Addis Ababa University

School of Commerce

Assessment on Safety Practices of Addis Ababa Road Construction Projects

By:
Betelehem Bekele

Project Work Submitted in Partial Fulfillment of the Requirement for the award of Masters of Art Degree in Project Management

Advisor: Abraraw Chane (PhD)

July 2019

Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

Assessment on Safety Practice of Addis Ababa road construction Projects

By: Betelehem Bekele

Approval Board Committee:

Dr Abraraw Chane	_____	_____
Research Advisor	Signature	Date
Dr Webeshet Bekalu	_____	_____
Internal Examiner	Signature	Date
Dr. Dereje T.	_____	_____
External Examiner	Signature	Date

Declaration

I, the undersigned, declare that the study entitled "Assessment on Safety practices of Addis Ababa Road Construction Projects" is the result of my own effort and study that all sources of materials used for the study have been acknowledged. I have conducted the study independently with the guidance and comments of the research advisor.

This study has not been submitted for any degree in any university .It is conducted for the partial fulfillment of the Master of Arts Degree in Project Management.

_____ _____

Betelehem Bekele Date

Letter of Certification

This is to certify that Betelehem Bekele has conducted this project work entitled “Assessment on Safety practice of Addis Ababa Road Construction Project” is under my supervision.

This project work is original and suitable for the submission in partial fulfillment of the requirement for the award of Master of Arts Degree in Project Management.

Dr Abraraw Chane _____ _____

Advisor Signature Date

Acknowledgements

I would like to thank my advisor Dr. Abraraw Chane for his remarkable advice and guidance in this study. In addition, to this I would like to express my appreciation to all participants and individuals who directly or indirectly provided the necessary materials and support for the realization of this thesis.

Abstract

Although proper safety management in construction is of utmost importance; evidence suggests that safety is not adequately considered in many developing countries. Hence, the objective of this study was to assess safety practice in road construction projects in the city of Addis Ababa. Questionnaire survey was used to collect data on safety practice in Addis Ababa road construction projects. A total of 83 questionnaires were distributed in three projects that were run by local Contactor, Chinese Contractor and own force project (the client act as both client and contractor and 83 responses were received. The data was analyzed using quantitatively descriptive statistics Microsoft Excel & SPSS. Consequently, the study result revealed that the safety practices of Addis Ababa road construction projects are not up to expectation. The constraints in implementing construction safety in Addis Ababa road construction projects are lack of personal protective equipment's, lack of top management commitment in safety programs, insufficient safety budget, lack of safety supervisor on site and ineffectiveness of current safety policies are the top five. Falling in to excavated pit, falling in to hot asphalt(leg or hand burn), falling from scaffolding, nail piercing, car/truck overturning, hit by equipment's/machinery, rock/ soil slide is and machinery accidents in loading and unloading are frequently occurring accidents that respondents identified in Addis Ababa road construction projects. Hazardous procedures, on or around machines or equipment's, unavailability of PPE; inappropriate PPE design, improperly guarded areas, lack of safety plan/ risk identification, lack of safety training/ lack of awareness and ineffectiveness of current safety policy are the contributing factors to the occurrence of accidents on the road construction sites in Addis Ababa.

Key words: safety practice, road construction project,

Acronyms

HS	Health and safety
OHS	Occupational health and safety
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
CSFs	Critical Success Factors

Table of Contents

List of Figures

List of Tables

CHAPTER-ONE: INTRODUCTION

1.1 Background of the Study

Globally, construction is one of the most hazardous industry sectors with many thousands of workers being killed and seriously injured each year. Worldwide occupational injury rates in construction are highest for all major industries (Lehtola et al 2008). Construction is always risky because of outdoor operations, work-at height, complicated on-site plant machinery and equipment operation coupled with worker's attitudes and behaviors towards safety (Choudhry and Fang, 2007).

Construction safety on project sites is of utmost importance due to the nature of the construction industry. However, it is usually a secondary concern in a market-driven society where the main concern is completing projects at the required quality with minimum time and cost. Thus, safety issues are considered only after an accident occurs at a construction site with follow up measures to improve working conditions, especially in developing countries (Toe, E., F. & Chong, A., 2005).

Construction hazards are generally classified in to four distinct categories which include job site conditions (nature and physical layout); equipment and materials; human; and management factors (Pipitsupaphol and Watanabe, 2000). The importance of the human element is highlighted by the role of errors and omissions in catastrophic system failures and occupational accidents (Lingard and Rowlinson, 2005). Management hazards such as poor training and lack of appropriate safety protocols are also considered important in the causation of accidents in construction.

It is commonly known that accidents have serious implications to the construction industry both in financial and humanitarian terms. Construction accidents may cause many problems, such as demotivation of workers; disruption of site activities; delay of project progress; and adversely affecting the overall cost, productivity and reputation of the construction industry.

Health and safety risks are needed to identify, assess, and take certain action to eliminate or minimize the probability of occurrence. In order to reduce the accident or incident level and subsequently cut losses, it is important to ensure that safe working practice is being observed (Radhlinah, 2000).

Accident is the main issue to consider in any industries, construction industry is no exception. It is a high-risk industry that covers a wide range of activities involving construction, modification, and/or reparations.

A research shows that the major causes of accidents are related to the unique nature of the industry, human behavior, difficult work site conditions, and poor work site management which results in unsafe work methods, equipment and procedure.

The nature of the construction work is dangerous and risky which make safety issues to be considered and advocated the idea that safety of persons are no luxury but a necessity, (Tam, et al., 2004).

A construction contract is signed between a client and a contractor or between the main contractor and subcontractors if any. The provisions of a contract mainly deal with what the client requires. Time, cost, and quality are commonly recognized as the three most important measures of project management success, and they are normally all a client requires. In fact, the standard conditions of construction contracts deal mostly with these three matters. The selection of construction procurement strategies is also based primarily on these criteria. The difference of various procurement methods lies largely on the different level of emphasis placed on each of the factors. For instance, when time is more important, strategies facilitating an overlapping of the design and construction phases are often proposed. When cost is more important, lump sum contracts are proposed. Standard forms of contract have detailed provisions on controlling quality, including specifying, checking, and inspecting materials and workmanship. But in all this safety tends to receive less attention. As it is a standard construction industry in all over the world follow the Ethiopian construction industry is no exception.

Accident is the main issue to consider in any industries, In the absence of the correct safety measures in road construction sites, accidents will continue to occur and can result in severe injuries. Researches show accident rates closely correlate to the level of activity within the industry, indicating that when work load is high, safety tends to receive less attention. The dangers faced by construction workers are alarming. Although, many accidents and ill-health problems remain unreported in Ethiopia there is concern that existing situation is alarming.

1.2 Statement of the Problem

From practices and experience it is confirmed that most construction companies in Ethiopia have no well-articulated and developed risk policy and response plans. As a result, in most construction industry adequate measures of safety in the sites have not been put in place and also various challenges are encountered in the management of safety. At construction sites numerous accidents/ injuries which result to hospitalization and absenteeism are viewing. Most of road constructed in Addis Ababa are constructed parallel to the traffic, pedestrian and around living areas it make the sector more prone to accident but the attention given to preventive and protective measures is much less. The driving force to study the selected area came from personal observation that safety in general not given the attention that it needs, PPEs are not applied on construction sites widely, efforts to implement the same have not been effective, no use of proper safety barriers and warning tapes around excavated area, no proper application safety barriers for light traffic and heavy traffic to minimize risk on highway work and users. And also, to differentiate the frequently occurring accidents and their major causes road construction projects. The research put forwarding solution for the combined sum of problems stated related to safety in Addis Ababa road construction sites and the expected expansions of road construction, and the need for effective safety management in Addis Ababa road construction projects.

1.3 Research Question

- What are the current safety practices in Addis Ababa Road Construction Projects?
- What are the constraints in implementing construction safety in Addis Ababa road construction projects?
- What are frequently occurring accidents in Addis Ababa Road Construction Projects?
- What are the major causes of accident in Addis Ababa Road Construction Projects?

1.4 Objective

1.4.1 General Objective

Main objective is to assess safety practices in Addis Ababa road construction projects.

1.4.2 Specific Objectives

- To assess the Safety Practices in Addis Ababa Road Construction Projects.
- To identify the constraints in implementing construction safety in Addis Ababa road construction projects.
- To identify frequently occurring accidents in Addis Ababa Road Construction Projects.
- To find out the major causes of accident in Addis Ababa Road Construction Projects.

1.5 Significance of the Study

The study is expected to provide multitude of purpose for the Client (Addis Ababa City Road Authority), Consultants and Contractors to make informed decision towards improving Safety practices in the road construction projects. Also, the assessment will be useful in providing information in terms of current safety practices in Addis Ababa Road construction sites.

Also, preventing accidents is the main significant point to improve the safety in the construction industry and that can be achieved by increasing the awareness of all concerned persons and by identifying areas of safety deficiencies in construction industry.

1.6 Delimitation of the Study

The study is limited to

- The Safety aspect of Occupational safety and health, the health issues are not covered in this study because the impact of health is long term.
- the execution phase of road construction in Addis Ababa, not included the after construction period
- the Road Construction projects in Addis Ababa
- Sample roads that are currently under construction.

1.7 Research Methodology

To successfully achieve the research objectives and answer the stated research questions, this study will used descriptive research approach. Primary data source was used. The primary data was obtained through interview and questionnaires. The targeted population was selected from the road projects from Addis Ababa which are at the construction stage. Descriptive statics will be the major technique of statically analysis using SPSS and Microsoft Excel spreadsheet.

1.8 Organization of the Report

This research report has five chapters. The first chapter deals with the introduction, background of the study, statement of the problem, objectives of the study and other relevant introductory issues. The second chapter focuses on literature review. The third chapter deals with the research design, approaches used throughout the data collection and analysis process. The fourth chapter presents the overall finding of the study and the last chapter, chapter five encompasses the summary of finding, conclusion and recommendation part of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter deals about different literatures' which was conducted on the area that provides the theories used for this research. Most of the literatures' discussed here under are conducted on different countries and situations to ascertain the fact that construction site involves a lot of activities and participants, and to understand the process and the interacting elements in construction safety.

2.2 Theoretical Review

2.2.1 Definitions of Safety

Occupational safety and health is an area concerned with the development, promotion, and maintenance of the workplace environment, policies and programs that ensure the mental, physical, and emotional well-being of employees, as well as keeping the workplace environment relatively free from actual or potential hazards that could injure employees Nyirenda V, Chinniah Y, Agard B (2015).

Occupational safety and health is a discipline dealing with the prevention work related injuries and diseases and the protection and promotion of the health of worker it aim at the improvement of working condition and environment.

Occupational safety and health (OSH) in construction is generally defined as the science of the anticipation, recognition, evaluation and control of hazards arising in or from the workplace that could impair the health and well-being of workers, taking into account the possible impact on the surrounding communities and the general environment.

Safety Defined as the fact of being free from danger or risk or to take safety precaution or safety measures to make sure something safe (Dictionary of human resource and personnel management 2003). According to (Mwombeki, 2005) safety defined as the condition of being protected against any type of events (accidents) which could be considered non-desirable by controlling hazards to achieve an acceptable level of risk.

Also accident defined as some sudden and unexpected event taking place without expectation that causes injury, damages or death. (Mwombeki, 2005)

Anton (1989) defined a construction safety program as ‘‘the control of the working environment, equipment, processes, and the workers for the purpose of reducing accidental injuries and losses in the workplace.

