



## A REVIEW STUDY ON BIOLOGICAL HAZARDS IN BUILDING CONSTRUCTION ACTIVITIES

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### Abstract:

Any source or situation that has potential to cause harm, injury and health effects is a hazard. The construction industry is the most hazardous workplace involved with various types physical, chemical, ergonomic, and biological hazards. The risk of being associated with living things or their byproducts, which might have a negative impact on one's health, is known as a biological hazard. Workers in contact with human body fluids such as blood, tissue, saliva, mucus, urine, or excrement are at risk. Biological hazards include environmental diseases that come from the biosphere. Animal bites like reptiles, dog bites, exposure to dead animals, birds decomposing in the atmosphere, improper water and sanitation facilities are biological hazards. Other biological hazards in construction sites are bacteria, viruses, fungi, other microorganisms, and their associated toxins. The presence of rats, insects, birds and animal wastes during remodeling of old buildings is also critical. Stinging insects like bees and wasps are especially dangerous to outdoor workers. Storage of construction materials on the street ways is one of the risks associated in the construction industry. The proper maintenance in and around the construction site and suitable usage of Personal Protective Equipment (PPE) and sanitation practices are the mitigative measures to prevent biological hazards in construction sites.

### Introduction:

The risk being associated with living things or their byproducts, which might have a negative impact on one's health is known as biological hazard. Workers in contact with human body fluids such as blood, tissue, saliva, mucus, urine, or excrement are exposed to biological risks. Animal bites like reptiles, dog bites, exposing to dead animal, birds decomposing atmosphere leads, improper water, and sanitation facilities prone to biological hazards. Self- hygiene and use of proper PPE during the work time decreases the cause of biological hazards.

### Review of Literature:

**Torghabeh et al (2013)** explained that hazard identification is the important step in construction safety management. the study aims to determine the severity of the hazards involved and rank the hazards based on the consequences. questionnaire survey was adopted. the study reports that awkward postures, material handling, forceful exertions. biological hazards Blue green algae and fungi are the least critical biological hazards involved in construction sites.

**Messens et al (2019)** focusses on biological hazards and its risk assessment in health perspective. Vector borne diseases and antimicrobial resistance (AMR) are used to identify the new methodologies for next generation .one biggest threats to human health in the infectious disease environment is AMR. Validated vector programs are to be conducted to identify the potential threats.

**Shrestha (2020)** discussed that accidents in a construction industry are high involved from minor injury to fatality. The first step is to identify the hazard. this paper intended to highlight the hazards in construction industry. The study involved with 6 major groups to study physical, chemical, biological and physiological hazards. 50 contractors and 5 building construction sites concluded that noise, electric shock as major physical hazards cement dust and sand are chemical hazards. The study reveals that mosquito bites was the major biological hazard. prevention can be done by using pesticides, swampy filling are required at construction sites.



**Assegaf et al (2021)** reported that lack of awareness among construction workers in the workplace and work safety shall be increased in Indonesia. Sanitation facilities, latrines, toilets, handwashing units, bathroom constructions need to developed .This work mainly focuses on analysing of OHS risk assessment the assessment was ranked in two levels , low risk and medium risk according to the materials and equipment available . moderate risk of 6.57 in installation of WWTP (waste water treatment plant) , surface uneven condition in Pondok pesantren Darullshah Islamic Boarding school and dig hole falling risk at Nahdotus Shibiyan Islamic Boarding school

### **Methodology:**

The present study is mainly in the construction sites, where different construction activities involved. The methodology adopted is on-site survey during work-time of the construction workers at construction sites. Construction workers are exposed to various biological hazards in around their work area involved .

The following are the various organisms causes the biological hazards in construction sites.

- 1) Animal and animal waste
- 2) Bacteria and Biological toxins
- 3) Mold and fungi
- 4) sting animals or insects.
- 5) Vectors and rodents
- 6) Organic matter decomposition
- 7) Contaminated waste
- 8) Improper sanitation and dampness.

