ASSESSMENT OF HEALTH SAFETY PERFORMANCE AND ANALYSIS OF ERGONOMIC RISK FACTORS IN CONSTRUCTION SITE

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Abstract— **Original Paragraph:**

The study on ergonomics makes the engineer or the managing person arrange the machinery, tools, skilled labourers, and their environment in order and conventional to complete the task effectively. To intensify the success rate through ergonomics, there should be good communication between the managing level and workers level. In the construction field, even with safety precautions, workers still face stress due to health and mental issues. This paper discusses the risk factors affecting communication between top and bottom levels in various psychological and administrative aspects. It also analyzes ergonomics measurement through a questionnaire survey conducted on five construction sites, along with remedial measures and challenges in implementing ergonomics. The proper implementation of ergonomics is explained through a recommended flowchart for both administration and workers in the construction field.

Ergonomics, which focuses on arranging tools, machinery, and the work environment for efficiency, is crucial in the construction industry. Effective communication between management and workers is key to its success. Despite safety precautions, construction workers often experience stress related to health and mental issues. This paper explores the factors impacting communication between management and workers, examines ergonomics through a survey on five construction sites, and discusses solutions and challenges in implementing ergonomic measures. The recommended flowchart aims to guide both administration and workers in implementing ergonomics effectively in construction.

I. INTRODUCTION

The Construction Industry which is one of the unavoidable industries involves mass workers working together at different stages in the environment where high significance needs to be provided in the areas of safety and health criteria. Most of these occupational groups face musculoskeletal disorders. Young workers face this problem due to their work in the same posture for a long time. Due to their routine work, construction workers have discomfort and suffering in the shoulders, back, neck, legs, and in some parts of the body. With the economic status of the workers, they choose the local remedies to get rid of these physical discomforts.

However, sometimes the construction workers become unfit for work due to this MSD problem. In simple words, Ergonomics may be defined as a study on arranging and managing the source of construction such as equipment, machineries, facilities, environment and even skilled labors such that achieving the results in a contentment manner. The word ergonomics is a Greek-derived word, in which Ergon stands for the meaning ‘‘Labor” and Nomos stands for the meaning ‘‘Study of”. Occupational Safety & Health Administration (OSHA) insists the employers to provide an environment in safety and in a comfortable way to work. Ergonomics helps in finding a way for employees to work in a danger-free zone environment. The employer is mainly responsible to provide the environment in a suitable safe manner to work and even employees should maintain the habits which make them feel healthy and comfortable. Proper Ergonomics should be designed in order to prevent the occupational workers to prevent from some muscular pains and injuries. If Ergonomics is not properly maintained, then the workers face a threat in their life due to musculoskeletal disorders.

II. LITERATURE SURVEY

A large number of research papers based on ergonomics have appeared in the published literature during the past decade. This research paper investigates work-related problems that exist in the construction industry. The risk factors, timings of work and environment of the workplace have been discussed in the literature.

Behnam Asl et.al (2013), analyzed the musculoskeletal disorder for steel bar benders. The work of steel bar bending has been considered to be noteworthy in the construction site as it involves four to six hours of work in awkward posture and close contact of eyes of swarf. Nordic Questionnaire, a standardized method has been carried out with twenty samplers to investigate the musculoskeletal symptoms. The prolonged working postures. become a threat to the employees. They analyzed the action involved in bar bending from picking up the rebar to bending of rebar, the time taken to complete each activity and the posture of the employee during each action of work. They consummate by giving suggestions to the employers to design the workplace with good lighting and ventilation, providing breaks and to provide training to workers to make them skilled and to prevent them from injuries.

Atishey Mittal et.al (2013) suggested activities to improve the ergonomics by adopting better communication by conducting regular meetings with high authorities and the workers, giving clear ideas about the structures, designing the workplace with good lighting, ventilation and environment, providing safety tools to avoid injuries and

effectively working. They also suggest that giving good knowledge by educating makes the workers to understand the job better. They initiate the employers to have insurance on lower premiums to workers which indirectly make reliable feel to the workers on the organization.

For a comprehensive literature review, it is advisable to search academic databases, journals, and conference proceedings related to automotive safety, IoT, wireless communication, and sensor technologies. Additionally, considering the rapid advancements in technology, it's essential to look for recent research papers and publications to stay updated on the latest developments in accident-avoidance systems.

III. Problem Statement

Construction industries are widely practiced in all over the developed and developing countries. The construction industry is very dangerous. The performance of the industry in occupational health and safety is very humble. The standard of occupational health and safety is even worse in developing countries. In developed countries, recent advancements in technology, on the one hand, has contributed positively to industry productivity, but on the other hand, it has created a more challenging and unsafe work environment. Every construction worker is likely to be temporarily unfit for work at some time as a result of a significant injury or a health problem after working on a construction site.

Developed countries use different technologically advanced materials and personal protective equipment (PPE) like safety shoe, belts because they are exposed to different problems. If the laborers are exposed to such problems they may lose their life, money, and body parts. Because of, the injury of the worker or labor the country also loses the economic benefit required from individual workers or laborers.