2.2.2 Construction Safety in Ethiopia

The construction sector is a major contributor to the Ethiopian economy and it’s one of the fastest-growing sectors. Adane MM, Gelaye KA, Beyera GK, Sharma HR, Yalew WW (2013) said that developing countries like Ethiopia are striving hard to improve their basic services by building schools, hospitals, housing complexes, shops, offices, highways, power plants, industries, bridges and other infrastructures. However, all these construction activities are carried out by unskilled labor forces at cheap rate. Occupational injuries and accidents among these workers are high due to illiteracy, poverty, lack of health and safety training and information on health hazards and risks at the work place. Such workers are known to face rapidly changing workplaces, a high degree of competition and attacks of unemployment.

As the emerging sector of Ethiopian economy, the status of the construction workers particularly their safety condition should be given emphasis and the safety of the working environment should be maintained. In spite of the significant rate of increment in the industry over the past decades, only few studies have been conducted to investigate the occupational safety and health status of workers working in the construction industry. (Hanna Mersha, Seid Tiku Mereta and Lamessa Dube, 2016).

Therefore, in developing countries the occupational health and safety hazards faced by construction workers are greater than those in industrial countries. The impact is also 10 to 20 times higher in these counties, where the greatest concentration of the world’s workforce is located. (Dong, 2005).

The poor safety practices among road construction workers in Ethiopia are because of unsafe conditions such as not having accident prevention tags as a temporary means of warning employees of an existing hazard and not having accident prevention warning tapes around deep excavated areas, hazardous procedure in, on or around machines or equipment’s such as equipment operators shouldn’t move equipment without making eye contact with workers in the vicinity, not having well trained and experienced flaggers which should keep enough distance

from other highway workers to ensure they can be distinguished by passing motorists. Flaggers should also not use good sight communication or two-way radios to communicate with fellow flaggers, insufficient light in working night shifts, lack of personal protective equipment and inadequate training of workers. Also unsafe working environments are the major cause of most workplace injuries, individual related factors such as young age, lack of formal education, lack of experience, job dissatisfaction, lack of physical exercise, extended working hours, night work and non-use of personal protective equipment are essential factors (Wong, 1994; Huang and Chen, 2002; Chau et al., 2004; Bresciani et al., 2012, Dong et al., 2015). About three-fifth of construction workers are not sure whether they have to wear protective equipment on the construction sites. They felt that it is inconvenient and uncomfortable when wearing protective equipment at work (Griffin and Neal, 2000).

2.3 Empirical Review

2.3.1 Factors Affecting Safety in Developing Countries

Safety in developing countries in particular is often at much lower levels mainly due to an absence of strict safety regulations. In developing countries, safety rules hardly exist and can often not work appropriately and effectively. This problem is generally due to the lack of effectiveness of the authority in implementing safety rules and programs (Hinze 1997). Some research findings from developing countries also apply to Ethiopian construction sites. Kartam et al. (2000) have observed, at Kuwaiti construction sites, that the problems arise due to disorganized labor, poor accident record-keeping and reporting systems, extensive use unskilled laborers, a lack of safety regulations and legislation, the low priority given to safety, the small size of most construction firms, and competitive tendering. Tam et al. (2004) conclude from their research of Chinese construction companies that the main factors affecting safety performance include top management's poor safety awareness, lack of training, project managers' poor safety awareness, reluctance to input resources for safety, and reckless operations. One study in Taiwan (Cheng et al. 2010) also identified problems that included not valuing the importance of safety measures implemented at workplaces, not giving sufficient safety education to new workers, and not hiring well-trained safety personnel to implement safety measures.

2.3.2 Safety Management Program

The objectives of safety programs in construction firms were identified by Rowlinson (2004) as to:

(1) Prevent unacceptable behavior that may direct to accidents;

(2) make sure the improper behavior are discovered and reported; and

(3) Ensure accidents are reported and handled accordingly.

Safety programs contain many elements such as safety policies, safety committees, safety training, accident investigations, in house safety rules, safety incentives programs, control of subcontractors, personal attitude and perception, personal protection equipment, emergency planning, safety promotions, safety record keeping, and job hazard analysis (Anton 1989; Rowlinson 2004).

Within the construction context, a great deal of research has been conducted to identify critical factors associated with safety management. Aksorn ; Hadikusumo (2008), revealed 16 critical success factors (CSFs) related to construction safety programs implementation in Thai and highlighted Management Support as the most dominant factor. Following Aksorn and Hadikusumo (2008), Al Haadir, S. and K. Panuwatwanich (2011) classified these factors into four groups, namely: (1) worker participation; (2) safety prevention and control system; (3) safety arrangement; and (4) safety commitment. These summarized in the table below:-

Table 1- CSFs in safety implementation (Al Haadir, S. and K. Panuwatwanich 2011)

S.N	Groups	Factors	Rank according to Al Haadir, S. and K. Panuwatwanich (2011)
1	worker participation	Personal Attitude	3
		Personal Motivation	13
		Safety Meeting	10
2	safety prevention and control system	Efficient Enforcement System	5
		Suitable Supervision	7
		Safety Training	6
		Equipment and Maintenance	12
		Personal Competency	15
		Program Evaluation	11
3	safety arrangement	Communication	14
		Allocation of Authority and Responsibility	8
		Adequate Resource Allocation	9
4	safety commitment	Management Support	1
		Teamwork	4
		Clear and Reasonable Objective	2

Based on the above findings, the study highlighted key areas for successful safety program implementation can be concluded as top management has the most significant role in supporting the successful implementation of safety program in construction projects. This should also be supported by having established clear goals and targets and teams of staff with the right attitude towards construction safety. Finally, successful safety programs implementation would need an effective enforcement plan, appropriate supervision and safety training and education.

2.3.3 Top Management Support

It is evident that management plays a very important role in an efficient and effective safety program. Management must fully and actively translate ideas into safety actions, including issuing a written comprehensive safety policy, allocating sufficient resources, promptly reacting to safety suggestions and complaints, attending regular safety meetings and training, regularly visiting the workplace, following the same safety rules as others, etc.

Top management commitment to safety should have to be consistent for the successful safety programs.

2.3.4 Clear and Reasonable Objective

Safety programs can accomplish the desired results when safety goals have been clearly established. The safety goals should give a clear picture, direction and focus for performing day-to-day activities in order to reach desired results. When realistic and achievable goals are set up, the progress towards accomplishing such goals can be easily measured.

2.3.5 Personal Attitude

Attitude is a tendency to respond positively and/or negatively to certain persons, objects or situations and is normally built up through experience. Individuals, however, differ in their perception of risks and willingness to take risks. Successful safety programs can be achieved if the positive attitudes of employees toward safety are reinforced.

Employee attitude is useful form of safety measurement the more mature the safety attitude of employees the more likely would search for safer environments hence unsafe behavior would decrease (Schroder 1970).

2.3.6 Teamwork

A safety program succeeds when all concerned parties from top to bottom hierarchical levels realize that preventing accidents is everyone's responsibility. Every functional unit must cooperate in achieving the goals set by the team such as planning and controlling their works, handling day-to-day safety problems. Also improving safety should be seen as collective effort which requires cooperation from everyone involved.

2.3.7 Efficient Enforcement System

Efficient enforcement scheme should be developed and implemented by top management to ensure workers follow the safety rules and regulation.

2.3.8 Safety Training

A successful safety program can be achieved if all employees are given periodic educational and training programs in order to improve their knowledge and skills on safety at work. These training sessions can be conducted through various techniques like worker orientation, safety induction, toolbox talks, or communication programs. It may include topics such as worker rights and responsibilities, falls from elevation in the construction of bridges ,box or slab culverts , personal protective equipment, first aid and emergency procedures, confined space entry, equipment training on know how to maneuver around equipment and take all precautions for their own safety and that of others, improve visibility in moving around vehicle and a wide assortment of other topics, whether to be presented updated information or just to be provided as a refresher on a subject, (Hinze & Gambatese, 2003).

2.3.9 Suitable Supervision

A sound safety program requires employers to provide sufficient supervision in protecting workers form workplace hazards. Successful supervision requires competent personal to assign work in line with the workers' ability, appraise workers when they do jobs safely, communicate by listening and speaking, set a good example by following the same safety rules and correct arising safety problems.

2.4 Preventive and Protective Measures

The incidence of accidents and work-related injuries in most occupational sectors is still disappointingly high; there is therefore an urgent need for preventive and protective measures to be instituted at workplaces in order to guarantee the safety of workers. Occupational accidents not only cause great pain, suffering or death to victims, but also threaten the lives of other workers and their dependents. Occupational accidents also result in:

- loss of skilled and unskilled but experienced labor;
- material loss, i.e. damage to machinery and equipment well as spoiled products; and

- High operational costs through medical care, payment of compensation, repairing or replacing damaged machinery and equipment.

Workplace safety programs should aim at eliminating the unsafe working conditions and dangerous acts which account for nearly all occupational accidents and diseases. Prevention by eliminating or reducing the sources of potential risks and the causes that trigger hazards can be achieved in a number of ways: engineering control, design of safe work systems to minimize risks, administrative or organizational methods, and use of personal protective equipment.

2.4.1 Engineering Control

Engineering control involves controlling the hazard at the source. These can be done by:

- **Separate Workers from Traffic** – be sure to separate workers from traffic as much as possible; although some workers will need to be flagging traffic in the road. Flaggers should know never to turn their backs to oncoming traffic.
- **Establish Safe Traffic Flow –** To ensure that workers and vehicles move around the work site safely, it's vital to establish where workers can enter and leave the site. There should also be procedures for when construction equipment is backing up and where it could come into contact with workers.
- **Improve Visibility**- It's important to ensure as much visibility as possible for workers. If visibility is low, use spotters to look out for potential hazards. Use of reflective uniforms also helps improve visibility. Additional work lighting may be necessary in addition to reflective tape on equipment.
- **Use Proper Safety Barriers** – While light traffic might call for orange safety cones, heavy traffic may require barrels, or even temporary concrete barriers.
- **Ensure that Employees are Attentive around Moving Equipment** – It's important that employees never stand in front of or behind an operating vehicle since equipment can often block an operator's field of vision.
- **Make Sure Employees Wear Personal Protective Gear –** Construction workers should always wear appropriate protective gear such as hard hats, reflective clothing and steel-toed shoes.

2.4.2 Administrative or Organizational Controls

In supervising or managing a highway construction project, consider the following tips on how to keep highway workers safe with administrative controls

- **Complete a Risk Assessment** – A risk assessment, based on policy, regulations and standards in the country and OSHA will help identify the risks workers face. The plan should outline what measures are needed to eliminate or mitigate those risks.
- **Train Workers on a Safe Work Zone** – Be sure to train workers on how to set up and maintain a safe work zone. Anyone flagging traffic should know to follow the safest practices. When it comes to traffic control, it's important to warn employee's and motorist traffic zones far in advance.
- **Require Equipment Training** – Be sure that employees know how to maneuver around equipment and take all precautions for their own safety and that of others.
- **Encourage Responsibility –** Encourage employees to take some time to walk around the site and check for hazards.

2.4.3 Personal Protective Equipment (PPE)

OSHA regulates employers to provide construction employees with proper personal protective equipment (PPE), used to supplement administrative and engineering safety controls. OSHA standards provide criteria for personal protective equipment, including protection for the head, feet, eyes, face, hearing and respiration. It could be the last defense between a worker and a possible injury.

However, many injuries occur not because employees don't have protective gear but because they choose not to wear it. This means that employers not only need to provide the PPE, but must require employees to always use it.

There are two categories of PPE. The first categories are safety helmet; safety shoes; and appropriate clothing. The second category depending kind of work, like eye protection, protective gloves, ear protectors, and the safety harness, (Jannadi & Bu-Khamsin, 2002).

It is common in the construction industry that PPE means safety of workers. However, safety is all about how to create the appropriate environment in the workplace that PPE only to be considered as extra protections for the worst scenario might occur.