### **Animal and Animal waste.**

Animals like street dogs move continuously on the roads and enter the construction area and especially during night times may sleep and sometimes attack on the construction workers spreads diseases like rabies etc.

Pet or security dogs at construction sites cause bites or scratch wound to the construction workers.

Secondary infections – improper cleaning or treat of wounds causes spreads the bacterial infections in the body of the worker.

Animal waste like animal urea and excreta is disposed of on the materials stored on the street and adjacent street. workers directly get contact with these animal waste during material transport causing disease spreading.

### **Microbes:**

Bacteria is a single celled microorganism that affects the human body in different ways depending on the person's immunity system. The infections caused by the bacteria can be of two types. localized infections like specific body parts or organs. Examples are urinary tract infections, skin infections etc.. Systemic infections mean bacteria can enter the bloodstream, causing systemic infections that affect multiple organs. This can lead to conditions like sepsis, a life-threatening response to infections.

some bacteria produce toxin that cause poison. Clostridium botulinum produces botulinum toxin, causing botulism.

Bacteria directly affects the immune system causes inflammation and affects the tissue damage.

Some invasive Bacteria like Mycobacterium tuberculosis can damage lung tissue in cases of tuberculosis.

Some types of Molds are known to cause infections can affect the skin, eyes, lungs, or other organs., do not affect healthy people. Affect most less immune people. High exposure to Molds causes asthma. fungi causes some types of allergies and causes toxic reactions to the body .it also causes skin irritation, headache and nausea .At construction sites fungi can be grown in more damp places such as floor laying , curing of walls .



Microbes cause food illness and contaminate the food and develops problems in digestive system  
Water stagnation places helps to the grow of bacteria and protozoa cause inflammatory bowel diseases.

### **Insects:**

Termites are the wood destroying insects lives in the wood cellulose, it helps to grow moisture and leads to the development of fungi, causes respiratory infections. Termites chew electrical cables that may leads to electrical hazard.

Wasps and honeybees are the commonly seen sting animals build their combs on the trees adjacent to street roads near to construction sites.

Ants and white ants at construction sites and demolish buildings build their nests and disrupt the work

Dust mites absorb moisture from air, cannot survive in low humid places. Dust mites impact the health of the worker by asthma, and allergic to mites. It has mild to severe allergic symptoms and responsible for causing asthma. Occupational runny nose, watery eyes, sneezing cough, congestion facial pressure, severe asthma attack. The quality of air should be increased by removing the inhaled particles.

### **Vectors and rodents and reptiles**

Vectors and rodents will transmit diseases from one host to another. These cause vector borne diseases. Mosquitoes cause malaria, fleas cause plague etc. Commensal rats, also called construction rats, commonly live in place association with humans. Roof rats (*Rattus rattus*) move in construction sites on the scaffolding and climbers. These rodents' urine is very infectious, and their bites spread pathogenic diseases. Reptiles like snakes, mostly seen at a place with thick jungle, thick grass grown on the sides, Most of the reptile bites leads to the death of an individual. Construction workers during their work-time and in most of the construction activities move in the ground-level have a chance of affecting from these rodent and reptiles bites.

Scaffolding laying at different levels makes the rodents like commensal rats cause the worker the rodent bites.

### **Organic matter decomposition**

Some animals and birds die and decompose themselves on the ground. Decomposition takes place due to microbial activity. Some flies lay eggs, larvae on these decomposing matter for multiplying their number. Some of the blood and fecal matter settle on the ground and cannot be visible. Workers in some construction activities who get direct contact with the soil will be affected.

### **Contaminated waste.**

Contaminated waste is the waste which contains hazardous agents and infectious agents. Improper handling of these contaminated waste causes chronic diseases.

