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Effect and Symptoms Related Hazards Exposure among Workers in Medical Laboratory at Imam Al-Mahdi University-White Nile State, October 2022 to March 2023

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Abstract:

Background: The health of healthcare workers is critical to the effective operation of any medical organization. The well-being of laboratory staff is essential to the efficient functioning of healthcare organizations.

Objectives: The present study aimed to assess the effect and symptoms related hazards exposure among Workers in Medical Laboratory at Imam Al-Mahdi University-White Nile State, October 2022 to March 2023.

Methods: This was a descriptive cross-sectional study. The study was conducted in Kosti City located in the central south of the White Nile State. All workers in the laboratories of Imam AL-Mahdi Medical University were recruited for the study. Data was analyzed using SPSS version 24.0. Data was collected using structured questionnaire. The results were presented in forms of tables and figures.

Results: The study showed that Eye illness was the common effect 38.2% of radiation and chemical hazards 32.1% on workers at medical laboratories. Hepatitis 50% and Anthrax 40% were the most common effect of biological hazards. Psychological pressure 65.4% was the most common effect of psychological hazards. Falls 51.9% was the most common effect of mechanical hazards. The most common symptoms related thermal hazards were headache 20.8% and raise temperature 16.7%. Headache 36.4% and ringing in the ear 22.7% were the common clinical symptoms related to noise hazard. Headache 25.8% and pain in the eye 22.6% were the most common clinical symptoms related to lighting hazards. Headache 26.9% and nausea vomiting 19.2% were the common clinical symptoms related to radiation hazards. Skin sensitivity 28.6% was the common clinical symptoms related to chemical hazards. Fever 29.4% was the most common clinical symptoms related to biological hazards. While poor ability to focus 32% was the common clinical symptoms related to psychological hazards. In addition, exhaustion 44.8% was the common clinical symptoms related to Ergonomic hazards Gender, age and education level were positively correlated with hazard effect of thermal, noise, lighting and mechanical. While radiation, chemical, biological and psychological effects were positively correlated with only age and education levels. Clinical symptoms related to thermal, noise, lighting and biological hazards were positively correlated with gender, age and education level. However, radiation, chemicals, psychological and Ergonomic hazards were positively correlated with age and education level.

Conclusion:

Workers in medical laboratories are exposed to a variety of hazards, resulting in the development of clinical symptoms and exposure to a variety of effects. It is necessary to promote worker awareness of occupational risk factors related to the work environment in order to anticipate possible future risks and provide guidance for taking the necessary measures to provide a safe medical laboratory environment.

Keywords: *Effect, symptoms, medical laboratories workers, El Imam El Mahdi University.*

الخلفية: تُعدّ صحة العاملين في مجال الرعاية الصحية أمرًا بالغ الأهمية لضمان فعالية عمل أي مؤسسة طبية. كما أن سلامة موظفي المختبرات ضرورية لضمان كفاءة عمل مؤسسات الرعاية الصحية.

الأهداف: هدفت هذه الدراسة إلى تقييم تأثير وأعراض التعرض للمخاطر المرتبطة بها بين العاملين في المختبرات الطبية بجامعة الإمام المهدي - ولاية النيل الأبيض، خلال الفترة من أكتوبر 2022 إلى مارس 2023.

المنهجية: أجريت هذه الدراسة الوصفية المقطعية في مدينة كوستي الواقعة في وسط جنوب ولاية النيل الأبيض. وقد تم اختيار جميع العاملين في مختبرات جامعة الإمام المهدي الطبية للدراسة. وتم تحليل البيانات باستخدام برنامج SPSS الإصدار 24.0، وجُمعت البيانات باستخدام استبيان مُهيكل. وعُرضت النتائج في جداول وأشكال بيانية.

النتائج: أظهرت الدراسة أن أمراض العيون كانت التأثير الأكثر شيوعًا بنسبة 38.2% من مخاطر الإشعاع والمواد الكيميائية بنسبة 32.1% على العاملين في المختبرات الطبية. كان التهاب الكبد 50% والجمرة الخبيثة 40% من أكثر الآثار شيوعًا للمخاطر البيولوجية. وكان الضغط النفسي 65.4% من أكثر الآثار شيوعًا للمخاطر النفسية. وكان السقوط 51.9% من أكثر الآثار شيوعًا للمخاطر الميكانيكية. وكانت الأعراض الأكثر شيوعًا المتعلقة بالمخاطر الحرارية هي الصداع 20.8% وارتفاع درجة الحرارة 16.7%. وكان الصداع 36.4% وطنين الأذن 22.7% من أكثر الأعراض السريرية شيوعًا المتعلقة بمخاطر الضوضاء. وكان الصداع 25.8% وألم العين 22.6% من أكثر الأعراض السريرية شيوعًا المتعلقة بمخاطر الإضاءة. وكان الصداع 26.9% والغثيان والقيء 19.2% من أكثر الأعراض السريرية شيوعًا المتعلقة بمخاطر الإشعاع. وكانت حساسية الجلد 28.6% من أكثر الأعراض السريرية شيوعًا المتعلقة بالمخاطر الكيميائية. وكانت الحمى 29.4% من أكثر الأعراض السريرية شيوعًا المتعلقة بالمخاطر البيولوجية. بينما كان ضعف القدرة على التركيز 32% من أكثر الأعراض السريرية شيوعًا المتعلقة بالمخاطر النفسية. بالإضافة إلى ذلك، كان الإرهاق (44.8%) من الأعراض السريرية الشائعة المرتبطة بالمخاطر البيئية. وارتبط الجنس والعمر والمستوى التعليمي ارتباطًا إيجابيًا بتأثير المخاطر الحرارية والضوضائية والإضاءة والميكانيكية. بينما ارتبطت التأثيرات الإشعاعية والكيميائية والبيولوجية والنفسية ارتباطًا إيجابيًا بالعمر والمستوى التعليمي فقط.

ارتبطت الأعراض السريرية المتعلقة بالمخاطر الحرارية والضوضائية والإضاءة والبيولوجية ارتباطًا إيجابيًا بالجنس والعمر والمستوى التعليمي. ومع ذلك، ارتبطت المخاطر الإشعاعية والكيميائية والنفسية وبيئة العمل ارتباطًا إيجابيًا بالعمر والمستوى التعليمي.

الخلاصة:

يتعرض العاملون في المختبرات الطبية لمجموعة متنوعة من المخاطر، مما يؤدي إلى ظهور أعراض سريرية وتعرضهم لمجموعة متنوعة من التأثيرات. ومن الضروري تعزيز وعي العاملين بعوامل الخطر المهنية المتعلقة ببيئة العمل من أجل توقع المخاطر المستقبلية المحتملة وتوفير التوجيه لاتخاذ التدابير اللازمة لتوفير بيئة مختبرية طبية آمنة.

الكلمات المفتاحية: التأثير، الأعراض، العاملون في المختبرات الطبية، جامعة الإمام المهدي.

Definitions

Effect

In the context of research, "effect" refers to the measurable impact or influence that one variable has on another.

Symptoms

Symptoms are the physical or psychological signs experienced by individuals that indicate the presence of a disease, disorder, or adverse condition.

Medical Laboratory Workers

Medical laboratory workers are healthcare professionals who perform laboratory tests on clinical specimens to diagnose, treat, and prevent disease.

El Imam El Mahdi University

El Imam El Mahdi University is a public higher education institution located in Kosti, Sudan.

Introduction:

Laboratories can be a source of risk to employee health and safety. Safe working conditions are necessary for healthcare staff to remain healthy and provide good services (Adıgüzel & Keklik, 2011). Employees in hospitals and healthcare institutions face several sources of risk, including physical, chemical, biological, psychological, and ergonomic factors. Physical risk factors include noise, vibration, ventilation, dust, radiation, and improper electrical systems. Laboratory workers may be exposed to toxic, allergic, carcinogenic, or harmful effects of numerous chemicals (such as reagents, disinfectants, drugs, or anesthetics). Blood, tissue, or body fluid samples, as well as medical waste, pose a potential biological risk and represent the most important foci of infection for laboratory workers (Kaplan & Emin, 2018).

