

## REVIEW ARTICLE

# Review of Knowledge, Attitude, and Practice Among Laboratory Workers Towards Occupational Safety and Health

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## ABSTRACT

Laboratory workers exposed to diverse occupational exposures to accidents. Evidently, extant, yet very limited empirical underpinnings suggest that knowledge, practices and awareness of safety precautions are uncharacteristically poor among laboratory workers. As such, their demonstration of safety-related attitudes and practices have remained questionable. This paper, thus presents a systematic search of the literature on laboratory workers' safety-related knowledge, attitudes, and practices. Specifically, literature published between 2007 and 2017 that characteristically attempted to evaluate knowledge, attitudes and practices among laboratory workers on Occupational Safety and Health were reviewed. Evidently, results from the review indicate poor knowledge, attitude and practice among the laboratory workers. It is critical that strategies be put in place by the management of the health facilities to institute and undertake activities in the form of training, improved safety management practices, organizational commitment and improved safety culture.

**Keywords:** Laboratory workers, Knowledge, Attitudes, Practices, Occupational safety and health

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## INTRODUCTION

Laboratory workers are constantly subjected to health risks occasioned by their exposures to a wide range of biological, chemical and physical occupational hazards (1,2). Basically, these exposures to occupational hazards arise in the manner the laboratory workers handle and use substances during their routine work schedules (3). Characteristically, infectious agents to which laboratory workers are commonly exposed to Mycobacterium Tuberculosis, Brucella and serum hepatitis virus (4). For physical and chemical hazards, the laboratory workers are exposed to risks from chemical toxicity, needle-stick injuries, and cuts from skin-related infections and the likelihood of cancer resulting from frequent exposure to radiological waves (5). As such, taking a critical view aimed at assessing the knowledge, attitudes and practices of laboratory workers in relation to their knowledge of safety precautions vis-a-vis their routine job functions cannot be over-emphasised.

## Occupational Safety and Health (OSH) among laboratory workers

Occupational safety and health (OSH) is a subject

that encompasses numerous fields of health and safety specializations (5). Essentially, OSH focuses on promoting and maintaining optimal physical, mental and social well-being of staff in all occupational categories (6,7). For optimal compliance to OSH initiatives, both employers and employees must collaborate and be involved in the implementation of OSH programmes (8), especially those who are directed towards prevention of exposures to workplace hazards. Moreover, matters in relation to occupational medicine, industrial hygiene, toxicology, education, engineering safety, ergonomics and psychology must be keenly focused on view of their importance in ensuring improved safety at work places and especially among workers (9,10). Occupational safety issues often get more attention because occupational health issues are more difficult to determine and address (9,10).

The need to take into cognisance the knowledge, attitudes and practices of laboratory workers vis-a-vis their proclivity to exposures to workplace accidents has become of utmost important. As such, efforts directed towards preventing work place accidents by way of improving the safety-related attitudes, behaviours and practices of laboratory workers is highly encouraged (11). Extensively therefore, by preventing laboratory workers exposures to occupational hazards, safety standards and indicators in the facilities where they work would improve (11).

Relatedly, recurrent handling of infectious substances – blood and other body fluids from patients such as pus, urine, stool, sputum, secretion, or saliva, lack of working experience and failure to comply with established procedures are also some of the routes through which laboratory workers are exposed to occupational hazards with resultant injuries and illnesses (12–14). There is no doubt that this debilitating hazardous situations are likely to cause difficult and unpleasant working conditions resulting in worker absenteeism, issuance of medical certificates (MC) for sick leave occasioned by physical ailments/injuries, all of which negatively impact productivity and financial efficiency of the companies they work for (15–17). Therefore, educating HCWs on this, related menace and associated risk factors would reduce exposures to laboratory-related occupational risks.

### **Knowledge, Attitudes and Practices (KAP) among laboratory workers – Some Empirical Submissions**

Knowledge is the dimension to obtain, remember and usage information, a combination of understanding, knowledge, judgement and ability. Attitude mentions about reaction in a confident method to certain condition; to see and understand proceedings based on a specific tendencies; or to establish feelings into intelligible and unified construction. Practice means the request of instructions and knowledge that leads to action. Good practice is an art that is related to the development of knowledge and technology and is performed in an ethical manner (18).

