestal on occupational hazards in hospitals India indicating that 23% of human error accidents in the work place are avoidable and may lead directly to both external and internal burns, gaseous embolism, in form of asphyxia that is generated by electrical explosion of fire or injuries that victims suffered after collapse due to electrocution.[17]

Compliance levels among medical laboratory staff to occupational safety and health

Among the respondents, 133 (89.3%) of the respondents asserted that they comply with OSH policies and laboratory SOPs. Fifteen (10.7%) of the respondents highlighted that they were not compliant with of the OSH and laboratory standard operating procedures.

The study further sought to establish compliance levels in place to mitigate health hazards and occupational safety. The researcher dwelt on compliance levels with regard to measures put in place in the laboratories, individual staff measures, and cleanliness measures that were put in practice so as to prevent health hazards and enhance occupational safety.

According to the correlation findings in Table 3, the individual protective control measures had strong correlation with each other and that they are statistically significant at level 0.01. This means that the health workers were provided with SOPs, provided with post exposure prophylaxis, hepatitis B vaccination, and personal protective equipment and used disinfectants. This implies that the respondents were cognitive of taking necessary precautions for health and safety.

Table 3: Protective measures correlations for medical laboratory staff at Kenyatta National hospital.

		Staffs received HIV screening	Provided with post exposure prophylaxis	Provided with Hepatitis A vaccination	Provided with Hepatitis B vaccination	Provision of PPEs	Use of disinfectants
Health workers receive HIV screening	Pearson correlation	1	-0.018	0.020	-0.109	0.020	0.013
	Sig. (2-tailed)	-	0.803	0.777	0.122	0.771	0.856
	N	148					
Provided with post exposure prophylaxis	Pearson Correlation	-0.018	1	0.009	0.075	0.084	-0.016
	Sig. (2-tailed)	0.803	-	0.898	0.283	0.234	0.819
	N	148					
Provided with Hepatitis A vaccine	Pearson correlation	0.020	0.009	1	-0.047	-0.069	0.808**
	Sig. (2-tailed)	0.777	0.898	-	0.507	0.329	0.000
	N	148					
Provided with Hepatitis B vaccine	Pearson correlation	-0.109	0.075	-0.047	1	-0.040	-0.050
	Sig. (2-tailed)	0.122	0.283	0.507	-	0.565	0.479
	N	148					
Provision of PPes	Pearson correlation	0.020	0.084	-0.069	-0.040	1	-0.044
	Sig. (2-tailed)	0.771	0.234	0.329	0.565	-	0.532
	N	148					
Use of disinfectants	Pearson correlation	0.013	-0.016	0.808**	-0.050	-0.044	1
	Sig. (2-tailed)	0.856	0.819	0.000	0.479	0.532	-
	N	148					

** Correlation is significant at the 0.01 level (2-tailed)

The study found that majority of the medical laboratory staff were using hygienic hand disinfection. From the findings, 87.7% were washing hands before and after every laboratory procedure, 82.8% were washing hands after handling soiled materials, 72.5% were washing hands after handling biomaterials and other hazardous materials, 67.2% were washing hands after removing the gloves and 46% were washing hands before and after handling patients.

According to the correlation findings Table 4, the hand washing practices had strong correlation with each other and that they are statistically significant at level 0.05.

The Centre for Disease Control has published guidelines for hand hygiene. In case the hands of a person is dirty, contaminated with Proteinaeous material, body fluids or blood, the CDC do recommend that it is prudent to wash the hands with soap and clean water. Moreover, the hands can be cleansed with alcohol-based agents in case the hands were not visibly soiled.[18]

Association between respondents' social demographics and compliance with OSH in the laboratories

The analysis of association shows that there was a statistically significant association between, age, ($x2(1) = 4.02$, $p=0.041$, $p<0.05$), level of formal education, ($x2(1) = 5.001$, $p=0.001$, $p<0.05$) and years worked ($x2(2) =$

5.021, p=0.027, p<0.05) with compliance to OSH. There was no association between gender of the respondents (p=0.039), employment status, (p=0.544), marital status (p=0.472) and religion, (p=0.326) and compliance to occupational safety and health among the laboratory staff.

Table 4: Hygienic hand disinfection correlations for medical laboratory staff at Kenyatta National hospital.