An individual's subjective judgment about the characteristics and severity of risks that could threaten their safety is defined as risk perception. A high level of risk perception generally indicates greater practice of safe behaviors. The sensitivity of laboratory workers to work environment risks may differ according to demographic features. The present study aimed to assess the effect and symptoms related hazards exposure among Workers in Medical Laboratory at Imam Al-Mahdi University-White Nile State, October 2022 to March 2023.

Laboratories can be a source of risk to employee health and safety. A safe working environment is necessary for medical staff to maintain good health and provide good service. Employees in hospitals and health care institutions face several sources of risk, including physical, chemical, biological, psychological, and ergonomic factors. Physical risk factors include noise, vibration, ventilation, dust, radiation, and improper electrical systems. Laboratory workers may be exposed to the toxic, allergenic, carcinogenic, or toxic effects of a number of chemicals (e.g., reagents, disinfectants, drugs, anesthetics). Blood, tissue, and body fluid samples and medical waste pose potential biological risks and are the most significant source of infection for laboratory workers (Yıldız, 2017).

An individual's subjective judgment of the characteristics and severity of a risk that may threaten his or her safety is defined as risk perception. In general, a higher level of risk perception indicates that safe behaviors are being practiced. The sensitivity of laboratory workers to work environment risks may vary according to demographic characteristics. This study aimed to assess the effects and symptoms of exposure to hazards among workers in the medical laboratory of Imam Al Mahdi University in White Nile State from October 2022 to March 2023.

Literature Review

The safety and wellbeing of employees are seriously threatened by occupational risks in healthcare settings, especially in medical laboratories. These risks result from the intricate and frequently dangerous work that laboratory employees do. They deal with a variety of biological agents, chemicals, and equipment, which puts them under physical, ergonomic, and mental strain. Developing successful occupational health and safety policies requires an understanding of these dangers and their consequences, particularly in environments with limited resources like Sudan.

Biological Hazards

People who work in medical laboratories are often among infectious materials like blood, sputum, stool, urine, and other body fluids. These things could have a lot of different infections in them, such as Hepatitis B virus (HBV), Hepatitis C virus (HCV), HIV, and Mycobacterium tuberculosis. Wilburn and Eijkemans (2004) assert that laboratory personnel are particularly susceptible to bloodborne diseases owing to their frequent exposure to sharp instruments, contaminated samples, and insufficient use of personal protective equipment (PPE). De Carli et al. (2003) underscored that insufficient immunisation and inadequate compliance with safety standards markedly elevate the risk of infection. In settings without comprehensive biosafety training and routine screening, biological exposure may result in serious consequences, including persistent infections or outbreaks of occupational illnesses.

Chemical Hazards

Chemical exposure is another common danger in medical labs. Formalin, phenol, ethanol, and staining reagents are some of the substances that might be dangerous if not handled appropriately. These compounds can cause skin burns, respiratory irritation, allergies, and long-term problems like cancer (Winder, 2004). If you are exposed for a long time without enough ventilation or personal protective equipment, you could have chronic symptoms like headaches, lethargy, nausea, and respiratory infections. The Occupational Safety and Health Administration (OSHA, 2021) says that strict rules must be observed for chemical safety, such as correct labelling, storage, and disposal. Workers must also be trained on how to deal with spills and breathing in chemicals.

Physical and Mechanical Hazards

Loud noises, radiation, very hot or cold temperatures, poor lighting, and machines are among physical dangers in labs. These factors can cause short-term symptoms and long-term problems such eye strain, weariness, burns, hearing loss, and even a higher risk of cancer from radiation (Teshome et al., 2021). The noise levels, especially from centrifuges and analytical machines, may be too high, which might make people tired and stressed out. Bad lighting can make your eyes tired and uncomfortable. In the meanwhile, falls, injuries from sharp tools, and burns from hot devices are all regular mechanical risks. Jagger et al. (2008) highlighted the ongoing occurrence of needle stick injuries and equipment-related incidents in laboratories, underscoring the necessity for adequate training and incident reporting systems.

Psychological Hazards

Psychological stress is a major danger in laboratories, even though it is generally ignored. Heavy workloads, long hours, exposure to upsetting samples (such those connected to infectious diseases), and not being recognised for their work can all lead to burnout, anxiety, and depression in laboratory workers (Khamisa et al., 2015). The combined effects of these stressors make it hard to focus, make decisions, and be happy at work. Psychological dangers may also be associated with a heightened risk of accidents resulting from mental weariness and diminished alertness.

Ergonomic Hazards

Repetitive movements, uncomfortable body positions, lengthy periods of standing or sitting, and fine motor control are all things that might lead to musculoskeletal diseases in the lab. For example, using a microscope too much without making ergonomic changes might create pain in the neck and back, and doing the same thing over and over again with a pipette can strain the wrist. Punnett and Wegman (2004) say that musculoskeletal problems are one of the most common work-related disorders among healthcare workers, especially in labs where workstations aren't meant to be comfortable.

Influence of Demographic Factors

Research indicates that demographic factors, including gender, age, and educational attainment, affect vulnerability to workplace hazards and compliance with safety protocols. Older employees are generally more careful since they have more experience, while younger employees may not know how to stand up to harmful behaviours or feel confident doing so. Higher levels of education have been linked to better knowledge of and use of safety practices (Ajani et al., 2020). Gender influences reporting behaviours, as evidence suggests that women are more inclined to disclose symptoms and adopt preventative measures, whereas men may underreport due to cultural norms or perceived stigma.

Preventive Measures and Global Trends

Organisations like WHO and OSHA provide international rules and guidelines that say businesses should do frequent health checks on their employees, train them, give them personal protective equipment (PPE), and use infection prevention and control (IPC) methods. Ndejjo et al. (2015) discovered that healthcare personnel in Uganda who underwent consistent training in hazard management were markedly less prone to work-related diseases. Safety programs in labs should contain both technical controls and behavioural interventions that promote a culture of safety.

Relevance to Local Context

In Sudan, where the study is located, laboratory infrastructure and occupational safety programs have a lot of problems since they don't have enough money, there aren't any standard safety standards, and the workforce isn't trained well enough. This makes it even more crucial to find out what the real impacts and symptoms of workplace dangers are at local schools like Imam Al-Mahdi University. There is an obvious need for treatments that are tailored to the situation and focus on low-cost but effective safety measures and personnel training and responsibility.

Conclusion of Literature Review

The current literature substantiates that medical laboratory personnel are perpetually exposed to various job dangers that may result in significant health implications. These dangers include infectious infections, chemical exposure, physical, ergonomic, and psychological threats. Demographic characteristics significantly influence workers' susceptibility and reactions to these dangers. Consequently, assessing the occurrence and impact of these dangers within a specific local environment, such as the laboratories at Imam Al-Mahdi University, is crucial for formulating effective safety procedures and health policies.

Previous studies

Lu et al. (2020) found a significant link between occupational hazards and mental health outcomes among factory workers and miners. This study is to evaluate the effects of different occupational hazards on job stress and mental health of factory workers and miners. A total of 6120 workers from factories and mining enterprises in seven districts and one district of Urumqi were determined using the stratified cluster random sampling method. The Effort-Reward Imbalance (ERI) questionnaire and the Symptom Checklist-90 (SCL-90) were used to evaluate the effects of occupational hazard factors on job stress and mental health of workers. The propensity score analysis was used to control the confounding factors. The occupational hazards affecting job stress of workers were asbestos dust (OR = 1.3, 95% CI: 1.09-1.55), benzene (OR = 1.25, 95% CI: 1.10-1.41), and noise (OR = 1.39, 95% CI: 1.22-1.59). The occupational hazards affecting the mental health of

workers were coal dust (OR = 1.19, 95% CI: 1.02-1.38), asbestos dust (OR = 1.58, 95% CI: 1.32-1.92), benzene (OR = 1.28, 95% CI: 1.13-1.47), and noise (OR = 1.23, 95% CI: 1.07-1.42). Different occupational hazards have certain influence on job stress and mental health of factory workers and miners. The enhancements in occupational hazard and risk assessment, occupational health examination, and occupational protection should be taken to relieve job stress and enhance the mental health of factory workers and miners.