Extant empirical underpinnings on the relationship between KAP and occupational injuries and illnesses among medical laboratory workers across diverse socio-demographic milieus does exist. For example, an empirical investigation conducted among laboratory workers in Yemen to ascertain their knowledge and practices of laboratory standard precautions (LSP) showed that the biosafety knowledge and practices by the personnel was relatively fair. This is in addition to their comparatively weak commitment to biosafety policies. The respondents of the study also noted that only a low percentage of laboratory workers received a biosafety manual and training. It is plausible to state that, lack of adequate training could have affected the workers' knowledge, attitudes and practices on biosafety training (19).

Relatedly, a cross-sectional survey was carried out to assess the awareness, attitudes and compliance with safety precautions (SP) among laboratory workers in South Western Nigeria and the University of Ilorin Teaching Hospital. It was concluded that there was awareness deficit of SP among laboratory workers and indicated that attitude and practice of safety rules were relatively satisfactory (20).

A cross-sectional study conducted for the purpose of

assessing the knowledge, awareness and adherence to OSH measures among 200 HCWs at the University Hospital of the West Indies, Jamaica. It was reported that about three-quarters of the respondents (70.8%) admitted that personal protective equipment (PPE) provided by the health organisation was inadequate (21).

Similarly, another cross-sectional KAP investigation was done in the India's Krishna Institute of Medical Science, Karad, on OHS awareness among Medical Laboratory Professionals (MLPs) working in pathology, microbiology and biochemistry departments. Results of their study showed a fair level of knowledge and attitude among their laboratory workers related to OSH (22).

In a related survey conducted among laboratory workers in India, it was found that awareness level pertaining to universal work precautions amongst the respondents of the survey was low with only 21% of them being aware of the universal work precautions. The conclusion of the study was that the knowledge, attitude, awareness, and the level at which the laboratory workers comply with universal work precautions was unsatisfactory, thus raising the urgent need for improvement (1).

Similarly, a study was done in India for the purpose of assessing the KAP among 81 paramedical staff. It was concluded that paramedical staff had adequate knowledge, and also showed similar results in terms of attitude and practice (23).

Nelbon (2010) in his cross-sectional study examined the awareness of staff regarding OSH Management in the hospitals of the Sabah Health Department in Malaysia. From the study, the author concluded that workplace OSH practice was chiefly dependent on training and competence, safety rules, work pressure and reporting of hazardous incidents(24). The author suggested the implementation of novel strategies to improve OSH management so that a better safety climate could be established in public hospitals, which would make significantly positive difference to the staff, management and patients (24).

A descriptive cross-sectional study was conducted in Iran to establish the level of knowledge, attitude and behaviour of staff towards OSH. According to the study, of the 210 employees the result indicated that 52.9% of them had low level of knowledge, 36.7% moderate, and 10.5% high level of OHS systems and policies. Furthermore, about 75.7% of the participants showed positive attitude towards OHS, 30% of them had low safety behaviour while 70% exhibited safe behaviour (25).

A cross-sectional empirical investigation was conducted to measure the KAP of Hepatitis B among laboratory workers in a public health facility in Ahmedabad, India. It was also revealed that 13.3% were exposed to infectious substances in the course of carrying out

their duties. Overall, only 35% were immunised for protection (26). This is an indication that it is critical to improve the KAP of laboratory workers on issues relating to universal safety precautions and infections prevention.

A Health and Safety survey was undertaken among laboratory workers at King Abdulaziz Medical City, Riyadh, Saudi Arabia to investigate the laboratory work environment, health and safety. The findings of the study further highlights the need for improvements in making the laboratory work environment as safe and it should be based on international health standards and practices (27).

It is the view of health care experts that needle-stick injuries is one of the common incident-related practice incident. However, irrespective that the incidence of needle stick injuries is low among laboratory workers, there is still an urgent need to have adequate and efficient occupational safety and health management systems with standard operating procedures of laboratory practice to prevent the spread of infections such as, HIV, Hepatitis B and Hepatitis C). Interestingly, research has revealed that 100,000 needle stick injuries have been noted in the United Kingdom and 500,000 in Germany each year (27,28) .

In addition, three have been recent reports of ergonomic hazards being a worrying threat to laboratory workers. True to this, George (2010) states that unusually long periods of continuous microscopic work compounded by poor physical posture at work is closely related to musculoskeletal diseases affecting pathologists and cytotechnologist(29). The study concluded that majority of the respondents knew about HPB infection, but their knowledge about the disease and protective measures still needs to be improved upon (26).

In another study conducted in Pakistan on the practices and awareness of biosafety awareness among laboratory workers, it was confirmed that the laboratory workers lacked awareness of good laboratory practices and biosafety measures. As such, the study highlights the need to training and re-training of the laboratory workers with a focus on increasing their awareness of good laboratory techniques and self-hygienic principles (30).