		Before and after every laboratory procedure	After removing gloves	After handling soiled materials	Before and after handling patients	After handling biomaterials and other hazardous materials
Before and after every procedure	Pearson correlation	1	-0.134	0.782**	-0.078	0.608**
	Sig. (2- Tailed)	-	0.056	0.000	0.267	0.000
	N	204	204	204	204	204
After removing the gloves	Pearson correlation	-0.134	1	-0.097	-0.051	-0.103
	Sig. (2-Tailed)	0.056	-	0.169	0.465	0.144
	N	204	204	204	204	204
After handling soiled materials	Pearson correlation	0.782**	-0.097	1	-0.079	0.536**
	Sig. (2-Tailed)	0.000	0.169	-	0.259	0.000
	N	204	204	204	204	204
Before and after handling patients	Pearson correlation	-0.078	-0.051	-0.079	1	-0.010
	Sig. (2-Tailed)	0.267	0.465	0.259	-	0.883
	N	204	204	204	204	204
After handling biomaterials and other hazardous materials	Pearson correlation	0.608**	-0.103	0.536**	-0.010	1
	Sig. (2- Tailed)	0.000	0.144	0.000	0.883	-
	N	204	204	204	204	204

** Correlation is significant at the 0.01 level (2-tailed)

Table 5: Chi Square test of respondents social demographics and compliance with OSH.

Social demographic		No of staff.	Percentage (%)	Chi-square
Gender	Male	87	58.8	X^2= 4.02 P= 0.041
	Female	61	41.2	
	Total	148	100	
Age of the respondent (years)	21-30	11	7.4	X^2= 3.96 P= 0.033
	31-40	58	39.19	
	41-50	55	37.16	
	51-60	24	16.23	
	Total	148	100	
Level of education	Diploma	58	31.76	X^2= 5.001 P= 0.001
	Higher diploma	26		
	Degree	61	62.16	
	Post graduate	3	6.08	
	Total	148	100	
Marital status	Single	23	15.54	X^2= 6.530 P= 0.176
	Married	96	64.86	
	Widowed	14	9.46	
	Divorced/separated	15	10.13	
	Total	148	100	
Years worked	0-10	29	19.6	X^2= 5.021 P= 0.0027
	11-20	77	52.02	
	20 and above	42	28.38	
	Total	148	100	

Health system factors associated with OSH compliance

To achieve the third research objective, the study examined health system factors that might influence compliance with OSH practices. The analysis included factors such as the provision of personal protective equipment (PPE), staff workload, supportive supervision, adherence to guidelines and standard operating procedures (SOPS), and the availability of resources.

Staff workload

Most of the respondents (66.2%) worked for up to 45 hours and were mainly the staff on main shifts a week while 20.95% worked for less than 40 hours and were either in charges and those on straight shifts. Majority of the workers depicted fatigue and lack of enough rest in between various shifts and were always on race to complete their tasks before handing over to the next shift.

Table 6: Chi-square tests between staff workload and OSH compliance.

Chi-square tests			
	Value	**Df**	**Asymptotic significance (2-sided)**
Pearson chi-square	148.376[a]	4	.000
Likelihood ratio	12.442	4	.014
N of valid cases	148		

[a]5 cells (55.6%) have expected count less than 5. The minimum expected count is 0.01.

Staff workload is significant factor influencing compliance (χ^2 = 148.376, p<0.001).

Provision of PPEs

According to this study, gloves, white coats and facemasks were among the PPEs mainly available in the laboratories under study. Purple color-coded waste disposal bins were largely unavailable. This is contrary to OSHA which emphasizes on proper labeling and disposal of wastes. Disinfectants/sterilizers were reported available in the laboratories, hand hygiene was widely practiced.

Table 7: Chi-square tests between provision of PPE and OSH compliance.

Chi-square tests			
	Value	**Df**	**Asymptotic significance (2-sided)**
Pearson chi-square	148.030[a]	4	0.000
Likelihood ratio	12.110	4	0.017
N of valid cases	148		

[a]5 cells (55.6%) have expected count less than 5. The minimum expected count is .01

Most of the policies in place were strictly followed. Most of the laboratories had a very conducive working environment as shown in Table 7. The analysis found a statistically significant relationship between the provision of PPE and OSH compliance (χ^2 = 148.030, p<0.001).

Supportive supervision

The respondents were asked if they thought supportive supervision has an impact on OSH. Their responses were tabulated as shown in Table 8. Supportive supervision also demonstrated a statistically significant relationship with compliance (χ^2 = 148.655, p<0.001).

Table 8: Chi-square tests between supportive supervision and OSH compliance.

Chi-square tests			
	Value	**Df**	**Asymptotic significance (2-sided)**
Pearson chi-square	148.655[a]	4	0.000
Likelihood ratio	12.647	4	0.013
N of valid cases	148		

[a]7 cells (77.8%) have expected count less than 5. The minimum expected count is 0.01

Provision of related safety resources

The researcher sought to find out how safety related resources were made available by the management across all laboratories. Provision of resources also demonstrated a statistically significant relationship with compliance (χ^2 = 148.655, p<0.001).