Rai et al. (2021) conducted a scoping review on occupational hazards in low- and middle-income countries, highlighting systemic exposure risks for healthcare workers. Healthcare professionals encounter several occupational dangers. The execution of safety protocols in affluent nations has significantly alleviated these hazards. Nevertheless, numerous low- and middle-income countries (LMICs) lack the means to implement safety measures, hence heightening the risk of occupational exposure to these risks. This scoping review aims to delineate and synthesise existing research on occupational hazards faced by healthcare professionals in low- and middle-income countries, identify research deficiencies, and guide policy development. Relevant papers were sought in five electronic databases utilising a wide array of search phrases. The inclusion criteria comprised quantitative observational or experimental studies that investigated exposure to one or more occupational risks among healthcare professionals in a low- and middle-income country; additionally, the publication must have been published in English in a peer-reviewed journal. Ninety-nine papers satisfied the inclusion criteria, and data were extracted from them. A significant number of healthcare professionals in low- and middle-income countries encountered biological hazards (blood borne pathogens, tuberculosis), psychosocial hazards (workplace violence, burnout, job dissatisfaction), ergonomic hazards (musculoskeletal issues), and chemical hazards (exposure to latex and antineoplastic agents). The execution of risk mitigation methods was inadequate. The predominant focus of the literature was on biological threats (48%), while research on other hazards was very scarce. Occupational safety must be prioritised as a public health problem to safeguard healthcare workers in low- and middle-income countries (LMICs). Further investigation is required to comprehend the extent of the issue in these nations.

Benson et al. (2021) evaluated health risks in the oil and gas industry, emphasizing common occupational hazards. The burden of the workplace is a considerable worry for employees in the oil and gas sector, because they are consistently exposed to several occupational hazards. The study sought to identify several health hazards and their causes within the oil and gas industry to assess the associated risks. Methods: A qualitative method was utilised to identify the various dangers associated with the operational environment. A total of 1,000 questionnaires were randomly dispersed among the several departments in the Nigerian oil and gas sector, with 327 returned to the research team. The data analysis was conducted via SPSS. Results: The findings indicate that ergonomic hazards were the most prevalent among the identified hazards in the industry. Ergonomic hazards account for 30%, physical hazards for 26%, chemical hazards for 23%, psychosocial hazards for 18%, and biological dangers for 3%. Conclusion: This study identified the hazards that exposed workers to health risks, along with their sources, inside the oil and gas operational environment. Certain health dangers were recognised to have short-term health impacts in workers, including headaches, skin burns, eye and skin irritation, and rashes. Conversely, musculoskeletal illnesses, respiratory diseases, leukaemia, asphyxiation, hypertension, and cardiovascular diseases are chronic health consequences resulting from alternative dangers. Recommendations: Implement stringent supervision of workers in their employment, conduct thorough danger assessments within the industry, and mandate regular medical evaluations to ascertain workers' health state.

Kim and Jeong (2024) examined how musculoskeletal pain and job conditions affect fatigue, anxiety, and depression in female nurses. Nurses encounter both physical illnesses and psychological health challenges. This study aims to examine the factors affecting general weariness, anxiety, and depression by thoroughly evaluating work characteristics, hazard exposure, and the occurrence of musculoskeletal discomfort. This study employed binary logistic regression to examine the factors affecting fatigue, anxiety, and depression, respectively. The independent factors included occupation, age, work experience, healthcare organisation, weekly working hours, shift type, duration of exposure to physical, biochemical, and ergonomic dangers, and the occurrence of pain in the back, upper limbs, or lower limbs. The determinants of overall weariness included shift type ($p = 0.007$), exposure to vibration ($p = 0.042$), uncomfortable posture ($p = 0.001$), repetitive motion ($p = 0.017$), and the presence of back ($p = 0.002$) or upper limb pain ($p < 0.001$). The determinants of anxiety included age ($p = 0.031$), weekly working hours ($p = 0.006$), engagement in patient lifting/carrying ($p = 0.041$), and the existence of upper ($p = 0.022$) or lower ($p = 0.039$) limb discomfort. The factors affecting depression included weekly working hours ($p = 0.042$), exposure to infection ($p = 0.005$), and the occurrence of lower limb pain ($p = 0.011$). This study revealed that musculoskeletal pain significantly affects psychological health issues, indicating that a comprehensive approach to managing both musculoskeletal pain and psychological health problems may effectively address health concerns within the nursing profession.

Che Huei et al. (2020) systematically reviewed occupational risks and control strategies in Taiwan's healthcare sector. Healthcare professionals in Taiwan encounter numerous occupational health and safety dangers, encompassing physical, biological, chemical, ergonomic, and psychosocial risks. Healthcare personnel employed in hospitals and healthcare facilities are more susceptible to these hazards than their colleagues in other sectors. This review is to evaluate existing research literature concerning this situation to inform policymakers and practitioners about exposure dangers and provide evidence-based recommendations for their mitigation or elimination. Employing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework, we executed a systematic review of studies pertaining to occupational health and safety conducted from January 2000 to January 2019, utilising the MEDLINE (Ovid), PubMed, PMC, TOXLINE, CINAHL, PLOS One, and Access Pharmacy databases. The review identified 490 studies concerning occupational health and safety issues; of these, 30 publications were incorporated into this systematic review. These papers documented a range of exposures encountered by healthcare practitioners. This review identified several measures that can be implemented to manage, eradicate, or mitigate dangers faced by healthcare personnel in Taiwan. Healthcare institutions provide numerous distinct

occupational health and safety risks that may impact the well-being and efficacy of healthcare personnel. The repercussions of these risks on healthcare personnel present a significant public health concern in Taiwan; thus, managing, eradicating, or mitigating exposure might enhance the healthcare workforce's capacity to elevate patient care and the healthcare system in Taiwan. Hazard elimination or reduction is most effectively accomplished by engineering controls, administrative policies, and the utilisation of personal protective equipment. This review has implications for research, policy, and practice, offering future students and researchers insights into systematic review procedures grounded in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses framework. It also recognises workplace health and safety hazards and offers insights and ideas for mitigation.

Krajnak (2018) analyzed the health impacts of vibration exposure in occupational settings. Employees across several occupational fields are subjected to workplace vibration on a daily basis. This exposure may occur through the utilisation of powered hand tools or hand-transmitted vibration (HTV). Workers may also experience whole body vibration (WBV) while operating delivery vehicles, earth-moving machinery, or utilising tools that produce vibrations at low dominant frequencies and high amplitudes, such as jackhammers. Occupational exposure to vibration has been linked to a heightened risk of musculoskeletal pain in the back, neck, hands, shoulders, and hips. Occupational exposure may also facilitate the onset of peripheral and cardiovascular illnesses, as well as gastrointestinal issues. Moreover, current findings indicate that work exposure to vibration may increase the chance of getting specific cancers. This review aims to evaluate jobs with significant vibration exposure and to delineate the negative health consequences linked to such occupational exposure. This review will analyse (Adıgüzel & Keklik, 2011) diverse experimental methodologies utilised to quantify and characterise the vibrations produced by different tools and vehicles, (Kaplan & Emin, 2018) the origins of vibration-induced disorders, and (Yıldız, 2017) the application of this data to evaluate and enhance intervention strategies and equipment aimed at mitigating vibration transmission to the body. Ultimately, there is an examination of the research deficiencies that require exploration to further diminish the prevalence of vibration-induced ailments and accidents.