PPE should be regarded as a 'last resort' when considering control measures. Other methods should be considered and used that will reduce or eliminate risk to injury. However, where PPE is the only effective means of controlling the risks of injury then employers must ensure that PPE is available. PPE should be worn at all construction sites. A typical construction site may require workers to wear a hard hat, coveralls, safety footwear, gloves, eye protection and high visibility vest. These must be provided to all employees.

- **Head Protection** – Hard hats protect against impacts from fixed and falling objects. Some hard hats may come equipped with face shields or ear muffs. Helmets should fit properly and never be altered. They should also be replaced after any heavy blow. Be sure to inspect them periodically for cracks or deterioration.
- **Eye and Face Protection** – Hard hats don't protect the face, which makes safety goggles or face shields very important. When it comes to cutting, grinding, welding, or nailing, eye protection is essential. They should also be worn when working with concrete or harmful chemicals, or when exposed to electrical hazards. Goggles might be tinted and some offer side shields.
- **Foot Protection** – Steel-toed boots will prevent toes from being crushed due to falling objects. Construction workers should also wear slip-resistant, puncture-resistant soles.
- **Respiratory Protection**– When employees work in quarry and crusher sites, asphalt plant respiratory protection is vital. Respiratory protection can protect chemical and even dust. Respirators must also be cleaned to remain effective.
- **Hearing Protection**–Be sure to use earplugs or earmuffs in work areas with high noise levels like crusher site.
- **Hand Protection**–Workers will need heavy-duty rubber gloves for concrete work and at asphalt plants.
- **High-Visibility Clothing**–When visibility may be impaired, reflective clothing will be necessary.

2.4.4 First-Aid Arrangements

First-aid is a provision of primary care for an injury as it is regularly carried out by trained first aider to an injured person until definitive medical treatment can be reached if required. It is essential for each construction site to have the appropriate first aid arrangements. However, these

arrangements would not eliminate the hazards but only to reduce the potential risk on the injured person which might be exposed.

2.5 Causes of Construction Accidents

Due to the high number of accidents that occur in construction and the consequences of it for workers, organizations, society and countries, occupational safety has become a very important issue for stakeholders to take care of the human resource.

Causes of accidents can be attributed to factors such as human error, unsafe behavior, and the interaction of humans with materials, tools, and environmental factors (Lehto and Salvendy, 1991).

Most of the accidents are caused by human error. The human error is considered as an undesirable human decision or action that reduces the effectiveness of safety or system performance. Examples are misuse of equipment and tools and misconduct of workers GIBB, A., (2005). Construction-project features, such as the project nature, method of construction, site restriction, project duration, procurement system, design complexity, level of construction, and subcontracting, contribute to accidents, and that the features' contribution is through the introduction of proximal accident causal factors in the construction process (Manu et al. 2010).

There are three basic causes of work place accidents;

- Chance of occurrence
- Unsafe condition and
- Unsafe acts

Let us focus on unsafe condition and unsafe act since chance of occurrence are more or less beyond management control.

2.5.1 Unsafe Condition

Unsafe Conditions are the mechanical and physical conditions that cause accidents. These are main causes of accidents and include things like:

- Improper guarded areas
- Inappropriate personal protective equipment's
- Hazardous procedure in, on or around machines or equipment's
- Improper illumination –glare , insufficient light in working night shifts

We can reduce unsafe conditions by Engineering control, Administrative or Organizational Controls and using personal protective equipment's.

2.5.2 Unsafe Acts

Unsafe acts can even the best attempts to reduce unsafe conditions but they are not easy answers to the question of what cause people to act recklessly.

We can reduce unsafe acts by emphasize in top management commitment, emphasize on safety, establishing a safety policies, reduce unsafe acts through selection, providing safety training, using posters and other propaganda, using positive reinforcement, using behavior based safety programs, encouraging worker participation and by conducting safety inspections regularly.

2.6 Conceptual frame work

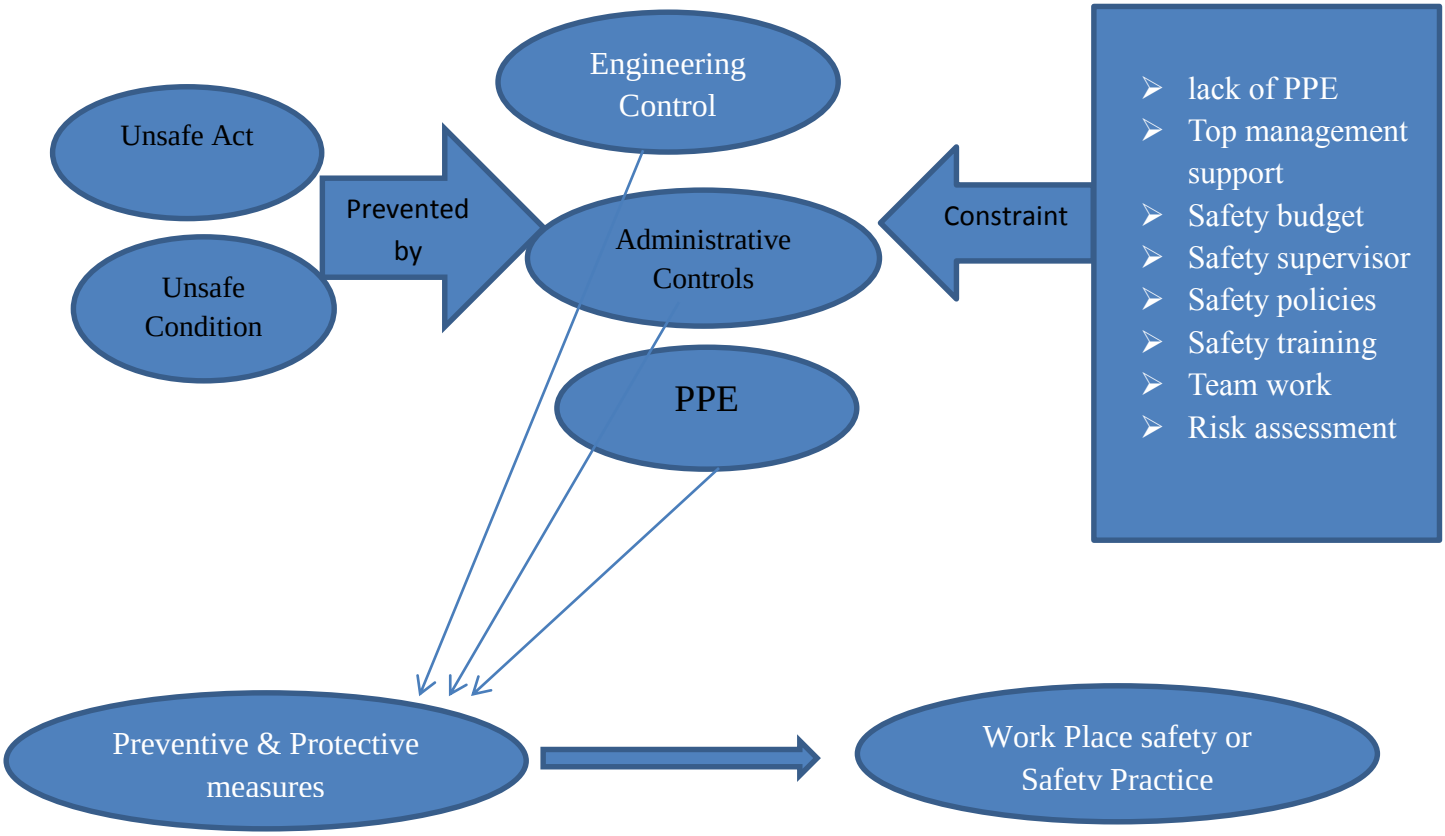

Figure 1 Conceptual frame work

CHAPTER-THREE RESEARCH METHODOLGY

3.1 Introduction

This chapter is discussed research design, population and sampling method, sources and tools/ instruments of data collection, data analysis methods and ethical consideration in general the study procedures and the method used to conduct the study related to its objective that discussed in chapter -1.

3.2 Research Design

To successfully achieve the research objectives and answer the stated research questions, the study was used descriptive research approach. Descriptive design used since it is a scientific method which involves observing and describing the behavior of a subject without influencing it in any way and it provides a great amount of description and detail about a particular case. This design enables the researcher to assess and describe the safety practice of Addis Ababa road construction projects.

3.3 Population and Sampling Method

3.2.1 Target Population

This study targeted road construction projects which are at the construction stage in Addis Ababa. The studied population was based on the data acquired from Addis Ababa City Road Authority office. Hence, the total population consists of 20 roads out of the total population three representative samples were taken by decomposing the road projects into three strata. These are road projects constructed by local Contractor, Own Force (the client act as both client and contractor) and foreign Contractor. The road projects constructed by local Contractors are 13, Own Force Contractor (the client act as both client and contractor) are 2 and foreign Contractor are 5.

The researcher narrows down the scope to the three representative road projects in Addis Ababa because of the following reasons of justification; the project being currently under construction stage, the data availability factor and the time constraint to complete the project work limited the researcher to focus only on the case study of these three project, being it the assessment of Safety Practices of Addis Ababa Road Construction Projects.

3.2.2 Sample Size

Convenience sampling technique was used to select the respondents under the representative road projects. The questionnaire was distributed to each project sites of all consultants' staff members, all contractors' staff members. The other representative of skilled and unskilled labors who are currently working in each of road construction project were interviewed. Therefore, the questionnaire was distributed for a total of 83 respondents', 31 of the respondents are from local Contractor, 25 of the respondents are from Own force and 27 of the respondents are from foreign Contractor. The response rate of the questionnaire was so far so good. 100% of each representative group returned the questionnaire by disclosing their view about the safety practices of the road constructions projects understudied.

3.4 Sources and Tools/Instruments of Data Collection

Primary data was collected from the selected road construction projects currently at the execution phase in Addis Ababa. The data for primary data was collected by using questionnaires and interview. The questionnaire contained both open ended and close ended questions. The questions were prepared based on the research questions. The questionnaire was distributed for each road projects and collected.

3.5 Data Analysis Methods

In the analysis part, the data gathered from the primary sources was analyzed using SPSS and Microsoft Excel spreadsheet, and interpret using descriptive statics.

3.6 Ethical Consideration

The research work was started after getting the willingness of the stated organizations. Respondents were clearly communicated about the objective of the research before they are asked to give their answer. The researcher ensures the quality and integrity of this project work. The confidentiality and privacy of the voluntary respondents was also guaranteed. This independent and impartial project work considered not to cause harm to respondents in what so ever way. Accordingly, the researcher optimally considers all the ethical perspectives.

4 CHAPTER FOUR: DATA PRESENTATION, ANALYSIS AND INTERPRTATON

4.1 Introduction

This chapter analyses the results of collected data from of the questionnaire four major sub topics. Totally, 3 road projects that are on the execution by Local Contractor, Own force (the client act as both client and contractor) and Foreign Contractor studied. The analysis have four parts , the first part, deals about the general information and the second part current safety practice, the third part shows the constraints in safety implementing in road construction projects and the last part is about the causes of frequently occurring accidents. This is to reorganize the data in a systematic manner so that they are clear and unambiguous to be understood and hence to be analyzed. Tables and charts are used because this method of data presentation is much more preferred among others, as it provides easier understanding and clearer picture of information to be delivered.

4.2 General Information of the respondents

This section presents the description of the respondents who participated in this study. The characteristics of respondents for the three projects that participated in this survey of will described here.

