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Risk Assessment of Biological and Psychosocial Hazards in a HealthCare Hospital Located in Lahore, Punjab, Pakistan

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Abstract

Risk assessment of biological and psychosocial hazards was conducted in a healthcare hospital located in Lahore, Punjab, Pakistan. Purpose of risk assessment was to identify various hazards and then removing or reducing the level of risk associated with them in order to ensure a safe environment at the workplace. Various biological and psychosocial hazards were noticed in the hospital by walk through surveys. Through risk assessment it was found that people in the hospital were at a risk of minor to major damage due to both biological and psychosocial hazards. It was interpreted that air –borne pathogens and patient/visitor aggression was at moderate level of risk that was undesirable. Out of all the hazards, work-related stress and bullying produced unacceptably high level of risk which requires strict measures to be taken. There is a dire need for the implementation of strategies in healthcare institutions of Lahore, so that the risks linked with biological and psychosocial hazards in the hospitals could be avoided.

Keywords: Risk Assessment; Biological; Psychosocial; Hazard; Hospital.

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1. Introduction

Hospital is a place for sick or injured people to get a medical treatment, but visiting such healthcare institutions may also become a source of threat for them, impacting their health in a negative way. People in hospitals get exposed to a variety of dangerous hazards [1]. Occupational hazards are the hazards that have an ability to cause damage and poor health in individuals. These hazards could be physical, chemical, ergonomic, mechanical, biological or psychosocial. If working environment is not safe for the workers in an occupational setting, this may lead to employee attrition from an organization, and this is actually happening in many parts of the world.

In the present study biological and psychosocial hazards were chosen for risk assessment. Purpose of this risk assessment was to find out different hazards in the hospital, level of risks associated with them and then suggesting measures for the significant risks in order to minimize the harm that can be caused by them in an occupational setting [2].

Biological hazards are caused by pathogenic organisms that can affect the health of people in a negative way either directly through germs or indirectly by coming in contact with an infectious environment of a hospital. On a daily basis, nurses have to deal with the infected urine, blood and wounds of patients, and are therefore, at a greater risk of getting harm from such biohazards [3].

Out of all the hazards, psychosocial hazards impacts the most on the mental health of people [4]. Stress due to overburden of work, bullying, peer pressure, offensive behavior and lack of transparency are some of the examples of biological hazards at the workplace. Prolonged exposure to biohazards are responsible for causing depression, anxiety, heart diseases [5] and mood disorders in a population that is vulnerable to such hazards. [6].

A research work was done on health risk assessment of infectious microorganisms found in trash of hospitals. It was concluded that medical waste contained a variety of bacteria, viruses and other types of germs but the health risks associated with such pathogens appeared to be low. This study suggested that trash of hospitals should be carefully monitored and managed in order to create a safe and healthy environment for those who comes in contact with them on a daily basis [7].

It was found that a large number of working days are being lost each year in United Kingdom due to psychosocial hazards at workplace [8]. Many people in Europe complained that their mental health was at risk due to work-related stress and other psychological hazards. About 50-60% of all the lost working days are due to psychological risks in an occupational setting [9].

Although a lot of research is being done in developed countries on biological and psychosocial hazards at the workplace, but a dearth of this problem exists in Pakistan. Hence, there is a need to explore the biological and psychosocial hazards among healthcare workers in under-developed and developing countries. Furthermore, this could serve as a basis for instituting occupational health and safety policy and programs tailored to healthcare workers. Present study aimed to identify the biological and psychosocial hazards and determine the risks in a population exposed to such hazards in a tertiary healthcare facility of Lahore, Pakistan.

2. Materials and Method

Employees in the healthcare institutions gets exposed to a variety of biological and psychosocial hazards on a daily basis. Present research study conducted risk assessment of biological and psychosocial hazards in a semi government hospital of Lahore. For carrying out risk assessment of selected hazards, permission was taken from the head(s) of the hospital. Biological and psychosocial health hazards were identified in the hospital through personal observation and workplace inspection checklist. Following four steps of risk assessment were carried out in the hospital [10].