Methodology

Study Design:

Descriptive cross sectional study.

Study area:

Kosti city located in the central south of the White Nile state, between latitudes {13.40-13.12} and longitudes {41, 32-31, 39} East. The area is 878 Kilometers, the population is 41, 7204 the number of villages are 47 and the number of neighborhoods are 114 villages. The highest temperatures ranging between 42 degrees Celsius in April and 33 degrees Celsius in August and in the period and between October and May. The city is subject to relative humidity by alternation of seasons.

Study population:

All workers in the laboratories of Imam AL-Mahdi Medical University.

Sample size:

The sample size was including all the laboratory workers in Al Imam Al-Mahdi University.

Data collection methods:

Self-administered questionnaires were used to collect data from the workers and the laboratory environment to determine the health hazards. The questionnaire consists of two parts, the first part was personal information such as age, type of work, educational level), the second part includes general information about the laboratories, risk to which workers are exposed, action taken to prevent hazards and health services that must be available in the laboratories.

Data analysis:

Data was analyzed using SPSS version 24.0. The results were presented in forms of tables and figures.

Results:

Eye illness was the common effect 38.2% of radiation and chemical hazards 32.1% on workers at medical laboratories, figure 1 and figure 2.

Figure 3 indicates that hepatitis 50% and Anthrax 40% were the most common effect of biological hazards.

Psychological pressure 65.4%, nervous tension 19.2% and depression 15.4% were the most common effect of psychological hazards, figure 4.

Falls 51.9% followed by burns 33.3% and electric shock 14.8% were the most common effect of mechanical hazards on workers at medical laboratories, figure 5.

The most common symptoms related thermal hazards were headache 20.8% and raise temperature 16.7%, figure 6.

Headache 36.4% and ringing in the ear 22.7% were the common clinical symptoms related to noise hazard, figure 7.

Figure 8 indicates that headache 25.8% and pain in the eye 22.65 were the most common clinical symptoms related to lighting hazards.

Figure 9 show that headache 26.9% and nausea vomiting 19.2% were the common clinical symptoms related to radiation hazards.

Skin sensitivity 28.6%, redness and sensitivity of the eyes 21.4% and sensitization of the nose and throat 17.9% were the common clinical symptoms related to chemical hazards, figure 10.
Figure 11 indicates that fever 29.4%, muscle pain 17.6%, exhaustion 17.6% and cough 17.6% were the most common clinical symptoms related to biological hazards.
Poor ability to focus 32%, extreme tiredness 20% and anxiety 16% were the common clinical symptoms related to psychological hazards, figure 12.
Figure 13 show that Exhaustion 44.8% and muscle pain 20.7% were the common clinical symptoms related to Ergonomic hazards 20.7%.
Table 1 indicates the person correlation between hazards effect and socio-demographic information. Gender, age and education level were positively correlated with hazard effect of thermal, noise, lighting and mechanical. While radiation, chemical, biological and psychological effects were positively correlated with only age and education levels.
Table 2 indicates the Person correlation between hazards clinical symptoms and socio-demographic information. Clinical symptoms related to thermal, noise, lighting and biological hazards were positively correlated with gender, age and education level. However, radiation, chemicals, psychological and Ergonomic hazards were positively correlated with age and education level.

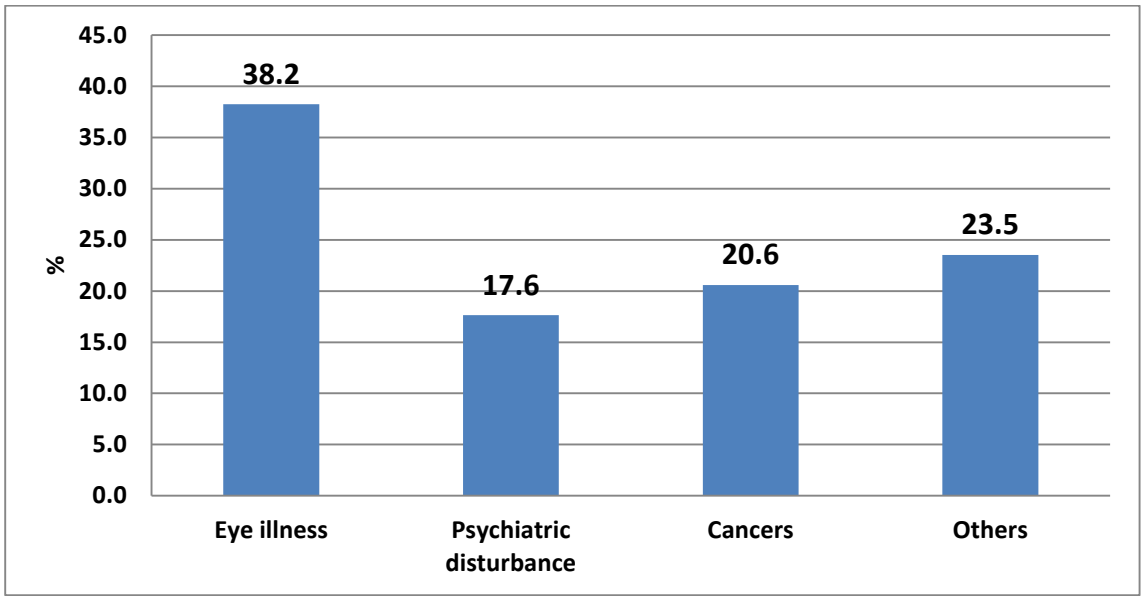

Fig.1. Effect of radiation hazards on workers of medical laboratories (n=34)

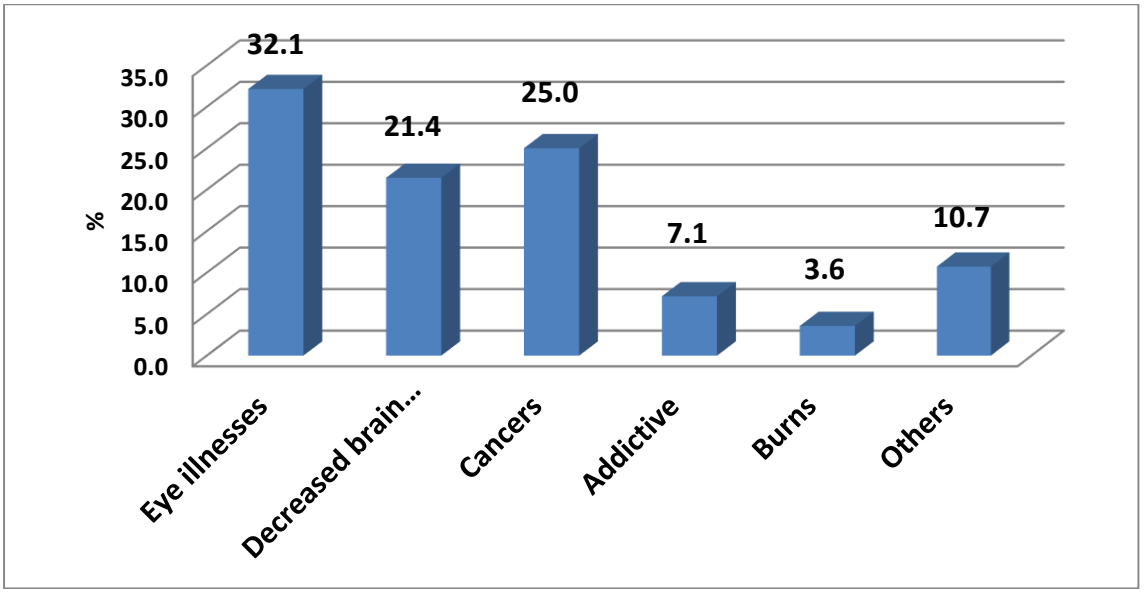

Fig.2. Effect of chemical hazards on workers of medical laboratories (n=28)