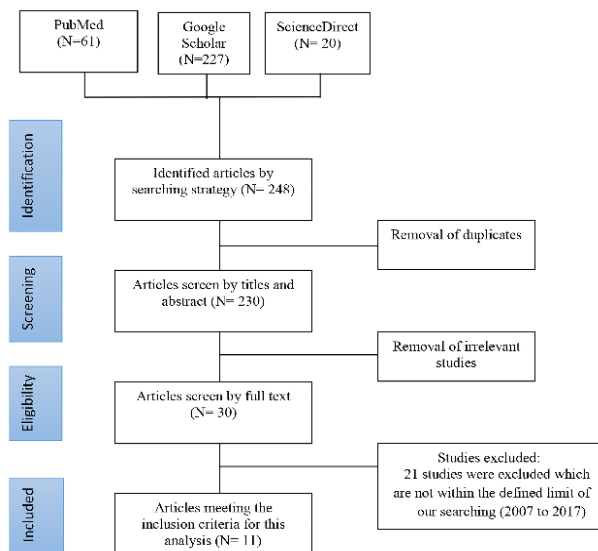
In an empirical investigation conducted to assess the knowledge, attitudes and practices of health care workers (inclusive of laboratory workers) on occupational exposures to blood-borne pathogens, a number of interesting findings were noted. Over 22.63% of the respondents have sustained needle-stick (NSI) at one time or the other. They further submitted that an education-centric approach was critical in improving the knowledge, attitudes, and practices of healthcare workers in reducing occupational exposures to injuries

and accidents(31). In a related study conducted among paramedical staff of laboratory services, it was noted that majority of the respondents knew very important issues related to Post Exposure Prophylaxis and discarding of blood samples. They noted that continuous training was key to improving the knowledge, attitudes and practices of the laboratory workers on reduction of occupationally-related injuries (23).

In all the review made above, it is evident to note that efforts need to be intensified in addressing the lack of knowledge, poor practices and deficit in the awareness of safety precautions among laboratory workers. More so, the present study is being undertaken among respondents who are mainly from a developing country with the hope that laboratory services be improved as it is in advanced economies. Thus the objective of this article is to analyses and summarize the previous studies published between 2007 and 2017 about knowledge, attitude and practice among laboratory workers toward occupational safety and health in a systematic review.

## **MATERIALS AND METHODS**

In order to identify publications to be included in this review, relevant articles related to KAP of laboratory workers on OHS were strategically searched for in PubMed (<http://www.ncbi.nlm.nih.gov/pubmed/>), Google Scholar (<http://scholar.google.com>), and ScienceDirect (<https://www.sciencedirect.com>) and EBSCO/Host literature databases to identify articles relevant to the topic of discussion on OHS. The search strategy was executed using key words such as “knowledge”, “attitude”, “practices”, “laboratory workers ” in combination with “occupational safety” and/or “occupational safety and health” published from 2007 to 2017 (for example, knowledge AND occupational safety AND attitude OR occupational health and safety. We further scanned through the references of the obtained articles to identify articles that might have been missing during inclusion. Furthermore, articles obtained were screened based on titles, abstracts, and full texts available for inclusion, without which, the articles were automatically removed. In addition to the above, the search focused on scholarly publications based on the premise that dissertations, conference and working papers have not been exposed to arduous peer-review processes and may not have been well developed, may not have been based on sound theory and experimental methods. As such, adding theory or underpinnings from such efforts in the reviews conducted might plausibly challenge the development of the field of the essence of the present paper. In addition, it should be noted that, we only included studies with clear methodology and just focused on knowledge, attitude and practice among laboratory workers. So, many researches with wide focuses were excluded. In addition, studies with unclear sample size calculation were not added to this research. Figure 1 shows the



**Figure 1: Flowchart of the study selection criteria**

flowchart of the study selection criteria.

**RESULTS**

Studies that include both international and local references which focused on knowledge, attitude and practices among laboratory workers on OSH were effectively reviewed and the summary of the results are found in Table I. The findings in Table I suggests that among laboratory workers, knowledge / awareness about OHS in relation to their jobs is relatively low. As such, their behaviours, attitudes and practices have a correlational low characteristics. It is supposed that knowledge should influence attitudes and subsequently practices. Therefore, the findings of this study should suggest means by which the knowledge of the laboratory workers can be improved, thereby improving their attitudes and practices.