2.1. Identification of Hazard

In this first step of risk assessment, hazards were identified in the hospital and their negative impacts on human health was observed.

2.2. Dose-response Assessment

In this second step of risk assessment, it was observed that how increased level of exposure to a hazard would impact the health of a person.

2.3. Exposure Assessment

In third step of risk assessment, people exposed to different types of hazards, their exposure pathway, type and time span of exposure was observed.

2.4. Risk Characterization

This last step of risk assessment was carried out in order to find out the intensity of risk associated with a certain type of hazard in a hospital. Risk matrices were used for the calculation of risk caused by biological and psychosocial hazards.

3. Results and Discussion

Table 1 and 2 shows biological and psychosocial hazards respectively that were observed in the hospital. Then presumed values for the targeted hazards were taken above and below threshold level and negative impacts on health of people were shown through graphs. After this, exposure assessment was done for the individuals (patients, doctors, nurses, sweepers, administrative staff, visitors etc.) who were exposed to various biological and psychosocial hazards in the healthcare facility as shown in Table 3 and 4 respectively. In fourth and last step, significant risks in the hospital were highlighted through risk matrices. Key for severity (Table 5), likelihood (Table 6) and risk (Table 7) was used for interpreting risk matrices [11].

3.1. Hazard Identification

Table 1: Biological hazards in various sections of a hospital

Sr. #	Section	Hazard	Metabolism and behavior	Qualitative health effects
1	Medical crisis unit, blood donor centre, patient room, surgery centre	Blood –borne pathogens	Such pathogens (virus) are transmitted by blood and body fluids to human body and replicate there.	Syphilis, malaria, brucellosis, hepatitis B, hepatitis C, AIDS, swollen lymph glands, diarrhea, herpes, rocky mountain spotted fever.
2	Hematology lab, surgical unit	Pathogenicity related proteins	Such allergenic proteins enter the body, causing the immune system to respond in an abnormal manner.	Rhinitis, asthma, anaphylaxis, facial edema, bronchospasm, death.
3	Medical labs, corridors	Cultures and stocks of infectious agents	Such contagious agents enter the body, react with host tissues, multiply and produce toxins there.	Ring worm, sinus congestion, body aches, and runny nose.
4	General wards	Air –borne pathogens	Such pathogens (bacteria) are transmitted by airborne particles to human body, where they flourish in organs such as lungs and reproduce there.	Tuberculosis, severe acute respiratory syndrome, measles, influenza, shortness of breath.
5	Waiting area, general Wards	Methicillin-resistant Staphylococcus aurea (MRSA)	Such multi-drug resistant organisms once enters the body, invade the body tissues and grow there.	Skin infections like sores or boil, pneumonia, infect surgical wounds.
6	Cafeteria	Toxoplasma gondii	When it enters the body, it multiplies there and destroys host cells.	Swollen lymph glands, muscle aches, toxoplasmosis- a parasitic infection
7	Biopsy/surgery unit	Micro-organisms	Once in the body, they multiply rapidly , slowing down the immune response and allowing for subsequent infection to proliferate	Plague, typhoid fever, diphtheria, typhus, pneumonia

Table 2: Psychosocial hazards in various sections of a hospital

Sr.#	Section	Hazard	Metabolic process	Effects on health
1	Wards, operating rooms, emergency room, lab testing units, kitchen, reception, pharmacy	Work-related stress	Due to stress, body releases certain types of hormones that causes irregular heartbeat and breathing patterns.	Increased blood pressure, heart diseases, nausea, chest pain, headaches, uncontrollable crying.
2	Pharmacy, cafeteria, nursing floor, waiting area, parking lot, wards	Bullying	Stress response system of a body gets affected by bullying, resulting in poor health of an individual.	Traumatic stress disorder, depression, anxiety.
3	Reception, general wards, pharmacy	Patient/visitor aggression	Serotonin level gets changed due to brutal behavior, affecting the attitude of an individual in a negative way.	Tremors (hands, lips), excessive sweating, feeling uncoordinated.
4	Pharmacy, nursing floor	Employee's exhaustion	Disturbance in the functioning of thyroid glands, which regulates the way the body uses energy.	Inattentiveness, fatigue, burnout, muscle aches, loss of motivation, frequent headaches.