### **Improper sanitation and dampness.**

Improper sanitation and poor management of the construction sites leads to the exposure of pathogens into a worker. Pathogens are the disease-causing microorganisms that may enter the host from various sources from intake of contaminated water and food. Urinal and human solid excreta etc. Stagnation of waste in and around the sites develops the larvae of flies and mosquitoes causes an unpleasant environment in the sites

Dampness in the construction site promotes the growth of molds and fungi, release the spores into the air, inhalation of these spores cause respiratory irritation causes discomfort to the workers during work-time



Table 1: The following are the various construction activities and their workplace.

Sl.no	Construction activity	Workplace	Location
1.	Excavation	Open place with or without boundaries, thick jungle, weeds , cave -ins	open to atmospheric condition
2	Laying of Foundations	Open place with no protection walls, exposed to free movement	open to atmospheric condition
3	Bar cutting	Done at ground level and street sides.	open to atmospheric condition
4	Column shuttering	Done at different levels	open to atmospheric condition
5	Bar bending	Mostly done at ground levels	open to atmospheric condition
6	Concrete pouring &mixing	Done at different levels of building construction	open to atmospheric condition
7	Removing column shuttering	Done at different levels of building	open to atmospheric condition
8	Brick work Laying	Done at different levels of building	Both from inside and outside of the construction area
9	curing	Done at different levels of building	Both from inside and outside of the construction area
10	Lintel work	Done at different levels of building	Inside the construction site
11	Flooring	Done at different levels of building	Inside the construction site
12	Electrical work	Done at different levels of building	Inside the construction site
13	Plumbing work	Done at different levels of building	Both from inside and outside of the construction area
14	Plastering work	Done at different levels of building	Both from inside and outside of the construction area
15	Painting work	Done at different levels of building	Both from inside and outside of the construction area
16	Carpentry work	Done at different levels of building	Both from inside and outside of the construction area



Table 3: Different Biological hazards, their affects and preventive measures

Sl.no	Biological hazard	Affects	Preventive measures
1	Animal bites	Wound injuries, Bacterial infections, Rabies transmission, tetanus risk Scarring and disfigurement, secondary infections	Avoid feeding of stray dogs, proper disposal of food waste in construction sites. pet dogs will be thoroughly vaccinated. Avoid provoking or any interaction with dogs. Provide a proper fencing around the construction are to avoid the entry of street animals .
2	Microbes	Some microbes spread localized infections such as urinary tract infections, respiratory problems pneumonia.  Microbes like fungi causes ring worm, candidiasis.  Viral infections such as influenza, covid -19  Spread of some bacteria and protozoa causes chronic inflammatory diseases	Prevent stagnant water places in the construction sites.  Construction sites should not contain dampness places.  Encourage the workers to use Mask or respiratory PPE and hand PPE to avoid spreading.  Bathrooms and disposal excreta should be properly cleaned to avoid bowel infections.
3	Sting animals, bites,  Termites  Dust mites	Sting animals like wasps, honeybees, bites develop localized pain, redness and have swelling nature, breathing problem or anaphylaxis. Wasp's sting contains venom a poisonous substances transmits from wasp to human body causes localized irritation  Termites such as ants and white ants cause painful stings, itching and burning sensations to the workers and doesn't cause harm to the human beings.  Dust mites causes asthma, and allergic. it has mild to severe allergic symptoms and responsible for causing asthma. occupational runny nose, watery	Avoid perfumed sprays, attracting smelled trees and fragrance flowers at construction sites to avoid sting animals at construction sites.  Avoid Direct contact with soil with proper usage of hand and foot protection. destruction of ant homes on the floors of construction sites etc  Dust mites can be decreased by proper maintenance of construction site. where respirable dust and dust particles must be decreased.