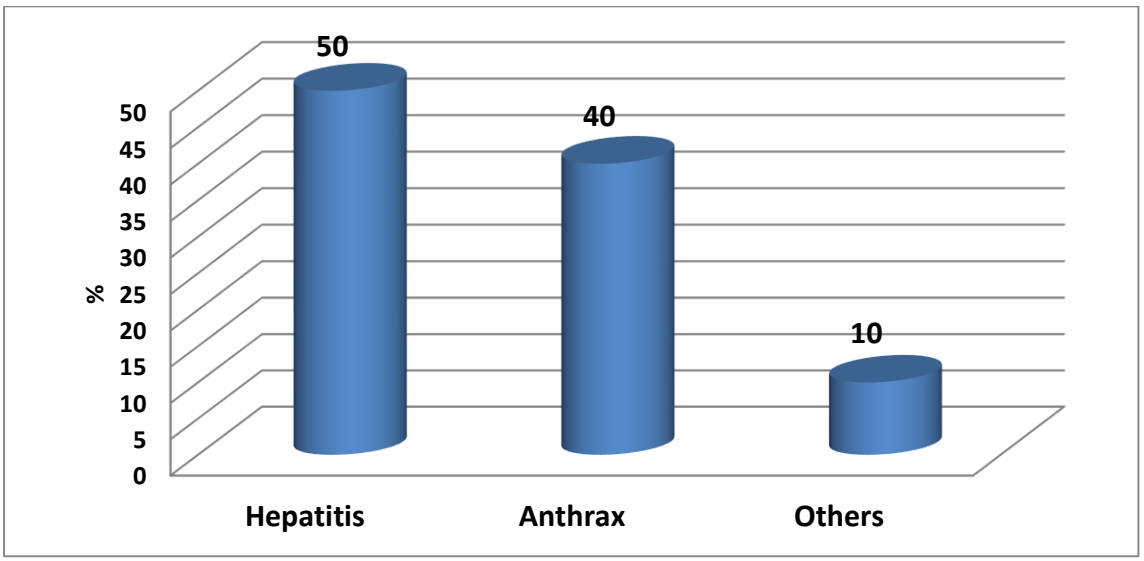

Fig.3. Effect of biological hazards on workers of medical laboratories (n=20)

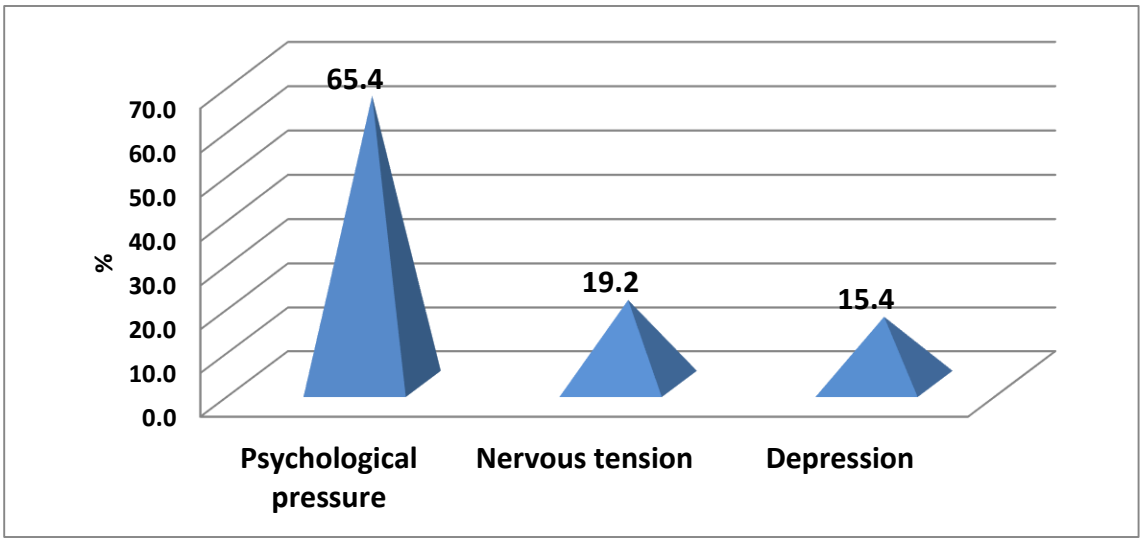

Fig.4. Effect of psychological hazards on workers of medical laboratories (n=26)

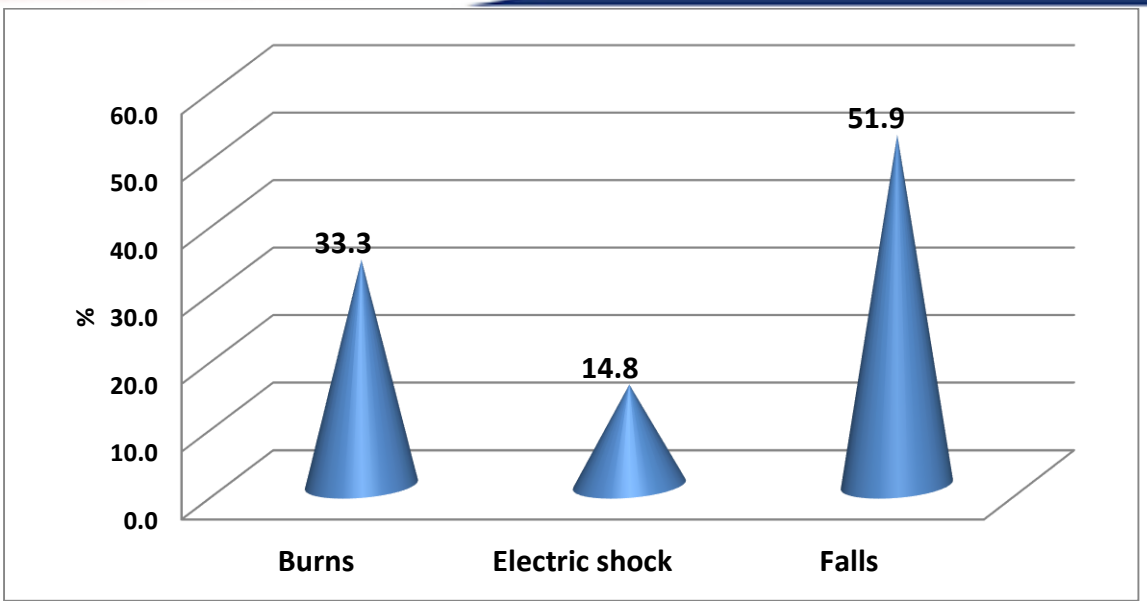

Fig.5. Effect of mechanical hazards on workers of medical laboratories (n=27)