3.2. Dose-Response Assessment

3.2.1. Biological hazard and its effects at different doses

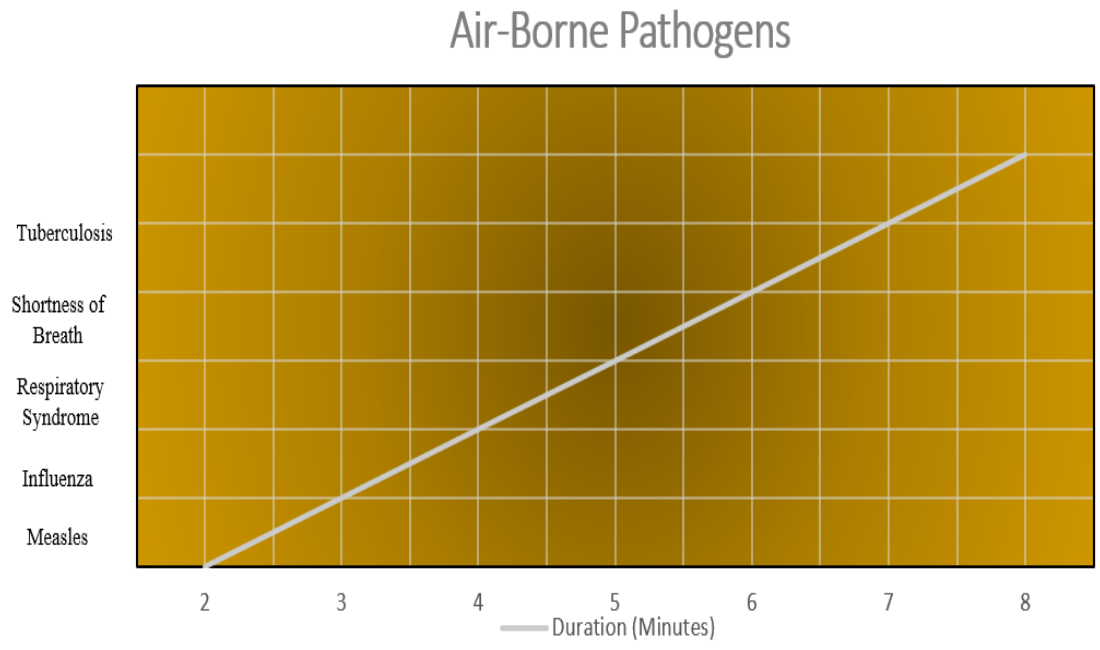

Figure 1: Potential health effects of air-borne pathogens

3.2.2. Psychosocial hazards and their effects at different doses

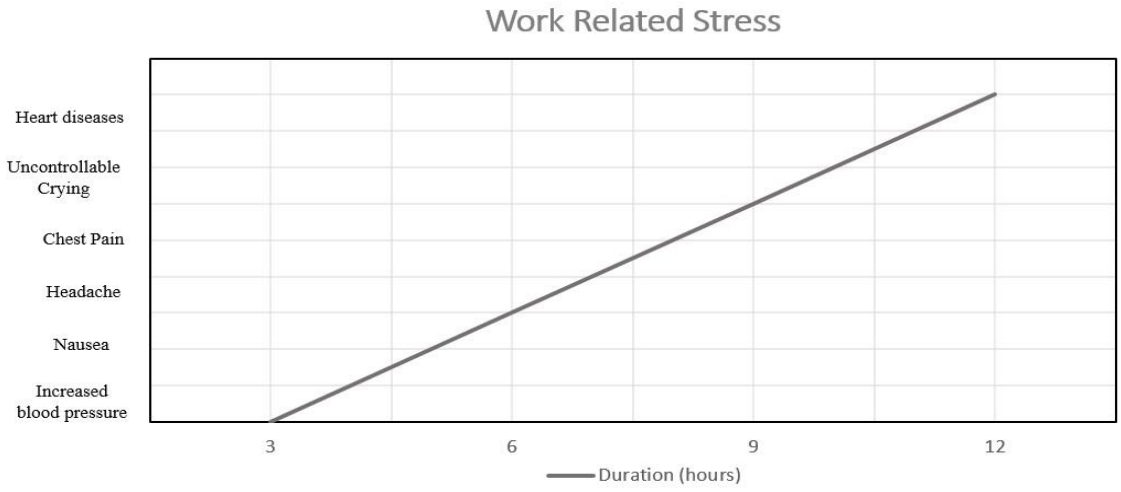

Figure 2: Potential health effects of work related stress

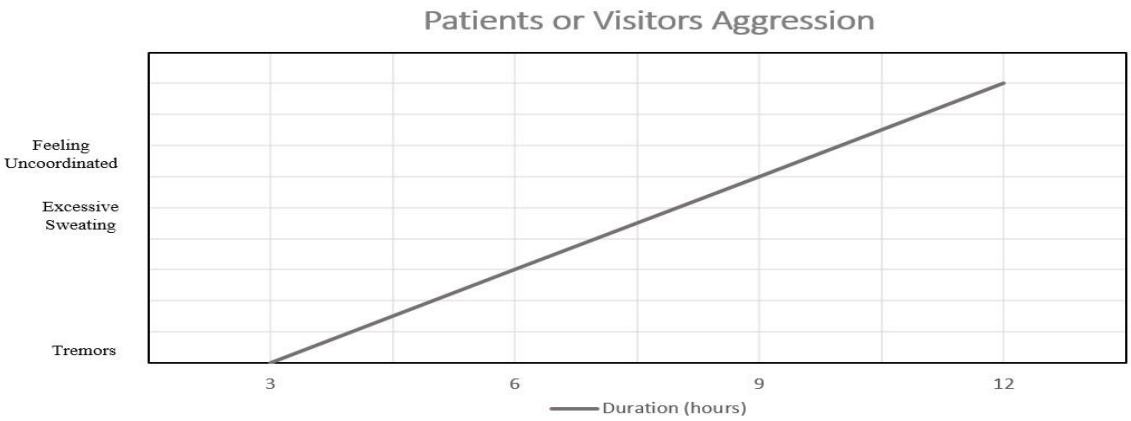

Figure 3: Potential health effects of patients or visitors aggression

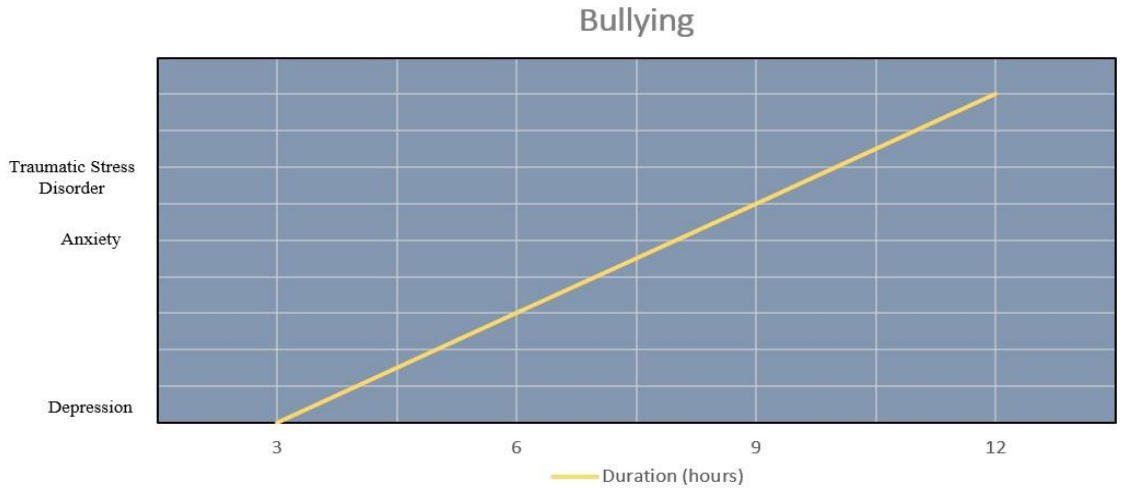

Figure 4: Potential health effects of bullying

3.3. Exposure Assessment

Table 3: Exposure assessment of biological hazards

Hazard	Exposure pathway					Nature of exposure		Extent of exposure	
	Source	VF	Route of intake			Cont.	Intermittent	Dose	Duration (hrs)
			I.G	I.H	A.B				
Blood –borne pathogens	Already used sharp needle sticks and razors	Contaminated blood	__	__	Yes	_	✓	__	4
Pathogenicity related proteins	Natural latex rubber (NLR) gloves	Food chain	Yes	Yes	Yes	_	✓	__	6
Cultures and stocks of infectious agents	Medical waste	Decaying organic matter, vector breeding,animals excreta, insects	Yes	Yes	Yes	_	✓	__	12