Educational status of respondents

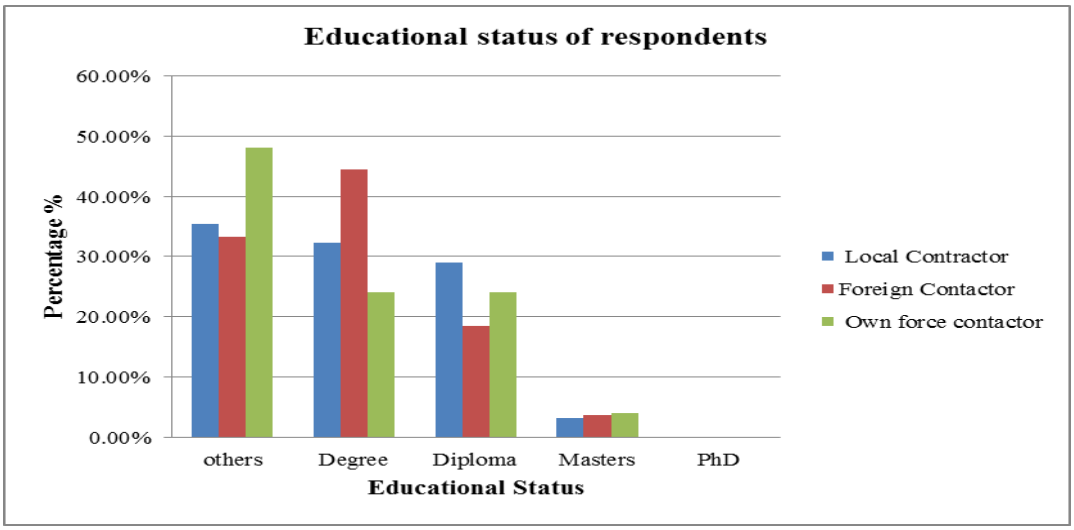

Figure 2 - Educational status of respondents

From the figure above, 32.26% of the respondents that works in local contractor have a degree, 29.03% have a diploma, 3.23 %have a master's degree and 33.33% works in local contractor are included in high school and elementary levels. On the other hand, 44.44% of the respondents that works in Foreign Contractor have a degree, 24% have a diploma, 3.7 %have a master's degree and 35.48% works in Foreign Contractor are included in high school and elementary levels. Also, 24% of the respondents that works in own force project have a degree, 24% have a diploma, 4 %have a master's degree and 48% works in own force projects are included in high school and elementary levels.

Year of Experience in Road Construction

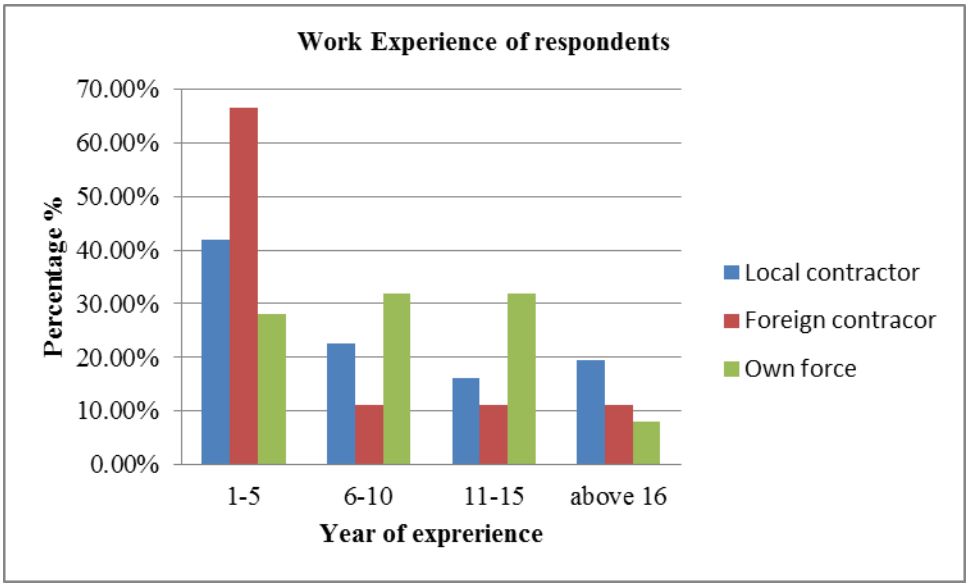

Figure 3 - Work experience of respondents

From the figure above, 19.35% of the respondents that works in Local contractor have an experience of above16 years construction industry, 16.13% have 11 up to 15 years of experience, 22.58% have 6 up to 10 years of experience and 41.94%have less than 5 years of experience in the construction industry. Also, 11.11% of the respondents that works in Foreign Contractor have an experience of above16 years construction industry, 11.11% have 11 up to 15 years of experience, 11.11% have 6 up to 10 years of experience and 66.67%have less than 5 years of experience in the construction industry and 8% of the respondents that works in Own force projects have an experience of above16 years construction industry, 32 % have 11 up to 15 years

of experience, 32 % have 6 up to 10 years of experience and 28 %have less than 5 years of experience in the construction industry.

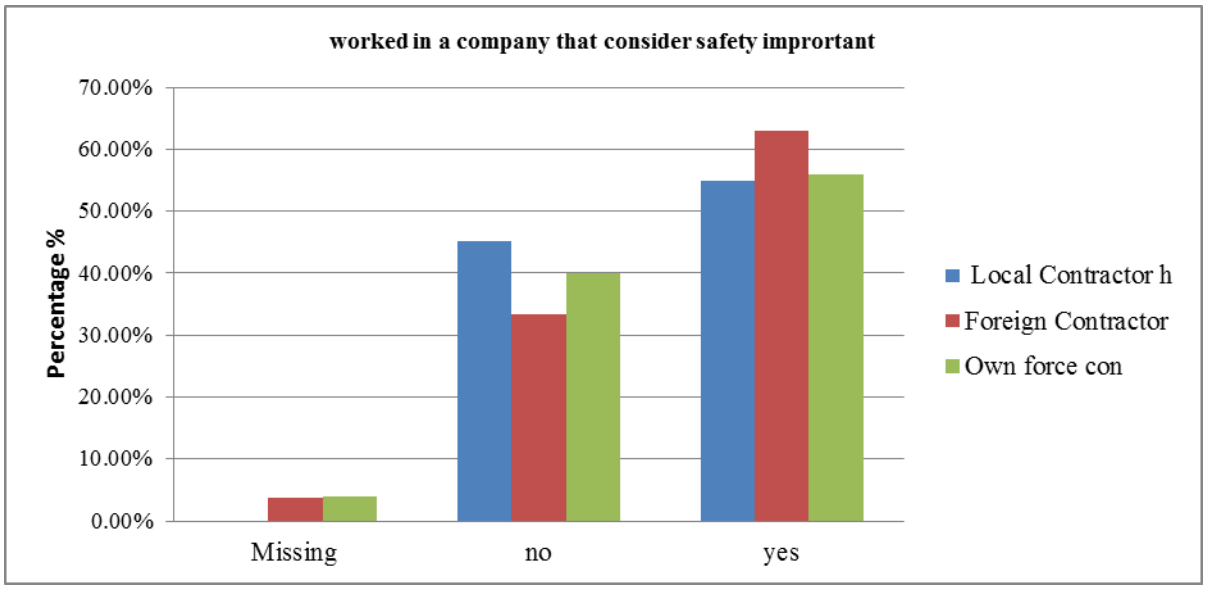

Figure 4 - Worked in a company that considers safety important

In the above figure also, respondents were asked about if they worked before in the construction company that consider safety important to assess their familiarity with the implementation of road construction safety, 45.16% respondents worked in Local contractor said they didn't work before in accompany that consider safety important and 54.84% of them have said they had worked. Also, 33.33% respondents worked in Foreign Contractor said they didn't work before in accompany that consider safety important and 62.96% of them have said they had worked. On the other hand 40 % respondents worked in own force project said they didn't work before in accompany that consider safety important and 56.00% of them have said they had worked.

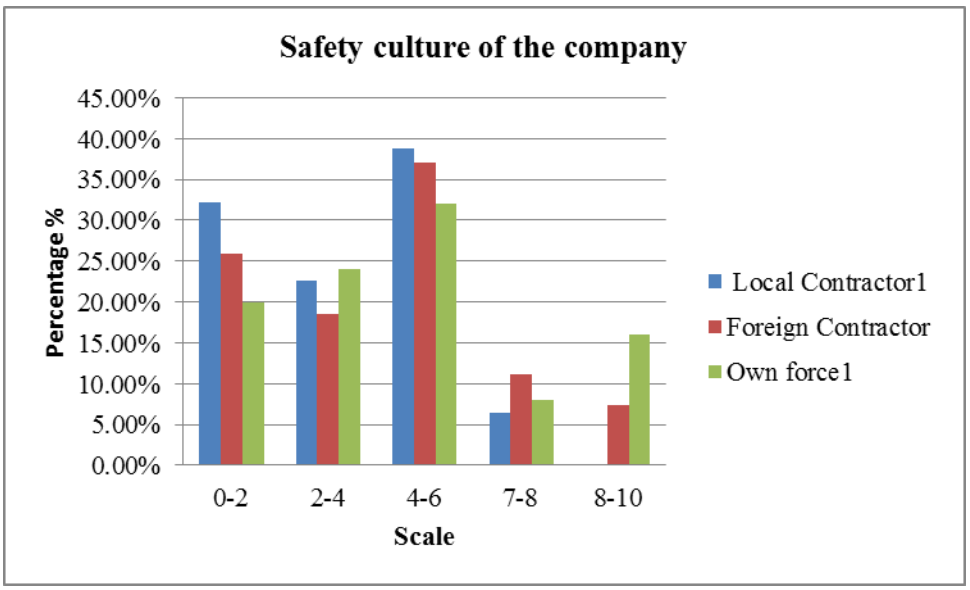

Figure 5 - Safety culture of the company

Also in the above figure, respondents were asked to rate the construction company they now working in scale 8-10 being the highest, and 0-2 the lowest. From the total of respondents 32.26% respondents that worked in Local contractor scale the company they working 0-2, 22.58% of them 2-4,38.71% of them 4-6, 6.45% of them 6-8 and 0 %of them 8-10. From respondents that worked in Foreign Contractor 25.93 % respondents scale the company they working 0-2, 18.52% of them 2-4,37.04% of them 4-6, 11.11% of them 6-8 and 7.4% of them 8-10. From respondents that worked in Own force projects 20% respondents scale the company they working 0-2, 24% of them 2-4,32% of them 4-6, 8% of them 6-8 and 16 % of them 8-10.

4.3 Current Safety Practice in Addis Ababa Road Construction Projects

This section presents information on the current safety practice of the Addis Ababa road projects at the execution phases by local contractor, own force (the client act as both client and contractor) and foreign contractor. The data contain potential Safety issues/factors which are drawn from different literatures and the analysis were collected from the questionnaire and analyzed in detailed result were displayed graphically in tables and figures.

4.3.1 Importance of Safety in Road Construction Projects

To assess the extent of awareness, respondents were asked how important they think safety is in road construction.

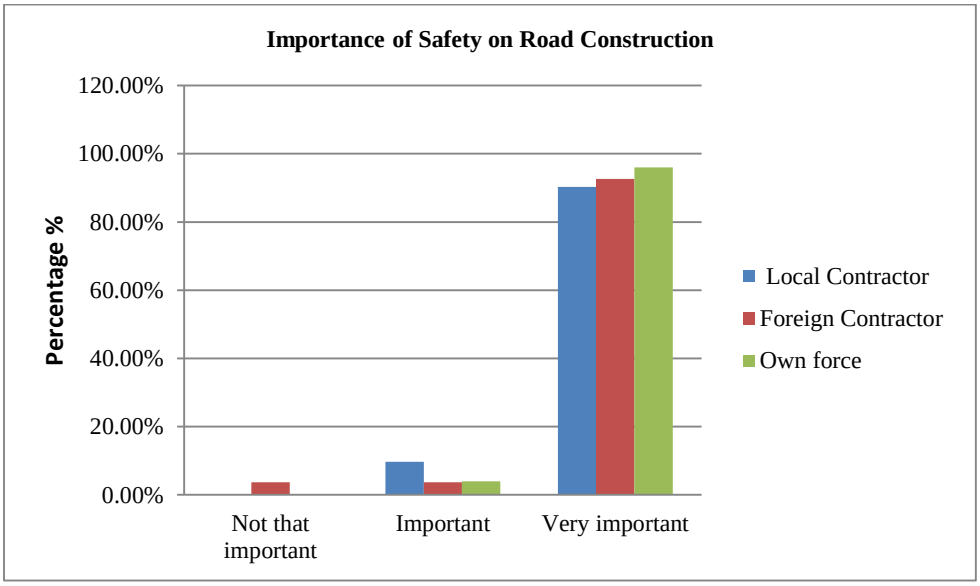

Figure 6 - Importance of safety in road construction

The above Figure shows that above 90 % of the respondents from the total that works in local contractor; own force and foreign contractor has witnessed the importance of safety in road construction projects.