Table 9: Chi-square tests between provision of resources and OSH compliance.

Chi-square tests			
	Value	**Df**	**Asymptotic significance (2-sided)**
Pearson chi-square	148.655[a]	4	0.000
Likelihood ratio	12.647	4	0.013
N of valid cases	148		

[a]7 cells (77.8%) have expected count less than 5. The minimum expected count is 0.01

Occupational safety and health training

The study sought to investigate occupational health trainings among the respondents. The study established that fifty-six per cent (56%) of the respondents were trained in the past three years, while 31.2% were trained within 4years and 12.8 % in over 6 years.

The results established that health workers who were not trained on occupational health hazards were more vulnerable to work-related injury/illness compared to

those who were trained. Respondents who were trained more than three years ago were equally vulnerable due to having forgotten what they learned during training. These findings are similar to those from a study in Southern India hospitals on perception and prevalence of work-related health hazards among healthcare workers in public health facilities, Senthil et al (2015), where 39% did not recognize work related hazards but reported at least one exposure to health hazard in the previous three months and despite training in handling infectious materials, HCWs reported direct skin contact with infectious materials and needle stick injuries. The longer staffs stay after training on any field the more likely they are to forget.

DISCUSSION

Krishna et al found that majority of laboratory staff were graduates.[19] Working in hospital laboratories requires technical ability and intense knowledge on testing techniques requires more focus on academic requirement Compliance with occupational health and safety practices and participation in safety promotion are key components in predicting safety outcomes. This study findings are comparable with those of Gestal et al on occupational hazards in hospitals India indicating that 23% of human error accidents in the work place are avoidable and may lead directly to both external and internal burns, gaseous embolism, in form of asphyxia that is generated by electrical explosion of fire or injuries that victims suffered after colapse after electrocution. Compliance to OSH protocols were largely high despite some workers ignoring them though, while some never knew of their existence, this led to exposure to hazards and injuries to laboratory staff, and pointed to a laxity in either new staff not being properly oriented or poor appraisal or updating of OSH safety protocols. Coggon et al found similar results where compliance to OSH protocols where not fully followed, putting the laboratory workers' safety and health at risk.[20] Compliance to standard operating procedures in laboratories is important in controlling the influence of common occupational hazards to employees while at work.

One of the noteworthy limitations pertains to the reliance on self-reported data, a methodological approach employed in data collection. While self-report surveys are valuable tools for capturing participants' perspectives and experiences, they are susceptible to response bias. Respondents may provide answers they perceive as socially desirable or withhold information on sensitive topics, potentially skewing the accuracy of the data. Consequently, the findings should be interpreted with this potential bias in mind, emphasizing the need for cautious extrapolation to broader populations and contexts. Furthermore, the issue of sample size warrants attention, particularly in the context of variables related to chemical exposure. The study encountered a small sample size for these variables, which, in turn, limited the depth and granularity of the analysis in these areas. This limitation highlights the challenge of generalizing findings based on a restricted dataset. Future research endeavors seeking to explore the intricacies of chemical hazards and their influence on OSH compliance should consider larger sample sizes to facilitate a more comprehensive examination.

CONCLUSION

In conclusion, this study enhances our understanding of compliance with occupational safety and health (OSH) practices among medical laboratory staff at Kenyatta National Hospital by identifying key factors that influence adherence. The findings highlight a generally high level of compliance, particularly in response to established OSH protocols, yet underscore the need for continuous improvement, particularly in addressing mechanical, chemical, biological, and physical hazards. Gaps in adherence to standard operating procedures, inconsistent OSH trainings, and insufficient supervision were found to affect compliance negatively. Furthermore, the study emphasizes the critical role of supportive supervision, manageable staff workloads, and the availability of resources in improving safety practices. These insights contribute to advancing knowledge on how healthcare institutions can create safer work environments for medical staff, offering practical recommendations for sustaining and enhancing OSH protocols. This research provides a foundation for future initiatives aimed at improving health system practices in occupational safety.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee of Kenyatta University /Kenyatta National Hospital

REFERENCES

1. World Health Organization. WHO/ILO joint estimates of the work-related burden of disease and injury, 2000-2016: technical report with data sources and methods. Available at: https://www.who.int/publications/i/item/9789240034945. Accessed 01 August 2024.
2. Seidelman JL, Lewis SS, Advani SD, Akinboyo IC, Epling C, Case M, et al. Universal masking is an effective strategy to flatten the severe acute respiratory coronavirus virus 2 (SARS-CoV-2) healthcare worker epidemiologic curve. Infect Contr Hosp Epidemiol. 2020;41(12):1466-7.
3. Bin-Ghouth AS, Al-Shoteri S, Mahmoud N, Musani A, Baoom NM, Al-Waleedi AA, et al. SARS-CoV-2 seroprevalence in Aden, Yemen: a population-based study. Int J Infect Dis. 2022;115:239-44.
4. Zhang JJ, Dong X, Cao YY, Yuan YD, Yang YB, Yan YQ, et al. Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China. Allergy. 2020;75(7):1730-41.