	Mosquitoes and flies	<p>eyes, sneezing cough, congestion facial pressure, severe asthma attack.</p> <p>Breed of mosquitoes and flies' developments larvae and spread the diseases like malaria, filaria</p>	<p>Reducing of humidity inside the construction sites can decrease the dust mites.</p> <p>Avoid water stagnation in the construction sites, avoid late and dark place works, providing proper ventilation inside the sites , covering of dust bins , avoid open disposal of human excreta and animal excreta.</p>
4	Vector bites	<p>Norway rat bites causes serious infectious disease caused by the bacterium Streptobacillus moniliformis. Serious infectious disease caused by the bacterium Streptobacillus moniliformi, includes fever. chills, joint pains It Causes Pasteurella bacteria are commonly found in the mouths of rodents.</p> <p>Rat bites causes tetanus risk that affects the nervous system</p>	<p>Proper rodent control should be recommended. covering of waste disposal and garbage in construction sites should be covered. Protective gear should be recommended to the work</p>
5	Dead birds and birds dropping	<p>Bird droppings causes respiratory related diseases. The bird droppings are moist and allow to grow bacteria and fungi and spread widely, that come in contact with hands and to nose cause various infections and reach inside the human body.</p> <p>Pigeon droppings causes Histoplasmosis, fungal infection Candidiasis, pulmonary disease called Cryptococcosis which affects the central nervous system.</p> <p>Histoplasmosis is an infection caused by breathing in spores of fungus found in bat and bird droppings</p> <p>St. Louis Encephalitis, an inflammation of the nervous system, usually causes drowsiness, headache and fever.</p>	<p>Wear a respirator that can filter particles as small as 0.3 microns. Wear disposable protective gloves, hat, shoe coverings. Moisten the droppings with a light mist of water to keep spores from becoming airborne and keep them wet.</p> <p>Bird nettings acts as physical barriers. obstructing the birds to access and roosting providing bird spikes etc are the control of birds movements and bird droppings in construction sites</p>

		<p>Candidiasis is a yeast or fungus infection spread by pigeons. The disease affects the skin, the mouth, the respiratory system.</p> <p>Dead birds with the help of moisture and microbes start decomposing and release toxic organisms to humans in air . infectious blood strains and blood droplets contact with persons spreads various types of infections</p> <p>Dead birds attract the other animals like dogs, cats etc causes danger to people in and around the site .</p> <p>Droppings, feathers, food and dead birds under a roosting area can breed flies, carpet beetles and other insects that may become major problems in the immediate area.</p>	
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- The construction activities which are done at ground level will have various biological hazards like effect of animal waste, microbes, vectors, rodents and dust mites.
- The construction activities which are done at various levels in construction sites and scaffolding works prone to biological hazards like effects of animal waste , sting animals , microbes , Norway and roof rodents , bird and bird droppings .



Fig(a) Improper storage of materials



Fig (b) contaminated and hazardous waste

Fig (c) improper sanitation



Fig (d) Honeycomb adjacent to construction site

### 3. Conclusions:

Construction workers health and safety is the primary consideration for the success of the project. Figure (a) explains that storing (or) dumping of the materials in and around the construction site makes the reptiles and rodents to live and causes a biological hazard to the worker involved during loading of these materials. Fig (b) shows storing hazardous materials like ladders, paint drums etc causes a risk of spreading contaminated diseases. Fig (c) improper sanitation causes breeding of mosquitoes, flies may spread vector borne disease. Fig (d) honeycomb on the street tree adjacent to construction sites, laying and working on the outside scaffolding works have a risk of honeybee comb. Measures like providing a boundary to the construction sites to avoid direct contact with adjacent street to avoid animals and street dogs entering the site. Proper and good sanitation helps the worker to protect from vectors and pathogens. Providing and using PPE (Personal Protective equipment) helps the workers to protect themselves from reptiles, animals etc to a extent. Workers working on the scaffolding should be provided with proper body harness to avoid slipping and falling during the time of honeybee attack to avoid a hazard. Self-hygiene and self-protection are very important for a worker to protect themselves from various hazards.

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