4.3.2 Training Taken with Respect to Road Construction Safety

The below table shows the respondents, that works in local contractor; foreign contractor and own force respectively, answer about how frequently they taken trainings (on job) with respect to road construction safety. From the total of respondents that works in local contractor 55% of them said they didn't taken training with respect to road construction safety, 16% of them said they didn't frequently trained, 19% of them said they taken trainings somewhat frequently and 10% of them said frequently taken training. From the total of respondents that works in foreign Contactor 56% of them said they didn't taken training with respect to road construction safety, 26% of them said they didn't frequently trained, 11% of them said they taken trainings somewhat frequently and 10% of them said frequently taken training. From the total of respondents that works in own force projects 72% of them said they didn't taken training with respect to road

construction safety,20% of them said they didn't not frequently trained, 8% of them said they taken trainings somewhat frequently and 10% of them said frequently taken training.

	Local Contractor	Percent	Foreign Contactor	Percent	Own force contactor	Percent
Not trained	17	55%	15	56%	18	72%
Not Frequent	5	16%	7	26%	5	20%
Somewhat frequent	6	19%	3	11%	2	8%
Frequent	3	10%	2	7%	0	0%
Very Frequent	0	0%	0	0%	0	0%
Total		100%		100%		100%

Table 2 - Training taken with respect to road construction

4.3.3 More Relevant PPE in Road Construction Projects

The below Figure shows that respondents preference with respect to Personal Protective Equipment (PPE).

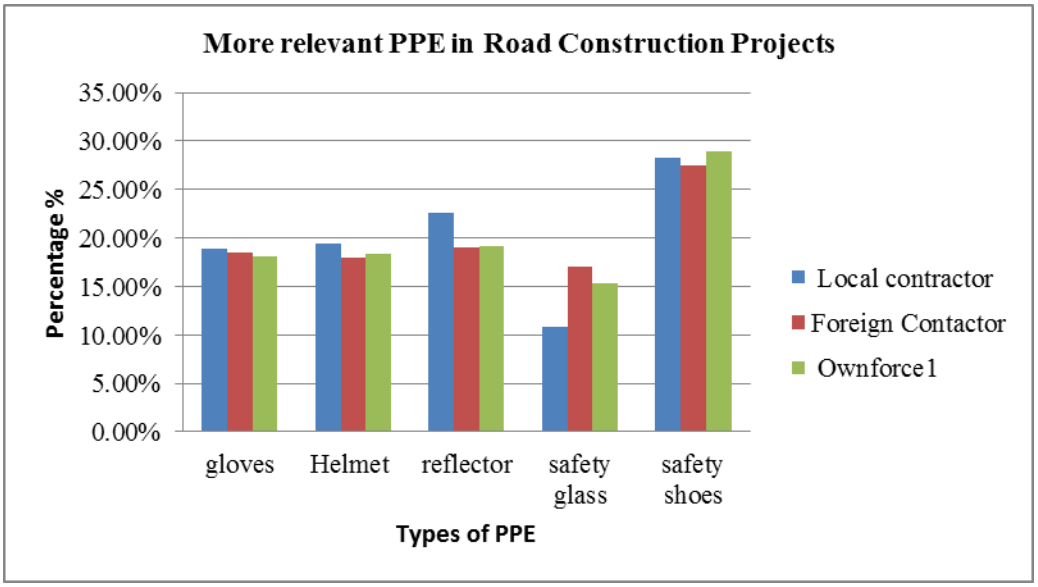

Figure 7 - Relevant PPE in road construction

Majority of the respondents that works in local contractor; own force and foreign Contactor has chosen safety shoes first, reflector jacket second, Glove and helmet on third and Safety glass last.

4.3.4 Personal Protective Equipment that Seen in Road Construction Projects

The table below shows the respondents, that works in local contractor, foreign contractor and own force respectively, were asked about personal protective equipment that seen in road construction projects mostly. From the total of respondents that works in Local contractor 36.3% of them said they see reflector jackets, 25% of them said they see gloves,20 % of them said they see safety shoes, 10 % of them said they see helmet and 8.8% of them said they see safety glass in road construction project. From the total of respondents that works in foreign Contactor 32.1% of them said they see reflector jackets, 29.6% of them said they see helmet,17.3 % of them said they see safety shoes, 16 % of them said they see gloves and 4.9% of them said they see safety glass in road construction project. And also from the total of respondents that works in own force projects 29.7% of them said they see gloves, 26.6% of them said they see reflector jackets, 25 % of them said they see safety shoes, 15.6 % of them said they see helmet and 3.1 % of them said they see safety glass in road construction project.

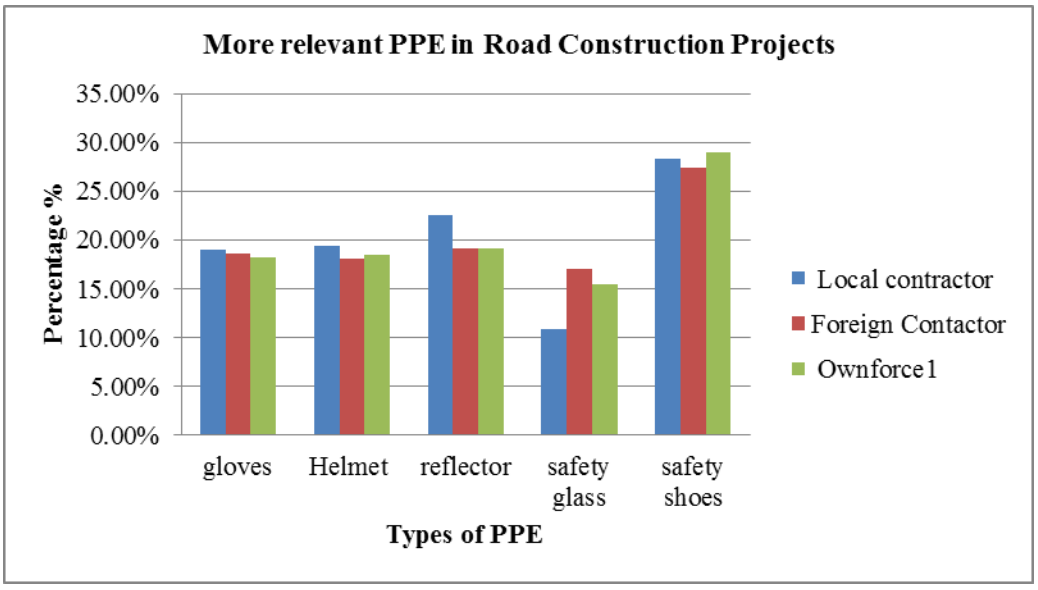

Figure 8 - Most seen PPE in road construction project

4.3.5 Personal Protective Equipment Provided by the firm

In the below Figure respondents were asked about whether or not the firm they are working provided PPE and from the total respondents more than 70% that works in local contractor, own force and Foreign Contactor has witnessed the provision of PPE in their respective sites.

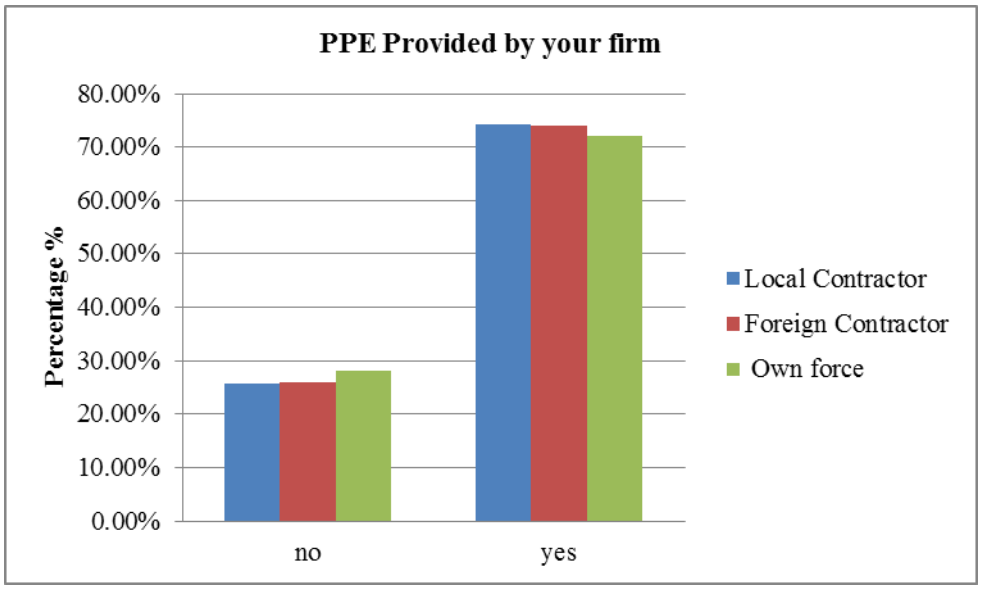

Figure 9 - PPE provided by the firm

On the other hand respondents were asked, if their answer for the provision of PPE is yes to list them, from the total respondents that are working in local contractor, 53% of them provided with reflector jacket, 32% of them provided with gloves, 11% of them provided with safety shoes and 5% of them provided with helmet.

From the total respondents that work in foreign Contactor, 43% of them provided with reflector jacket, 16% of them provided with gloves, 8% of them provided with safety shoes and 33% of them provided with helmet.

Similarly, from the total respondents that works in own force projects, 13% of them provided with reflector jacket, 25% of them provided with gloves, 18% of them provided with plastic safety shoes, 23% of them provided with helmet and 21% of them provided with Working Suits (Tutas).

4.3.6 The Adequacy of PPE on Construction Sites

Also in the below Figure respondents were asked about the adequacy of PPE in their particular sites, and from the total respondents more than 70% that works in local contractor, own force and foreign Contactor has witnessed inadequacy of PPE in their respective sites.