Air –borne pathogens	Droplet nuclei of infected patients	Coughing, exhalations, sneezing	__	Yes	__	_	✓	__	3
Methicillin-resistant Staphylococcus aurea (MRSA)	One's own nasal bacteria/ contact with a carrier who is colonized but has no symptoms	Coughing, sneezing, contaminated food, water and air	Yes	Yes	Yes	_	✓	__	6
Toxoplasma gondii	Contamin-ated/unco-vered food	Contaminated food, water and air, insects, animals excreta	Yes	Yes	__	_	✓	__	4
Micro-organisms	Contaminated endoscope	Contaminated food, water and air	Yes	Yes	Yes	_	✓	__	3

Table 4: Exposure assessment of psychosocial hazards

Hazard	Exposure pathway					Nature of exposure		Extent of exposure	
	Source	VF	Route of intake			Continous	Intermittent	Dose	Duration (hrs)
			I.G	I.H	A.B				
Work-related stress	Shortage of time to complete a task	__	__	__	__	__	✓	__	6
Bullying	Fights at workplace	__	__	__	__	__	✓	__	1
Patient/visitor aggression	Improper dealing with patients/visitors	__	__	__	__	__	✓	__	3
Employee's exhaustion	Lack of reasonable shift schedules	__	__	__	__	__	✓	__	8

Table 5: Key for Severity

Probability	Severity	Description
1	Insignificant	No medical attention needed
2	Low	In-depth evaluation not required
3	Tolerable	Medical attention required
4	Serious	Immediate hospitalization required
5	Epidemic	Thorough assessment required

Table 6: Key for Likelihood

Probability	Likelihood	Description
1	Unlikely	May occur only in extraordinary situations
2	Rare	May occur once or twice a year
3	Infrequent	May occur once a month
4	Probable	May occur once a week
5	Recurrent	May occur at least once a day

Table 7: Key for Risk

Level of Risk	Descriptor	Description
1	Desirable	Negligible impact.
2	Admissible	Area needs to be monitored
3	Undesirable	Observation needs to be increased
4	Unbearable	Major impact on a small population.
5	Critical	Significant impact on a large population.

3.4. Risk Matrices

3.4.1. Risk matrix for biological hazards

		LIKELIHOOD				
	Risk	1	2	3	4	5
SEVERITY	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9 *1	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

Figure 5: Risk matrix for biological hazards

3.4.1.1. Air –borne pathogens (Hazard 1)

Risk was taken as 9 because possibility of its occurrence was not frequent. People are usually affected by air borne pathogens at least once a month.