5. Alshalani AJ, Salama KF. Assessment of occupational safety practices among medical laboratory staff in Governmental Hospitals in Riyadh, Saudi Arabia. J Safe Stud. 2019;5(1):1-23.
6. Asemahagn MA. Factors determining the knowledge and prevention practice of healthcare workers towards COVID-19 in Amhara region, Ethiopia: a cross-sectional survey. Trop Medi Heal. 2020;48:1-1.
7. Amri Z, Alasmari N. Self-efficacy of Saudi English majors after the emergent transition to online learning and online assessment during the COVID-19 Pandemic. Int J Higher Educat. 2021;10(3):127-37.
8. Ndejjo R, Musinguzi G, Yu X, Buregyeya E, Musoke D, Wang JS, et al. Occupational health hazards among healthcare workers in Kampala, Uganda. J Environm Publ Heal. 2015;2015(1):913741.
9. Tait FN, Mburu C, Gikunju J. Occupational safety and health status of medical laboratories in Kajiado County, Kenya. Pan Afr Medi J. 2018;29(1):1-7.
10. Tenkate T, Adam B, Al-Rifai RH, Chou BR, Gobba F, Ivanov ID, Leppink N, et al. WHO/ILO work-related burden of disease and injury: Protocol for systematic reviews of occupational exposure to solar ultraviolet radiation and of the effect of occupational exposure to solar ultraviolet radiation on cataract. Environment Int. 2019;125:542-53.
11. Powell-Jackson T, King JJ, Makungu C, Spieker N, Woodd S, Risha P, Goodman C. Infection prevention and control compliance in Tanzanian outpatient facilities: a cross-sectional study with implications for the control of COVID-19. The Lancet Glo Heal. 2020;8(6):e780-9.
12. Che Huei L, Ya-Wen L, Chiu Ming Y, Li Chen H, Jong Yi W, Ming Hung L. Occupational health and safety hazards faced by healthcare professionals in Taiwan: A systematic review of risk factors and control strategies. SAGE Open Medi. 2020;8:2050312120918999.
13. Zhao S, Lin Q, Ran J, Musa SS, Yang G, Wang W, et al. Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak. Int J Infect Dis. 2020;92:214-7.
14. Mohammadyan M, Moosazadeh M, Borji A, Khanjani N, Rahimi Moghadam S. Investigation of occupational exposure to lead and its relation with blood lead levels in electrical solderers. Environmental monitoring and assessment. 2019;191:1-9.
15. Vaisbuch Y, Hosseini DK, Wagner A, Hirt B, Mueller M, Ponnusamy R, et al. Surgical approach for rapid and minimally traumatic recovery of human inner ear tissues from deceased organ donors. Otol Neurotol. 2022;43(4):e519-25.
16. Sewunet T, Kebede W, Wondafrash B, Workalemau B, Abebe G. Survey of safety practices among hospital laboratories in Oromia Regional State, Ethiopia. Ethiop J Heal Sci. 2014;24(4):307-10.
17. Gestal MC, Blas-Machado U, Johnson HM, Rubin LN, Dewan KK, Bryant C, et al. Disrupting Bordetella immunosuppression reveals a role for eosinophils in coordinating the adaptive immune response in the respiratory tract. Microorganisms. 2020;8(11):1808.
18. Shafiabadi Hassani N, Talakoob H, Karim H, MozafaryBazargany M, Rastad H. Cardiac magnetic resonance imaging findings in 2954 COVID-19 adult survivors: a comprehensive systematic review. J Magnet Reson Imaging. 2022;55(3):866-80.
19. Krishna A, Herd KB, Aydınoğlu NZ. A review of consumer embarrassment as a public and private emotion. J Consumer Psychol. 2019;29(3):492-516.
20. Coggon D, Harris EC, Poole J, Palmer KT. Mortality of workers exposed to ethylene oxide: extended follow up of a British cohort. Occupat Environm Medi. 2004;61(4):358-62.

Cite this article as: Mukiti AM, Warutere P, Mathenge S. Compliance with occupational safety and health practice among medical laboratory staff at Kenyatta National Hospital, Nairobi city county, Kenya. Int J Community Med Public Health 2025;12:1181-90.