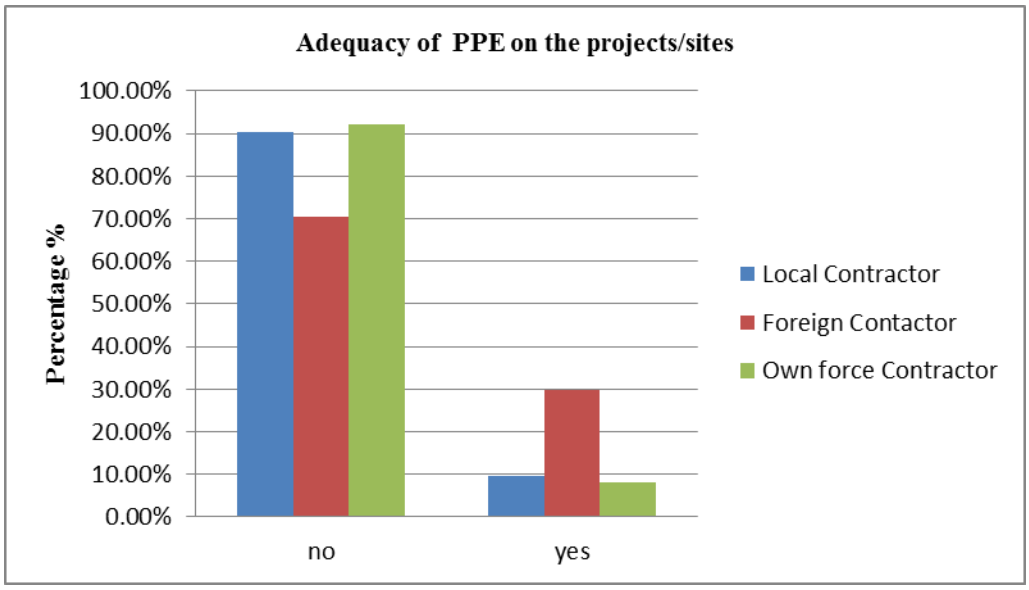

Figure 10 - Adequacy of PPE in your site

On the other hand respondents also, asked about why or why not they said inadequacy in the provision of safety equipment's (PPE) and the respondents that works in local contactor 50% lack of awareness, 33% said due to inadequacy in PPE provision and 17% said because management did not given attention. The respondents that works in foreign contactor, 31% said due to inadequacy in PPE provision, 23% said PPE provision is costly for the contractors and contractors want to minimize their cost, 15% of them said the provision of PPE is dependent on the work type, 8% of them said due to lack of awareness and binding rule or policy that obligate any stakeholder for the provision of PPE. And also from the respondents that works in own force projects, 60% said due to inadequacy in PPE provision, 20% said because management did not given attention and the other 20% said lack of safety policy.

4.3.7 How likely are You Applying Safety Equipment's

Similarly, as shown in the below figure respondents were asked about, how likely they apply PPE if they were provided with it, and from the total of respondents that works in local contractor, 53.33% of them said they were very likely apply it, 43.33% of them said they were likely apply it and 3.33% of them said they were somewhat likely apply it. Likewise, from the total of respondents that works in foreign contractor, 38.46% of them said they were very likely apply it, 28 % of them said they were likely apply it and 26.92 % of them said they were somewhat likely apply it. Also from the total of respondents that works in own force projects, 52 % of them said they were very likely apply it, 28% of them said they were likely apply it, 16% of them said they were somewhat likely apply it and 4% of said they were very unlikely apply it.

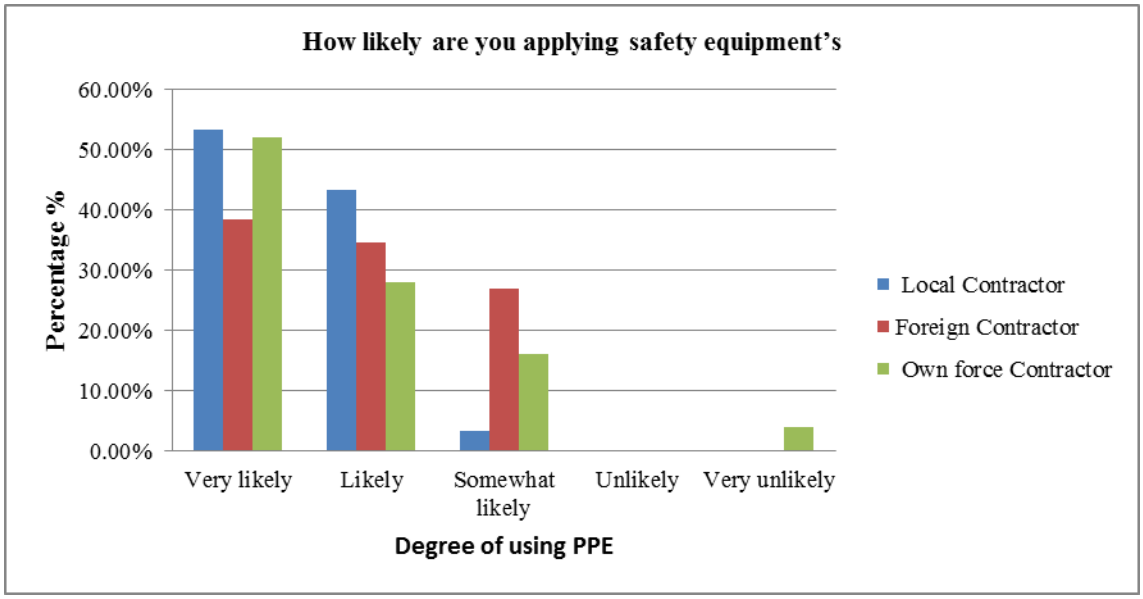

Figure 11 - How likely are you applying PPE

4.3.8 Factors contributing for not Continuously Apply PPE

In the below figure respondents were asked about, what are the factors for not continuingly apply PPE, and from the total of respondents that works in local contractor, 54.84% of them said it is because they are not provided with it, 3.23% of them said it is because of the climate, 19.35% of it because of the discomfort to wear or use it and 22.58% of them said it is because of lack of awareness. Also, from the total of respondents that works for both foreign contractor and own force project, 23.08% of them said it is because they are not provided with it, 3.85% of them said

it is because of the climate, 45.31% of it because of the discomfort to wear or use it and 30.77% of them said it is because of lack of awareness.

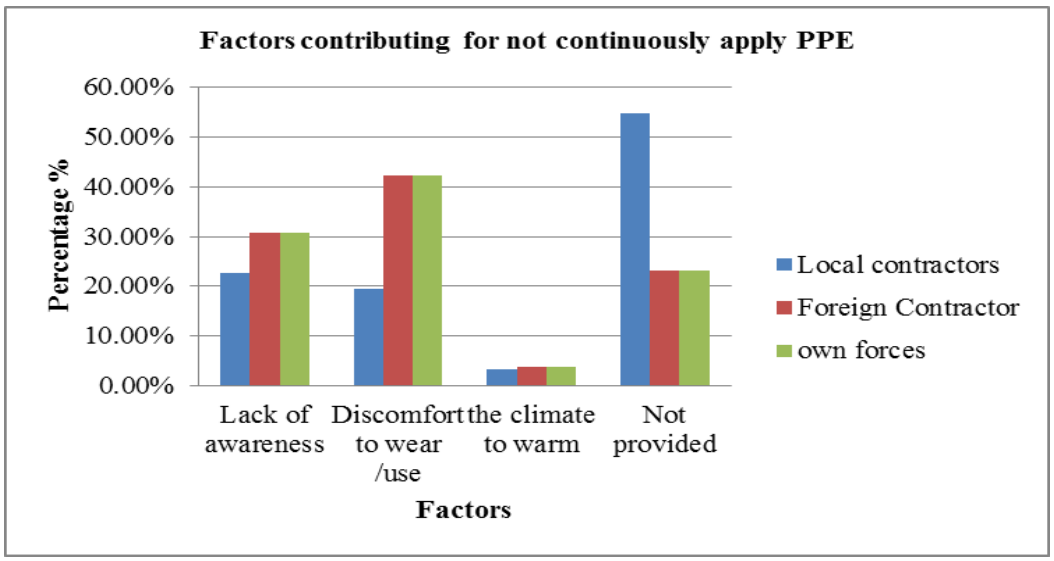

Figure 12 - Factors contributing for apply PPE

4.3.9 Construction Firm Have Safety Policy, Rules or Regulation and Safety Procedures

In the below figure respondents were asked about, does the construction firm have Safety policy, and from the total of respondents that works in local contractor, 62.07% of them said they don't have information, 27.59% of them said it didn't have a safety policy, 10.34% of it have a safety policy. Similarly, from the total of respondents that works in foreign Contractor, 40.74% of them said they don't have information, 22.22% of them said it didn't have a safety policy, 37.04% of it have a safety policy. Also, from the total of respondents that works in own force projects, 58.33% of them said they don't have information, 33.33% of them said it didn't have a safety policy, 8.33% of it have a safety policy.

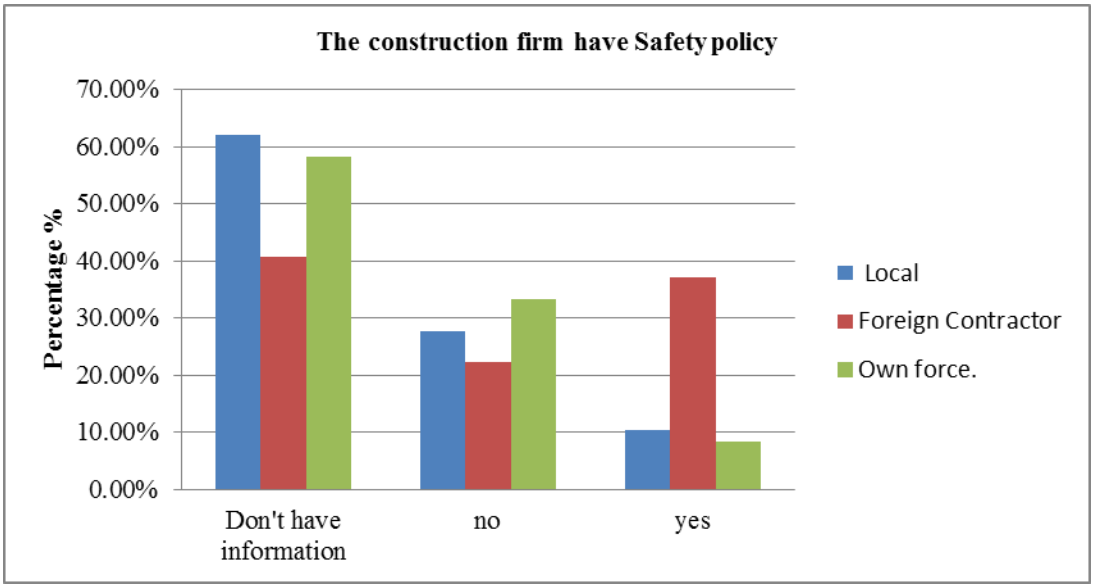

Figure 13 - Construction firm have safety policy

On the other hand, in the below figure respondents were asked about, whether or not the company have a written Safety rules & regulations which reflect management concerns for safety, and from the total of respondents that works in local contractor, 54.84% of them said they don't have information, 32.26% of them said it no it didn't have, 12.90% of yes it have. Similarly, from the total of respondents that works in foreign Contractor, 29.63% of them said they don't have information, 40.74% of them said it no didn't have, 29.63% of yes it have. Also, from the total of respondents that works in own force projects, 54.17% of them said they don't have information, 33.33% of them said no it didn't have, 12.50% of them said yes it have.

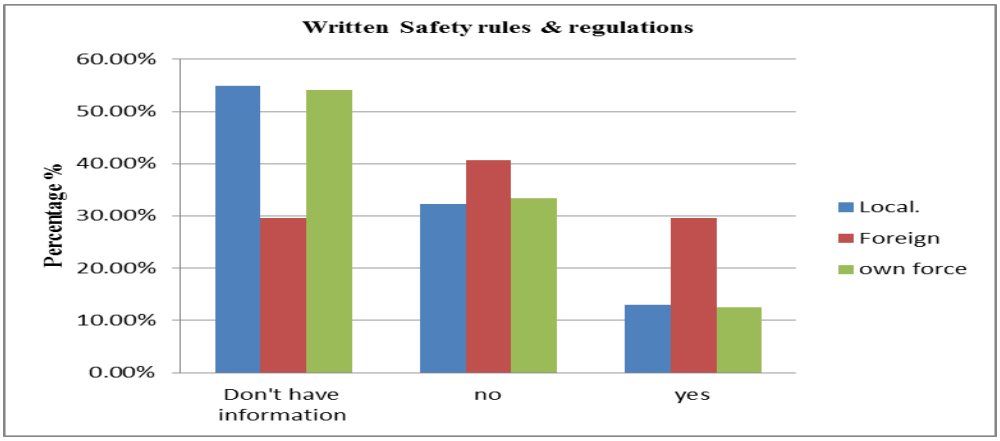

Figure 14 - Written safety rules and regulation

Similarly, in the below figure respondents were asked about, whether or not Construction site provide awareness with written information about Safety procedures, and from the total of respondents that works in all local contractor, Foreign Contractor and Own force projects more than 68%, of them said no it didn't have and less than 32% of them yes it have.