In study of Al-Abhar et al., it was shown that Biosafety knowledge and practices were noted to be poor among laboratory staff. The findings underlines the need to strengthen biosafety programs and policies in laboratories in Yemen (19). In study of Wader et al., it was shown that Training on safety and health to improve attitude and practice is suggested by this study (22). In other study, by Korja & Lala, it was mentioned that Laboratory workers knew that hepatitis B is infectious and preventable but knowledge about the disease and protective measures are still needed in laboratory technicians (26). In the other study, by Zaveri et al., it was shown that the knowledge, attitude, perception, and compliance with universal work precautions amongst laboratory technicians are poor and suggested for improvement (1). In study of Goswami et al., it was concluded that paramedical persons had good knowledge, almost similar in many aspects therefore; attitude and practice percentage is also very high (23). In study of Fadeyi

et al., deficit in the awareness of SP among laboratory personnel and demonstrates that attitude and practice of safety rules are unsatisfactory (20). In study of Akhter et al., the practice amongst laboratory was not adequate (27). In study of Vaz et al., found no knowledge among participant towards occupational safety and suggested training to increase their knowledge about blood-borne pathogens and universal precautions (21). In other work done by Nasab et al., it was mentioned that Educational interventions should design by managers and implement to promote knowledge, attitude and safe personnel (25). In another study by Nasim et al., confirmation of a lack of awareness regarding good lab practices and biosafety measures among lab technicians in Karachi, Pakistan (30). Finally, in study of Kashyap & Gupta, it was shown that An education-centric approach and a comprehensive infection control protocol with strict compliance with the practices within the healthcare system is needed (31)

**DISCUSSION**

Management of medical laboratories should emphasize the need for achieving the fundamental safety goal of reducing accidents and injuries. However, a comprehensive knowledge of risks and practical measures in ensuring the above has to be taken into cognizance(32). Despite the fact that the laboratory workers had some form of knowledge about safety precautions in their workplaces, there were noticeable disparities in their attitudes and practices.

In a study done in Nigeria, findings showed 41% lack awareness and 25% do not adhere to SP. However, in terms of the availability of safety devices and equipment, the researchers found that hand gloves (86%), disinfectants (84%), HBV immunisation (46%) and post-exposure prophylaxis (PEP) for HIV and HBV (80%) were available. Results from the study also indicates that the respondents’ attitude towards safety was quite worrisome. Evidently, 60.0% of the respondents consume food, drinks and other edibles while working in the laboratory. 51% were lax when recapping needles and use of sharps box was 57%. Despite that 83% of the respondents agree to the importance of only 1.5% present themselves in the event of a laboratory injury (20). In a cross sectional study done in Jamaica, results indicate that 57 (28.5%) of the staff reportedly had no knowledge of general occupational safety and health policies. Similarly, 15 (7.5%) respondents had low level of knowledge of OSH policies and almost two-thirds (64.0%) of respondents had high level of knowledge about OHS (20).

In another study done in India, results from the survey indicate that of the 19 respondents reached in the survey, 50% from pathology department had moderate knowledge of OSH awareness, while 50% had high knowledge. However, results from the biochemistry