Industrial safety and health problems are becoming major challenges in Ethiopia because of low occupational hazard awareness, lack of workplace safety and health policy, and inefficient safety management systems, due to these factors employers, workers, and the government are incurring measurable and immeasurable costs.

This research aims to assess the performance of the use of safety materials and personal protective equipment (PPE) in construction industries and also assess Ethiopian legislation concerning construction projects in order to keep the safety and health of workers to increase the income gained from the construction industry. In this study, appropriate measures also recommended based on the findings from the case study.

IV. METHODOLOGY

The study was conducted in order to investigate the knowledge and application of ergonomics in the construction field. The use of questionnaire made the whole study easier to know the basic information on ergonomics assessment. Both grading scale and subjective rate scale has been adopted to know the situation in the construction field clearly. The grading scale involves with the like scale with 1 = Strongly agree, 2 = Agree, 3 = Disagree, 4 = Strongly disagree. The subjective scale is useful in order to get the information in detail and to know the risk factors clearly. The methodology adopted throughout the study has been represented
in Fig. 1.

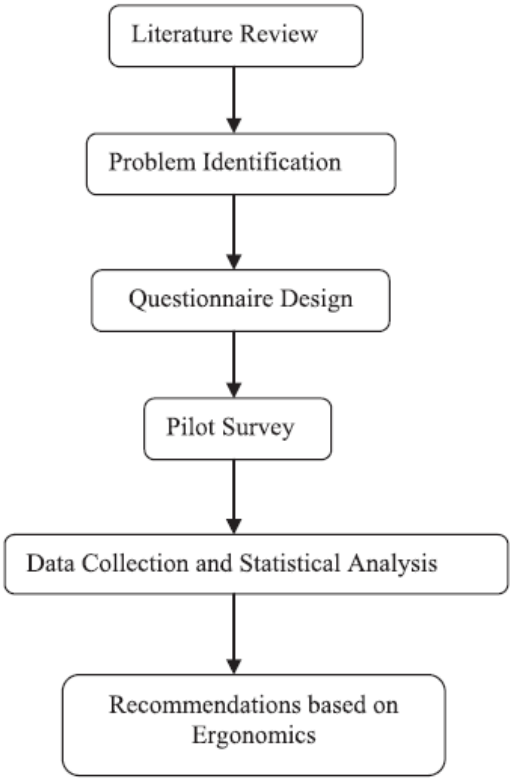

Fig. 1. Methodology.

V. Significance of Ergonomics

In the current scenario, construction workers were involved in various stages of work in the field and exposed to health and mental challenges. Ergonomics is the study that is helpful in creating the consciousness to the workers regarding the health and mental issues they face in their work. Ergonomics also improve the efficiency of workers by providing the training programme and guiding them in warm-up exercises which make the workers to work without any pain in their body and also to work in a safe environment.

This makes the employers to be satisfied as it
a) Increase productivity
b) Reduction in accidents and injuries, in turn reduces compensation amount

The employee also benefits as this
a) Reduce the mental stress of the worker

b) Reduce musculoskeletal pain
c) Increase the efficiency, making them to work hard without absenteeism
d) Major accidents and injuries have been reduced
e) Increased confidence level

Overall, the organization and the workers will recognize the early symptoms of musculoskeletal pain and can reduce the basic risk factors that lead to the project completion of an organization efficiently.

VI. QUESTIONNAIRE INFORMATION

The interview was done with workers collecting the basic information with the following aspects
1. Personal Information: It covers the basic information such as Gender, Age, Marital Status, Family size, and any other family member working conditions in the family
2. Health Issues: It covers whether they face any breathing problems, heart pain, asthma, sugar, blood pressure
3. Nature of Job: Type of activity, time of work, Load they carried
4. Others: Food intake, Scheduled breaks, Holidays, Overtime, welfare
Amenities With these as primary information, basic health test have been carried out to note the weight, and height of the individual, and their blood pressure has been also noted.

VII. RISK FACTORS IDENTIFICATION

With the help of a Questionnaire survey, the Ergonomic risk factors that contribute to stress in workers have been identified. The risk factors were categorized into Administrative risk factors, Environmental risk factors, Health-related risk factors, and Miscellaneous Risk factors. To provide a safe and comfortable environment for the workers, every behavior of workers, machines, tools and activities was understood shortly. The Characterized Risk Factors have their features which have been tabulated.

In the construction industry, workers need to work in different sites at different shifts to perform their activity which leads in stress for workers when working in a prolonged manner. To prioritize the indicators involved in this survey, the Relative Importance Index (RII) is used. RII is selected as the tool to work with Likert scale. Four scale rating (1 = Strongly agree, 2 = Agree, 3 = Disagree, 4 = Strongly disagree) was involved in this questionnaire study on ergonomics which made the survey easier. From these results, the graph representing the risk factors and their averaged rating.

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