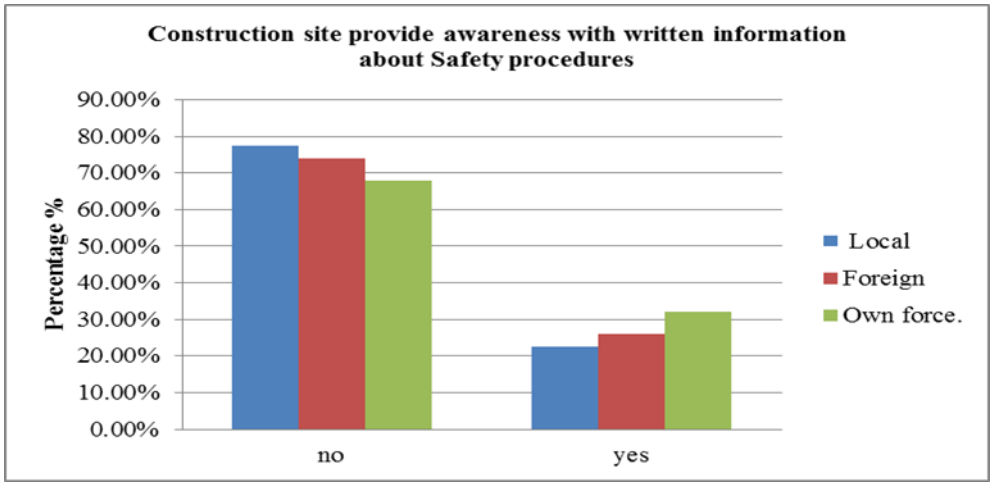

Figure 15 - Awareness with written information about safety procedures

Respondents also, were asked about if there answer for your Construction site provide awareness with written information about Safety procedures is yes to specify them. And all the respondents that say yes in all specific sites witnessed they have warning signs, safety barrier or reflector cone that give awareness in sites.

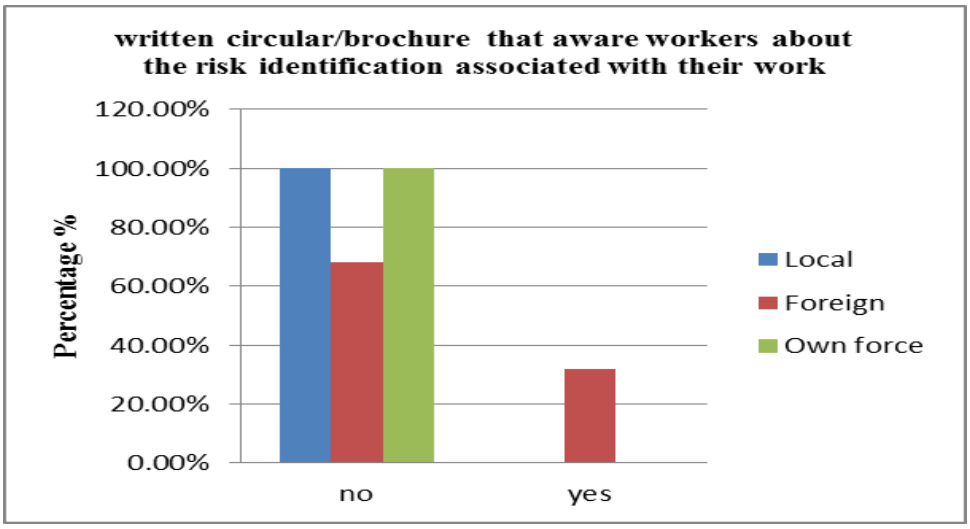

Figure 16 - Written circular /brochure that aware worker

In the above figure respondents were asked about, whether or not Construction site prepare written circular/brochure that aware workers about the risk identification associated with their work, and all of the respondents that works local contractor and own force projects said no. similarly the respondents that works foreign Contractor were asked and 68% said no and 32% of them said yes.

4.3.10 Managers Encourage, Support Worker Safety Programs and Safety Training

In the below figure respondents were asked about, whether or not Managers encourage and support worker Safety programs and from the total of respondents that works local contractor 77.42% of them said no and 22.58% of them said yes. Similarly the respondents that works foreign contractor were asked and 68% said no and 32% of them said yes.

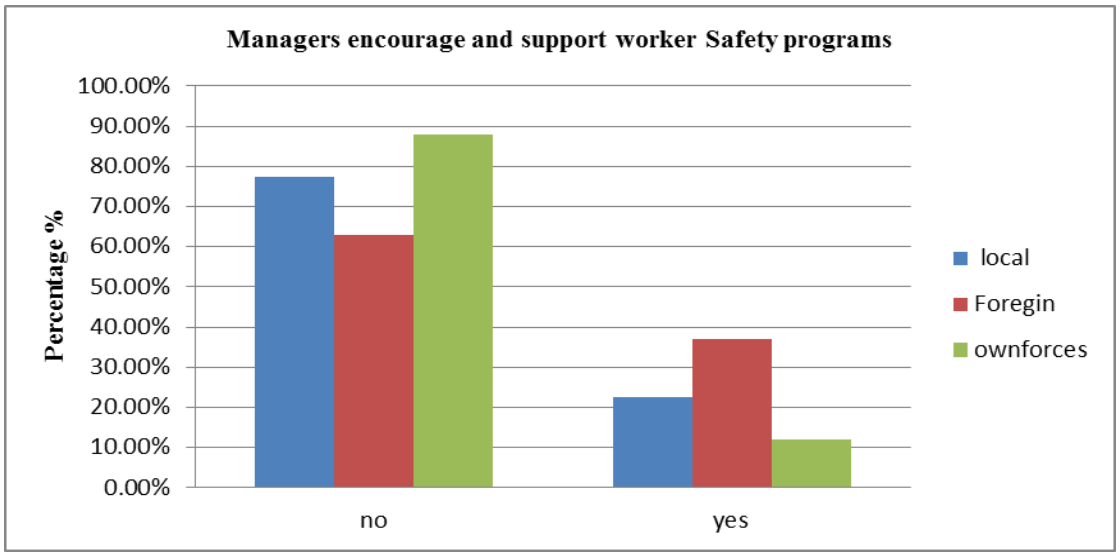

Figure 17 - Managers encourage and support in safety program

Figure 18 - Managers support in safety trainings for new employees

In the above figure respondents were also asked about, whether or not managers encourage and support safety trainings for new employees and from the total of respondents that works local contractor 83.87 % of them said no, 12.90 % of them said don't have information and 3.23% of them said yes. Similarly the respondents that works foreign contractor were asked and 77.78 % of them said no, 3.70 % of them said don't have information and 18.52 % of them said yes.

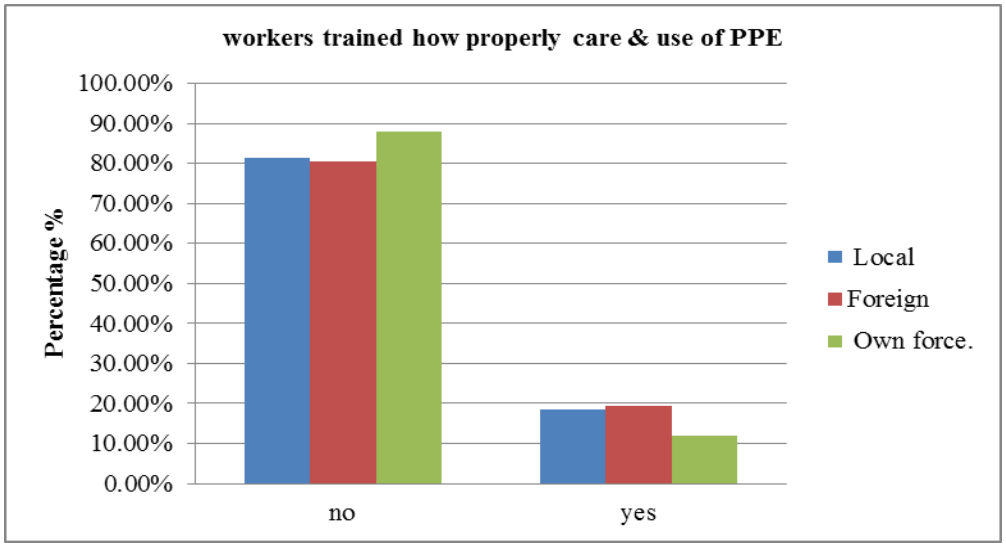

Figure 19 - Training about how properly care and use PPE

Also Respondents in the above figure, were asked about whether or not they are trained how properly care & use of PPE. And more than 80% of the respondents that worked all sites said no and less than 20% of them said yes.

4.3.11 Project Have Safety Supervisor on Site

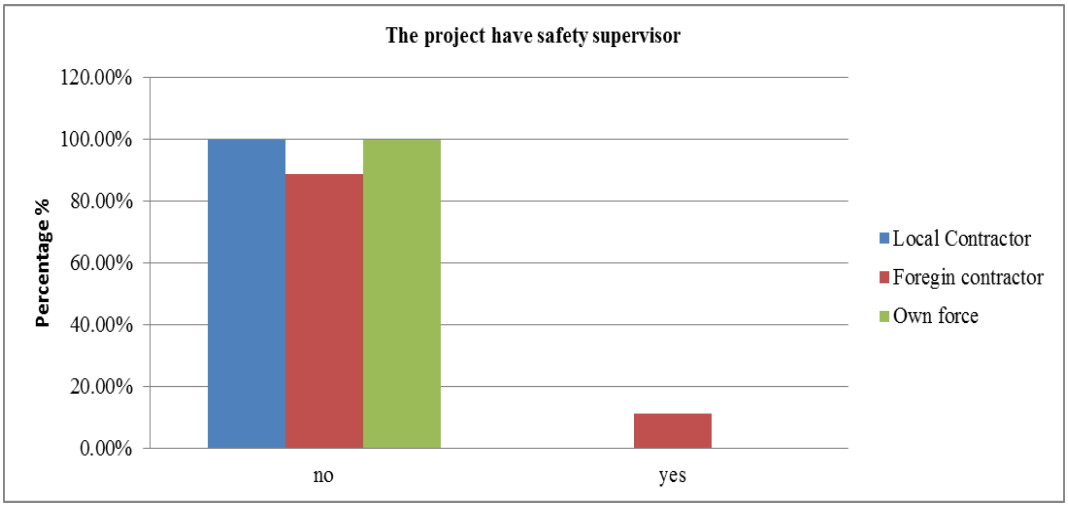

Figure 20 - Safety supervisor

In the above figure respondents were also asked about whether or not the projects have safety supervisor on site. And respondents those worked in local contractor and own force projects witnessed there has no safety supervisor. Similarly, respondents that worked in foreign contractor were also asked and 88.89% of them said no there is no safety supervisor and 22.11% of them said the site engineer act like one.

4.3.12 Action that will be Taken If Minor or Major Injuries Occur in the Road Construction Projects

In the below figure respondents were asked about, what action taken if minor injuries occurred and from the total respondents that worked in local contractor 64.52% of them said they will be taken to nearby clinic , 3.23% of them said they will be taken to site clinic and 32.26% of them said they will be treated by traditional means. From the total respondents that worked in foreign contractor 66.67% of them said they will be taken to nearby clinic, 11.11% of them said they will be taken to site clinic and 22.22% of them said they will be treated by traditional means. Likewise, from the total respondents that worked in own force project 36% of them said they

will be taken to nearby clinic , 16% of them said they will be taken to site clinic and 48% of them said they will be treated by traditional means.