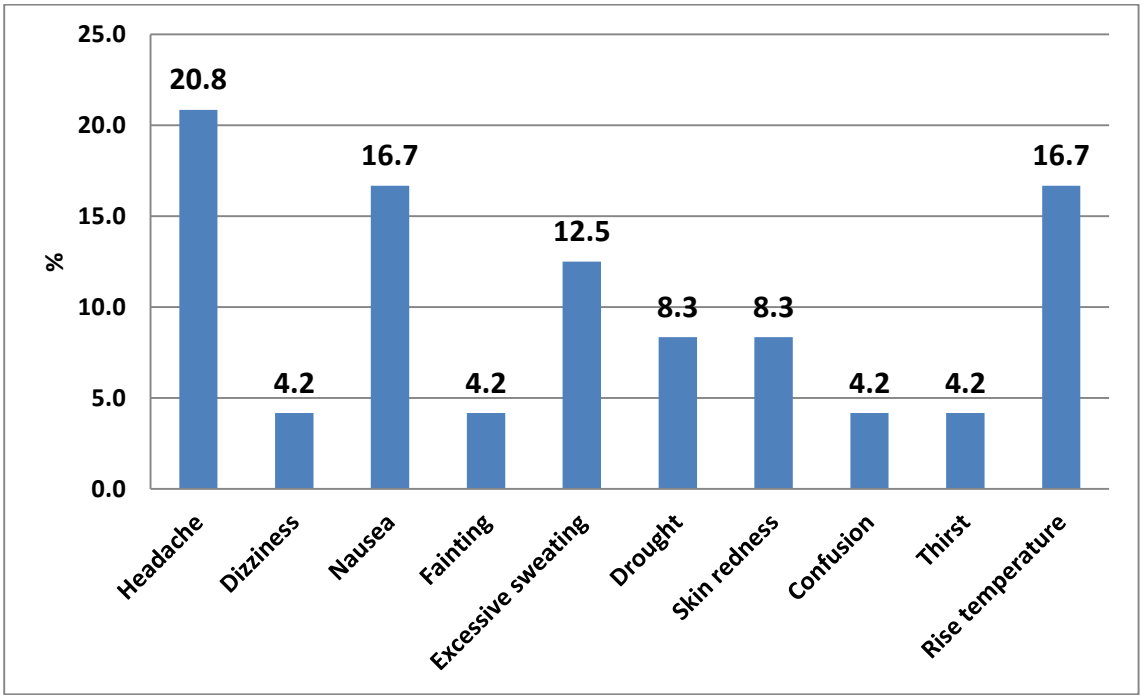

Fig.6. Clinical symptoms associated with thermal hazards among workers of medical laboratories (n=24)

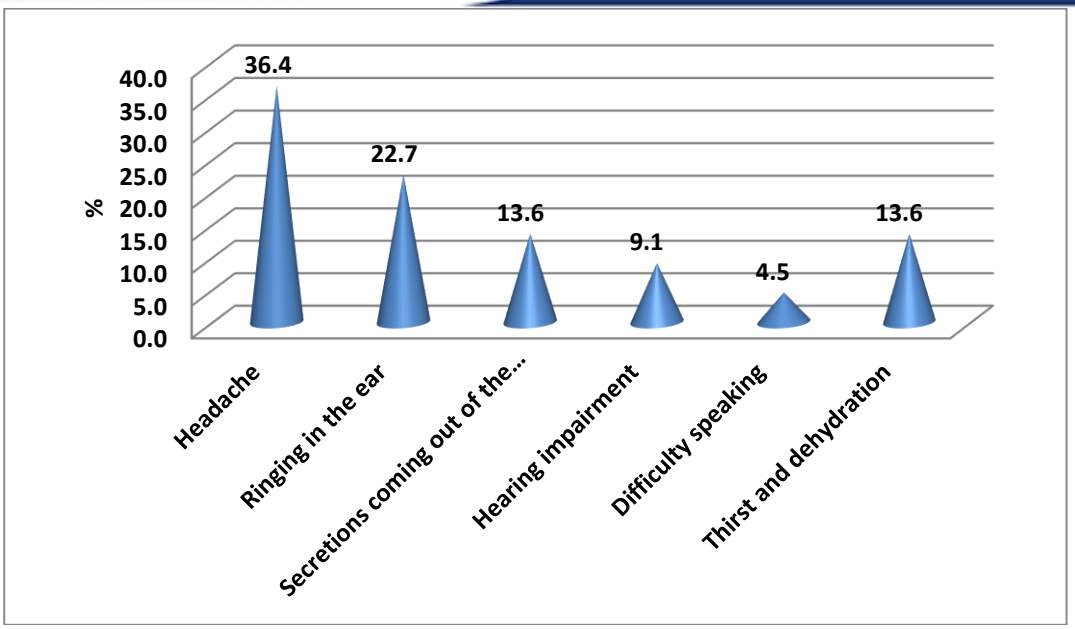

Fig.7. Clinical symptoms associated with noise hazards among workers of medical laboratories (n=22)

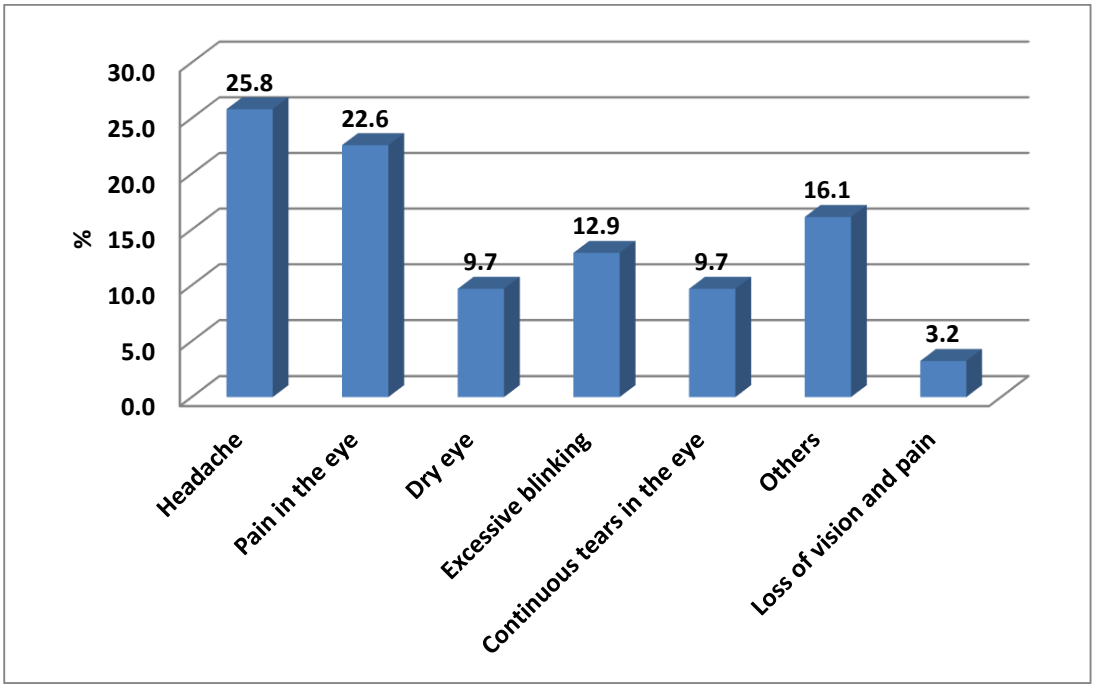

Fig.8. Clinical symptoms associated with lighting hazards among workers of medical laboratories (n=31)