3.4.2. Risk matrix for psychosocial hazards

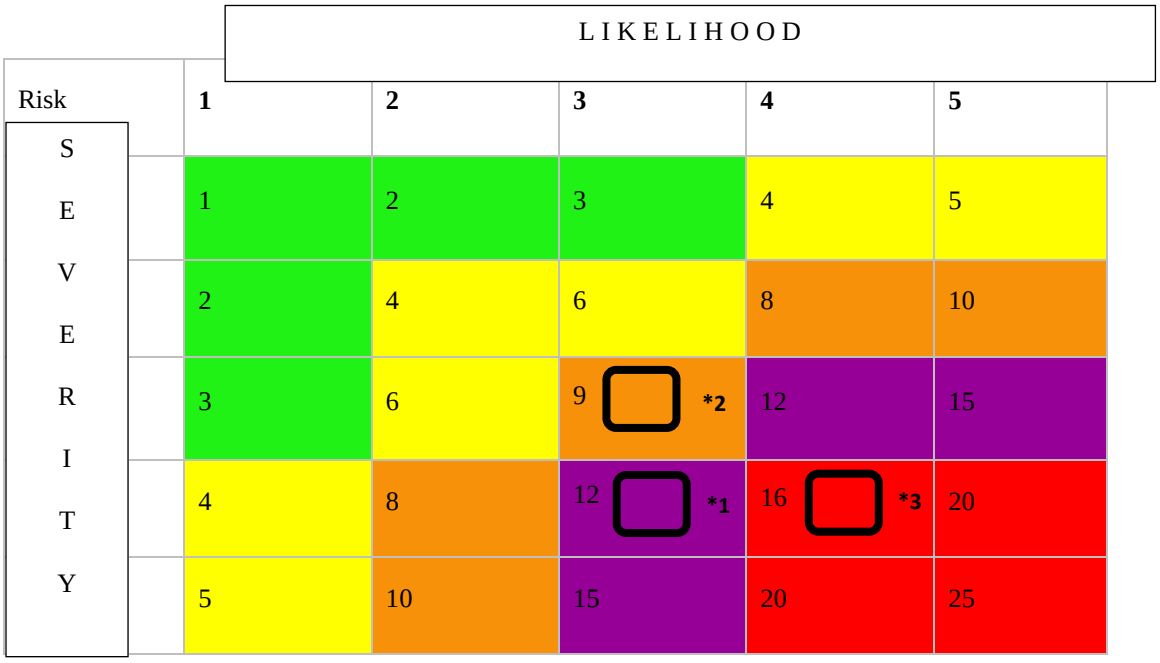

Figure 6: Risk matrix for psychosocial hazards

3.4.2.1. Work-related stress (Hazard 1)

Risk was 12 because its probability of occurrence i.e. likelihood was occasional. Majority of population is affected due to stress.

3.4.2.2. Patient/Visitor aggression (Hazard 2)

The Risk was taken as 9 because its probability of occurrence i.e. likelihood was occasional. Its severity was 3 because the impact of this hazard is such that it requires in depth evaluation but there is a loss of minimum 1 work day.

3.4.2.3. Bullying (Hazard 3)

Risk was taken as 16 because its probability of occurrence i.e. likelihood was once a week which could result in traumatic depression and anxiety.

Present study is the first one that was conducted in a hospital of Lahore, Pakistan for conducting risk assessment of biological and psychosocial hazards. It was noticed that in the selected hospital, doctors were doing their duty in three shifts, the lab technologists had a work shift of 8 hours from 9 am to 5 pm and the patients in the emergency wards were usually present 24/7 while waiting for operation. A major drawback was that, due to

shifts more number of workers were exposed to all hazards that are mentioned above. It was found in present research work that workers in the hospital were exposed to many types of hazards such as biological (air –borne pathogens, cultures of infectious agents, blood-borne pathogens etc.) and psychosocial (work-related stress, patient/visitor aggression and bullying). Air –borne pathogens and patient/visitor aggression was at moderate level of risk that was undesirable. Work-related stress produced unacceptably high level of risk which requires prompt action. Bullying was at critically high level of risk and requires strict action.