**Table 1: Laboratory workers' knowledge, attitudes and practices of occupational safety and health (N=11 studies)**

Year of Publication and Journal	Author	Knowledge	Attitudes/Practices	Summary
2017, Applied Biosafety	Al-Abhar et al. (19)	Overall, 38% of respondents had good knowledge of LSP, 49% had fair knowledge, and 13% had poor knowledge.	32% of respondents had good practice in LSP; 59% had fair practice level, and 9% had poor practice level.	Biosafety knowledge and practices were noted to be poor among laboratory staff. The findings underlines the need to strengthen biosafety programs and policies in laboratories in Yemen.
2013, International Journal of Health Science Research	Wader et al. (22)	Knowledge of laboratory workers in pathology (50%) was at a moderate level.  In biochemistry, 25% had moderate level.  In microbiology all of them had high knowledge.	<b>Attitude</b> , only in microbiology 100% had positive attitude.  <b>Practice</b> , in pathology 16.7% had poor, 66.7% had fair and 16.7% had good level of practice.	Training on safety and health to improve attitude and practice is suggested by this study.
2012, Health Line	Koria & Lala (26)	67% knew that hepatitis B is an infectious disease and 88% believed that infected blood could spread the disease.	87% were wearing gloves and taking precaution while handling the sample.	Laboratory workers knew that hepatitis B is infectious and preventable but knowledge about the disease and protective measures are still needed in laboratory technicians.
2012, National journal of medical research	Zaveri et al. (1)	Only 20.8% of laboratory workers were aware of universal work precautions	The attitude and practices of the laboratory health personnel towards universal precaution are worrying as 45.6% of them work in the laboratory	It is concluded that the knowledge, attitude, perception, and compliance with universal work precautions amongst laboratory technicians are poor and suggested for improvement
2011, National Journal of Community Medicine	Goswami et al. (23)	The majority were aware of the importance of laboratory safety like Post Exposure Prophylaxis (96.55%) and safe disposal blood samples (93.10%).  In respect of attitude towards the scientific process, 100% were aware about the importance of protective devices (i.e. Wearing Gloves) and Biomedical waste management.		This study found that paramedical persons had good knowledge, almost similar in many aspects therefore; attitude and practice percentage is also very high.
2011, Post Graduate medical journal.	Fadeyi et al. (20)	41% of laboratory workers were unaware.  Availability of various safety devices and equipment such as hand gloves (86%), disinfectants (84%), HBV immunisation (46%) and post exposure prophylaxis (PEP) for HIV and HBV (80%)		It is concluded that deficit in the awareness of SP among laboratory personnel and demonstrates that attitude and practice of safety rules are unsatisfactory
2011, Pharm Biomed Science	Akhter et al. (27)	61% of respondents washed their hands after removing gloves and 8% did not practiced.  (19%) thought there was not adequate PPE.		It is concluded that the practice amongst laboratory was not adequate.
2010, International Journal of Occupational and Environmental Health	Vaz et al. (21)	Among these participants (28%) of the workers reported having no knowledge of general occupational safety.	71% reported that personal protective equipment (PPE) provided by the health organization was inadequate.	This study found no knowledge among participant towards occupational safety and suggested training to increase their knowledge about blood-borne pathogens and universal precautions.
2009, Iranian Journal of Public Health	Nasab et al. (25)	53% of personnel had low level of knowledge.	<b>Attitude</b> , 76% of the participant had positive attitude towards OHS.  <b>Practice</b> , 30% of personnel had low safety behaviour .	Educational interventions should design by managers and implement to promote knowledge, attitude and safe personnel.
2010, Applied Biosafety	Nasim et al. (30)		46.2% of the laboratory workers did not use any kind of personal protective equipment.	Confirmation of a lack of awareness regarding good lab practices and biosafety measures among lab technicians in Karachi, Pakistan.
2016, International Journal of Hospital Research.	Kashyap & Gupta (31)		70.5% awareness. 47.36% average knowledge and 44.2% good knowledge of PEP.	An education-centric approach and a comprehensive infection control protocol with strict compliance with the practices within the healthcare system is needed.



unit indicates that 25% had moderate knowledge but 75% had high knowledge. On the other hand, among laboratory technicians working in microbiology all the participants had high knowledge. On attitude of the MLPs working in pathology, 16.7% had positive attitude, in biochemistry 12.5% had negative attitude, while 12.5% had positive attitude. In microbiology, all the respondents had positive attitude. With respect to practice issues, MLPs in pathology showed 16.7% had poor practice knowledge, 66.7% had fair practice knowledge and 16.7% had good practice knowledge. Also, in the biochemistry department, 81.5% showed fair practice knowledge and 12.5% showed good practice (22).

The above identified gaps needs to be addressed so that laboratory workers can be shielded from been infected and/or exposed to the myriad of occupational hazards. Awareness should be raised about this issue, which should also be an opportunity for stressing the importance of abiding by laboratory safety precautions. Furthermore, the attitude and practice of the laboratory workers related to universally accepted safety precautions raises concerns. Hence, there is the need to clearly present the concept use, benefits and efficacy of universal precautions to all laboratory workers. In addition to the above, it is important to continuously organize basic training programs, close supervision and monitoring to increase awareness of safety principles and self-hygienic procedures for laboratory workers is greatly needed. This is the position of researchers that have conducted similar studies and have been cited in this study. This study has a number of limitations. First, the study is a small-scale study, hence its findings cannot be generalized to other personnel in the medical field. Secondly, the paucity of previous research in relation to the present limited the number of studies that were reviewed for analysis. There is therefore need for further empirical endeavours especially in developed and second-world countries so that developing countries can learn from their experiences.

## CONCLUSION

Based on the findings of this study, all of the previous reserahces concluded about lack of knowledge, attitude and practice among laboratory workers. It should be noted that, there is a need to design a standard strategy to improve their knowledge, attitude and practice in this population and it would be interesting, if this could be defined for any group of workers separately.

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