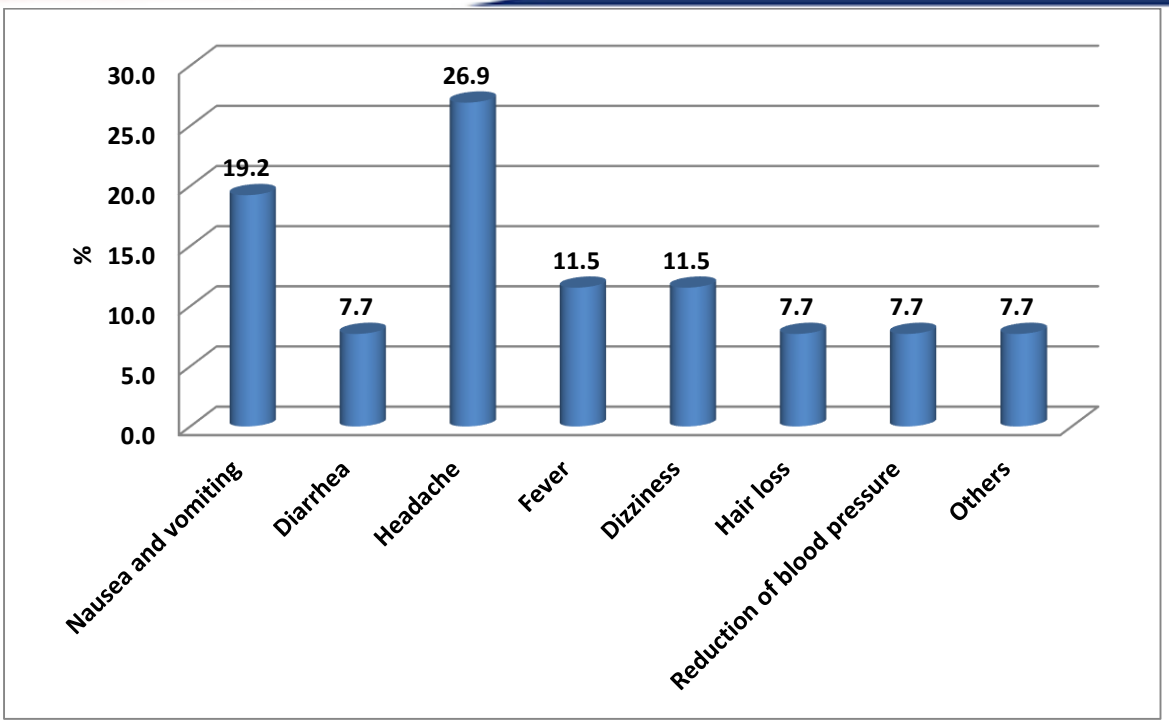

Fig.9. Clinical symptoms associated with radiation hazards among workers of medical laboratories (n=26)

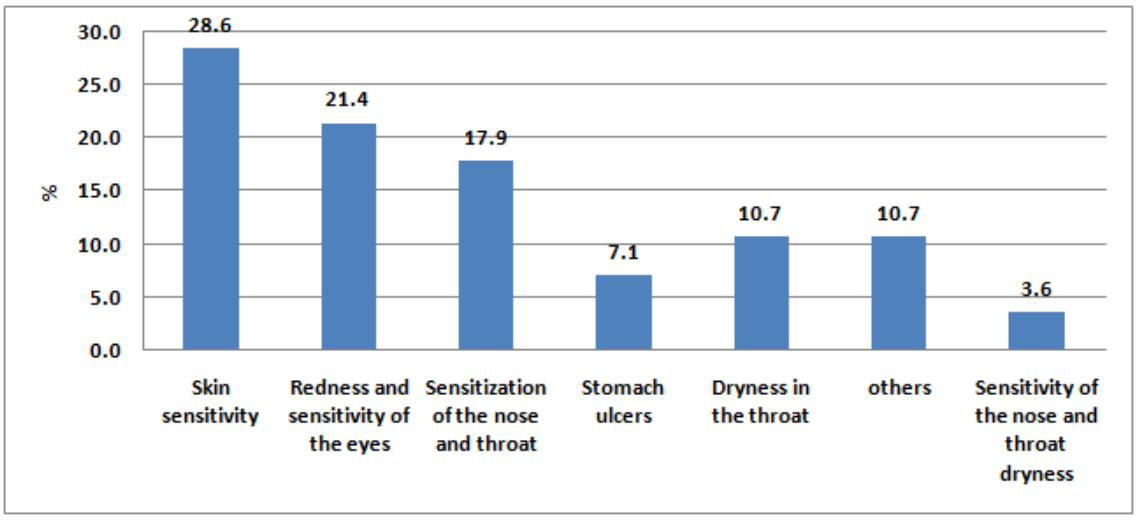

Fig.10. Clinical symptoms associated with chemical hazards among workers of medical laboratories (n=28)

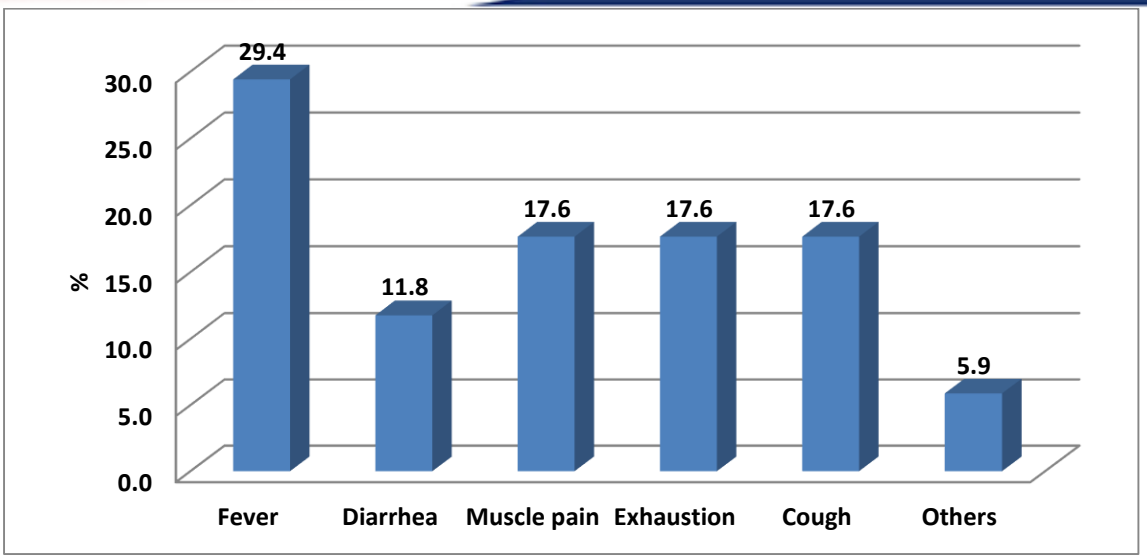

Fig.11. Clinical symptoms associated with biological hazards among workers of medical laboratories (n=17)

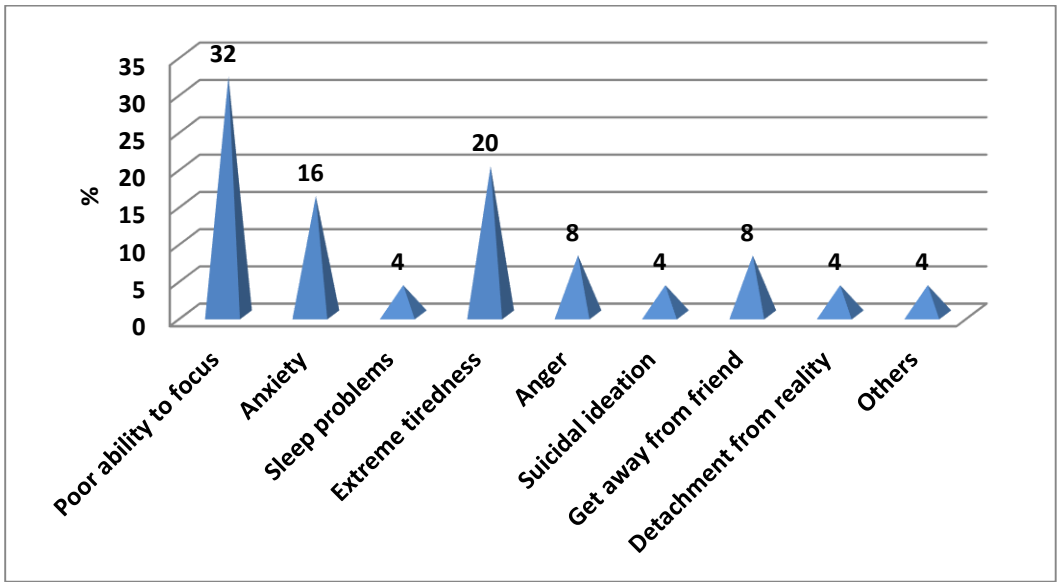

Fig.12. Clinical symptoms associated with psychological hazards among workers of medical laboratories (n=25