Results of present study matched with the study [12] that investigated risk levels of different psychosocial hazards and concluded that high level of risk was associated with burden of work in all sections of hospital. High level of risk was also linked with poor interpersonal relationships, but in some sections of hospital. High level of risk was found with aggression from patients' relatives in the same study [12] which did not match with the result of present study that noticed medium level risk linked with patient/ visitor aggression. Another research study declared the presence of various microorganisms in medical debris but found the health risk associated with such pathogens to be low [7]. This result was not in consistent with the result of present study which showed medium level of risk linked with air-borne pathogens.

4. Conclusion

Present study showed that workers in the hospital were exposed to many biological and psychosocial hazards. Conducting risk assessment of biological and psychosocial hazards is a legal duty of organizations and is a part of workplace health and safety in many developed countries. However, data regarding biological and psychosocial risk assessments in hospitals of Lahore is scarce. Data is lacking in present study regarding the exposure assessment of highly exposed and highly susceptible groups or individuals. Risk assessment of biological and psychological hazards is also a beneficial tool to recognize the masses at risk. This paves the way to implement plan of actions so that physical and mental health of people could be improved. Thus studies are needed in Pakistan to address these gaps.

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References

[1] R. Ndejjo, G. Musinguzi, X. Yu, E. Buregyeya, D. Musoke, J.S. Wang, et al. "Occupational health hazards among healthcare workers in Kampala, Uganda". *Journal of environmental and public health*, pp. 1-9, Jan. 2015.

[2] H.P.Berg. "Risk management: procedures, methods and experiences". *Reliability: Theory & Applications*, vol. 5, pp. 79-95, 2010.

[3] T. Daly and K. Dickson. "Biological hazards". *Nursing Standard (through 2013)*, vol. *13*, pp.43, Oct. 1998.

[4] G. Franco and F. Franco. "Bernardino Ramazzini: The Father of Occupational Medicine". *American journal of public health*, vol. 91, pp. 1382, Sep, 2001.

[5] E.M. Backé, A. Seidler, U. Latza, K. Rossnagel and B.Schumann. "The role of psychosocial stress at work for the development of cardiovascular diseases: a systematic review". I*nternational archives of occupational and environmental health*, vol. *85*, pp. 67-79, May. 2012.

[6] E. Cottini and C. Lucifora C. "Mental health and working conditions in Europe". *ILR Review*, vol. *66*, pp. 958-988, 2013.

[7] H. Park, K. Lee, M. Kim, J. Lee, S.Y. Seong and G. Ko. "Detection and hazard assessment of pathogenic microorganisms in medical wastes". *Journal of Environmental Science and Health Part A*, vol. *44*. pp. 995-1003, 2009.

[8] S. Leka, A. Jain, S. Iavicoli S and C.D. Tecco. "An Evaluation of the Policy Context on Psychosocial Risks and Mental Health in the Workplace in the European Union: Achievements, Challenges, and the Future". *BioMed research international*, pp. 1-18, 2015.

[9] "Psychosocial risks and work-related stress". Internet: https://www.ilo.org/global/topics/safety-and-health-at-work/areasofwork/workplace-health-promotion-and-well-being/WCMS_108557/lang--en/index.htm,[July.29, 2022].

[10] "Human Health Risk Assessment". Internet: https://www.epa.gov/risk/human-health-risk-assessment#tab-1, July.26, 2022 [July. 29,2022].

[11] A. Baig, S. Nadeem, A. Ahmad and M. Bilal. (2021). "Risk assessment of physical and ergonomic hazards in a reputable hospital of Lahore, Pakistan". *Journal of natural and applied sciences Pakistan*, vol. 3, pp. 739-750, 2021.

[12] C.U. Okeafor and F.E. Alamina. "A qualitative study on psychosocial hazards among health care workers in a tertiary health facility in South-South Nigeria". *Annals of Ibadan postgraduate medicine*, vol. 16, pp. 23-29, 2018.