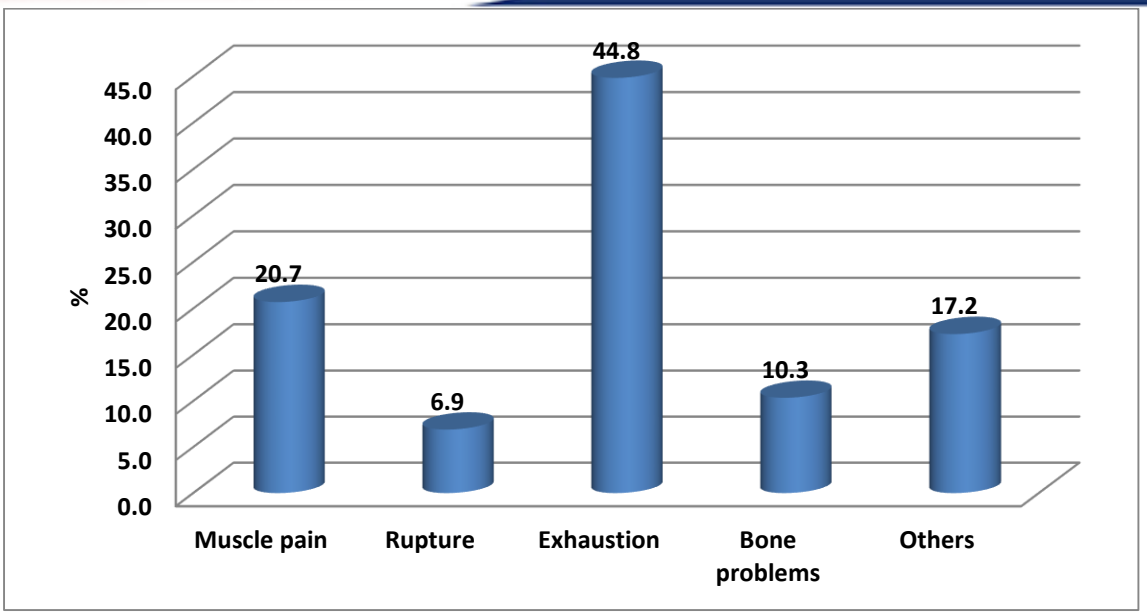

Fig.13. Clinical symptoms associated with Ergonomic hazards among workers of medical laboratories (n=29)

Table 1. Person correlation between hazards effect and socio-demographic information

Effect		Gender	Age	Education
Thermal	Pearson Correlation	**.323(*)**	**.897(**)**	**.873(**)**
	Sig. (2-tailed)	.039	.000	.000
	N	41	41	41
Noise	Pearson Correlation	**.450(**)**	**.881(**)**	**.799(**)**
	Sig. (2-tailed)	.003	.000	.000
	N	41	41	41
Lighting	Pearson Correlation	**.368(*)**	**.667(**)**	**.693(**)**
	Sig. (2-tailed)	.018	.000	.000
	N	41	41	41
Radiation	Pearson Correlation	.248	**.859(**)**	**.842(**)**
	Sig. (2-tailed)	.117	.000	.000
	N	41	41	41
Chemical	Pearson Correlation	.265	**.891(**)**	**.906(**)**
	Sig. (2-tailed)	.094	.000	.000
	N	41	41	41
Biological	Pearson Correlation	.197	**.724(**)**	**.856(**)**
	Sig. (2-tailed)	.216	.000	.000
	N	41	41	41
Psychological	Pearson Correlation	.199	**.882(**)**	**.875(**)**
	Sig. (2-tailed)	.212	.000	.000
	N	41	41	41
Mechanical	Pearson Correlation	**.395(*)**	**.821(**)**	**.805(**)**
	Sig. (2-tailed)	.011	.000	.000
	N	41	41	41

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 2. Person correlation between hazards clinical symptoms and socio-demographic information

Symptoms		Gender	Age	Education
Thermal	Pearson Correlation	**.322(*)**	**.743(**)**	**.829(**)**
	Sig. (2-tailed)	.040	.000	.000
	N	41	41	41
Noise	Pearson Correlation	**.362(*)**	**.708(**)**	**.773(**)**
	Sig. (2-tailed)	.020	.000	.000
	N	41	41	41
Lighting	Pearson Correlation	**.315(*)**	**.881(**)**	**.857(**)**
	Sig. (2-tailed)	.045	.000	.000
	N	41	41	41
Radiation	Pearson Correlation	.257	**.836(**)**	**.900(**)**
	Sig. (2-tailed)	.105	.000	.000
	N	41	41	41
Chemicals	Pearson Correlation	.258	**.853(**)**	**.886(**)**
	Sig. (2-tailed)	.104	.000	.000
	N	41	41	41
Biological	Pearson Correlation	**.405(**)**	**.653(**)**	**.738(**)**
	Sig. (2-tailed)	.009	.000	.000
	N	41	41	41
Psychological	Pearson Correlation	.231	**.810(**)**	**.883(**)**
	Sig. (2-tailed)	.146	.000	.000
	N	41	41	41
Ergonomic	Pearson Correlation	.236	**.886(**)**	**.910(**)**
	Sig. (2-tailed)	.137	.000	.000
	N	41	41	41

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed)

Discussion:

This descriptive cross-sectional study aimed to assess health risk exposure and its types among workers at the Medical Research Institute of Imam Al Mahdi University (White Nile State) from October 2022 to March 2023.

The results showed that 38.2% of the radiation exposures were eye diseases and 32.1% of the chemical exposures were eye diseases. In addition, hepatitis and anthrax were the most common effects of biological hazards, at 50% and 40%, respectively. Furthermore, the most common effects of psychological hazards were psychological pressure 65.4%, nervousness 19.2%, and depression 15.4%. This finding is consistent with the fact that employees in hospitals and health care institutions face multiple sources of risk, including physical, chemical, biological, psychological, and ergonomic factors (Harrington & Shannon, 1976).

(Kılıç, Karabulut, & Köse, 2014), reported that the greatest risks in the work environment are sharp objects, biological, psychosocial, physical, and chemical injuries; (Pedrosa & Cardoso, 2011), observed in a study conducted in Brazil that 92% of blood-borne infections occur in hospitals; according to Gündüz found that out of 988 healthcare workers, 64% were infected at least once due to exposure to blood or body fluids. exposure to blood or body fluids at least once. In addition, a study on exposure to chemicals conducted by an Italian laboratory found that 54.4% of respondents felt very exposed to chemical risks (Papadopoli et al., 2020). On the other hand, headache and tinnitus were the most common noise-related clinical symptoms (36.4% and 22.7%, respectively). Similar findings indicated that noise, inadequate ventilation, contact with hazardous materials, cleaning agents used, and patient contact were perceived as hazards. Hazardous materials, inadequate equipment, and radiation were not perceived as major sources of risk. Results of the Occupational Risk Perception Scale showed that noise was perceived as the greatest risk and radiation exposure was considered the lowest risk; (Ilgar, 2012) also noted that noise ranked first among the important risk factors defined by health care workers; in a study by (Vehid et al., 2011), noise was a high risk factor. They also reported that medical waste, electrical equipment, noise, and HVAC systems are potential sources of injury exposure for nurses (Özkan & Emiroğlu, 2006).

This study showed that the most common clinical symptoms associated with 20.7% of ergonomic hazards were fatigue (44.8%) and muscle pain (20.7%). In other studies, the most common health problem was lower extremity pain (36.3%). Healthcare workers have significantly greater exposure to musculoskeletal disorders than some other occupations (Çetin,

2008). The high number of lower extremity injuries reported in this study may be related to inadequate training on how to avoid such injuries. The daily activities of health care workers can lead to musculoskeletal disorders over time.

Conclusion

In conclusion, workers in medical laboratories are exposed to a variety of risk factors, resulting in the development of clinical symptoms and exposure to a variety of effects. It is necessary to promote worker awareness of occupational hazards associated with the work environment in order to predict possible future risks and provide guidance for taking the necessary measures to provide a safe medical laboratory environment.

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