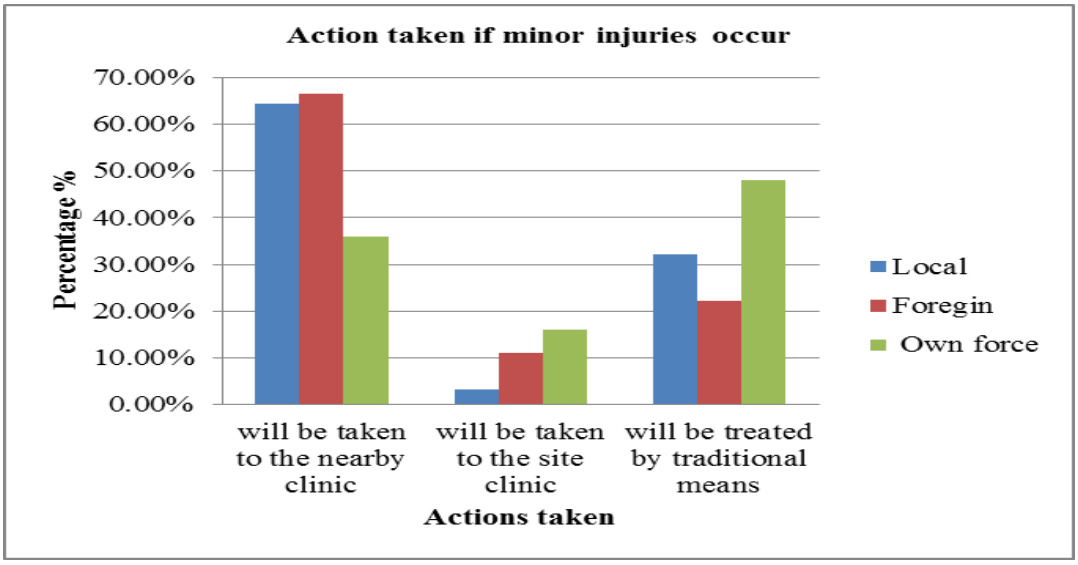

Figure 21 - Action taken for minor injures

Action Taken If Major Injuries Occur

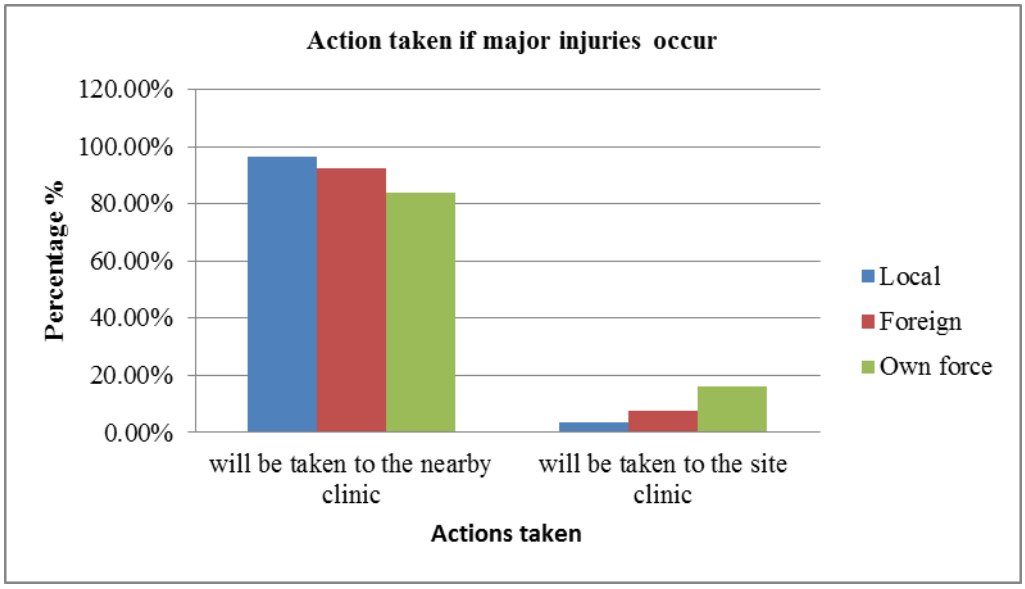

Figure 22 - Action taken for major injuries

Also Respondents in the above figure were asked about what action taken if major injuries occurred. And from respondents that work in all projects more than 84% of the respondents said they will be taken to nearby clinics and less than 16% of them said will be taken to site clinic.

Injuries & Fatalities Reported

Similarly, in the below figure respondents were asked about if injuries and fatalities reported to safety or site supervisors. And from respondents that work in all projects more than 68% of the respondents they didn't reported and less than 32% of them said yes.

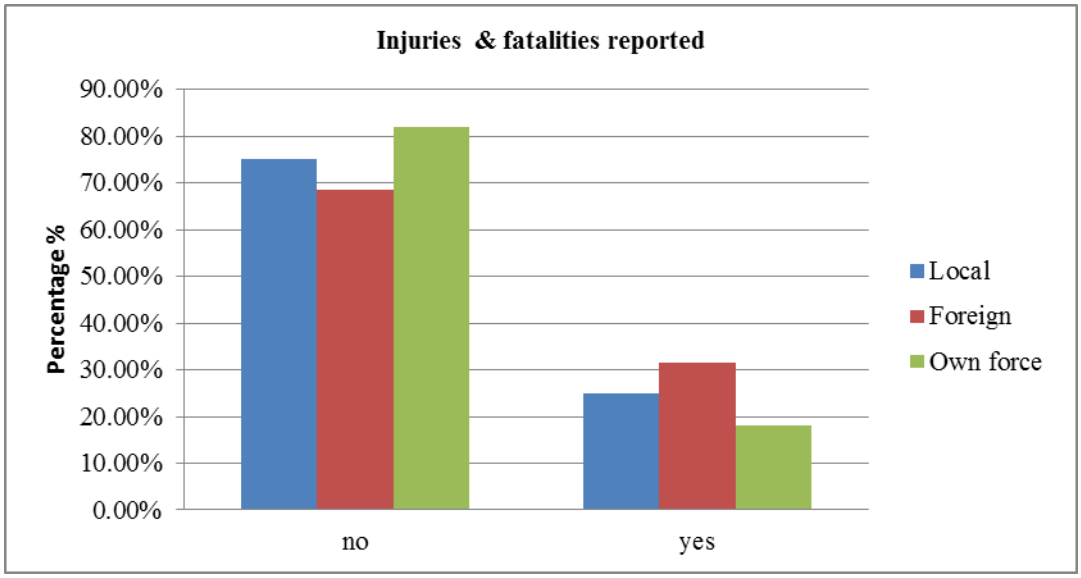

Figure 23 - Injuries and fatalities reported

4.4 Constraints in Safety Implementing On Road Construction Projects

This section presents information on the constraints in safety implementing in Addis Ababa road projects at the execution phases by local contractor, own force (the client act as both client and contractor) and foreign contractor. The data contain potential safety implementation constraints which are drawn from different literatures and the analysis were collected from the questionnaire and analyzed in detailed and result were displayed graphically in tables and figures.

4.4.1 Constraints in Safety Implementation in Local Contractor

The below figure respondents were asked to differentiate the factors that affecting the implementation of safety how likely it affects and then the result ranked. Among the factors the top five chosen by respondents of local contactor are lack of top management commitment in

safety programs, lack of personal protective equipment's, lack of safety supervisor on site, insufficient safety budget, lack of emergency plan and procedures.

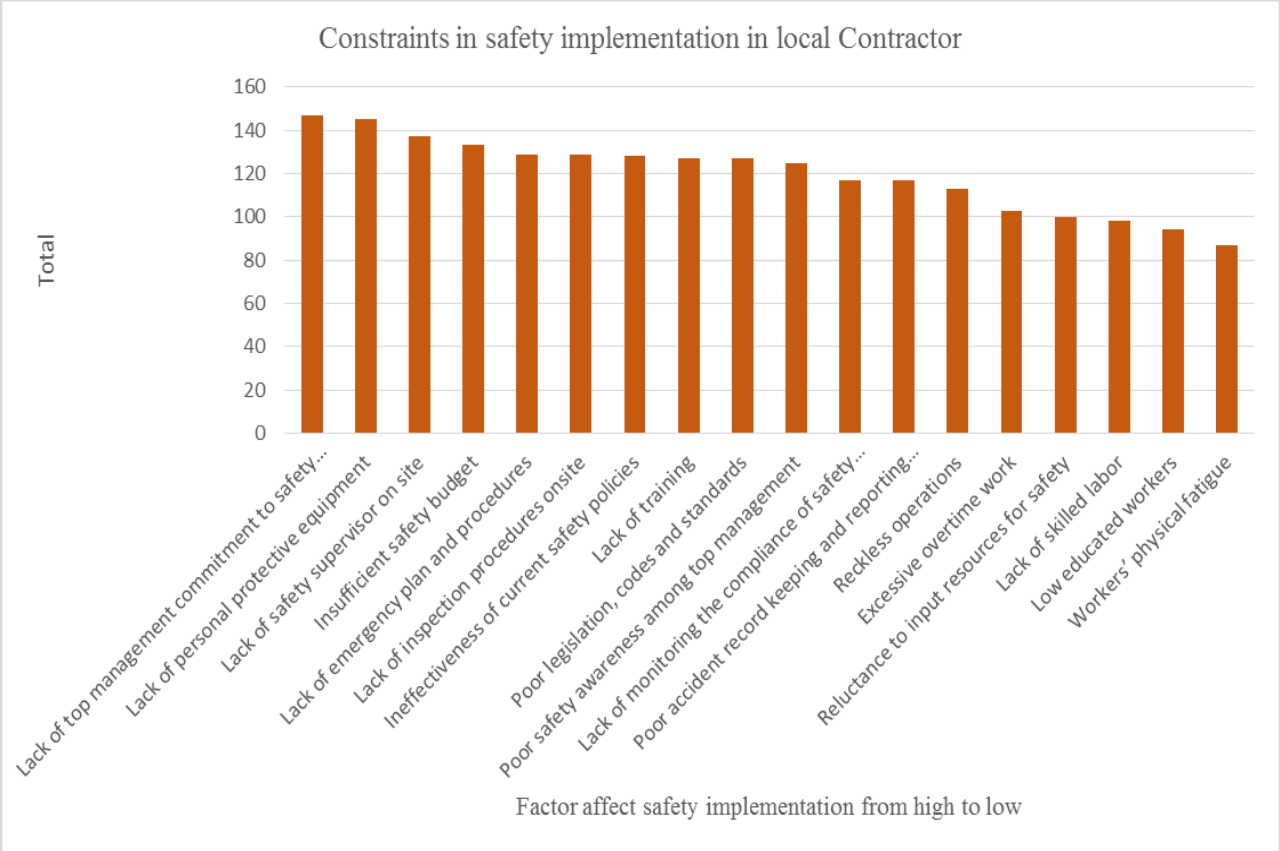

Figure 24 - Constraint in safety implementation for local contractor

4.4.2 Constraints in Safety Implementation in Foreign Contractor

The below figure respondents were asked to differentiate the factors that affecting the implementation of safety how likely it affects and then the result ranked. Among the factors the top five chosen by respondents that work at foreign contractor 2 of them ranked first equally by respondents these are lack of personal protective equipment's and ineffectiveness of current safety policies, third insufficient safety budget, fourth lack of top management commitment in safety programs, lack of inspection procedures onsite ranked fifth.

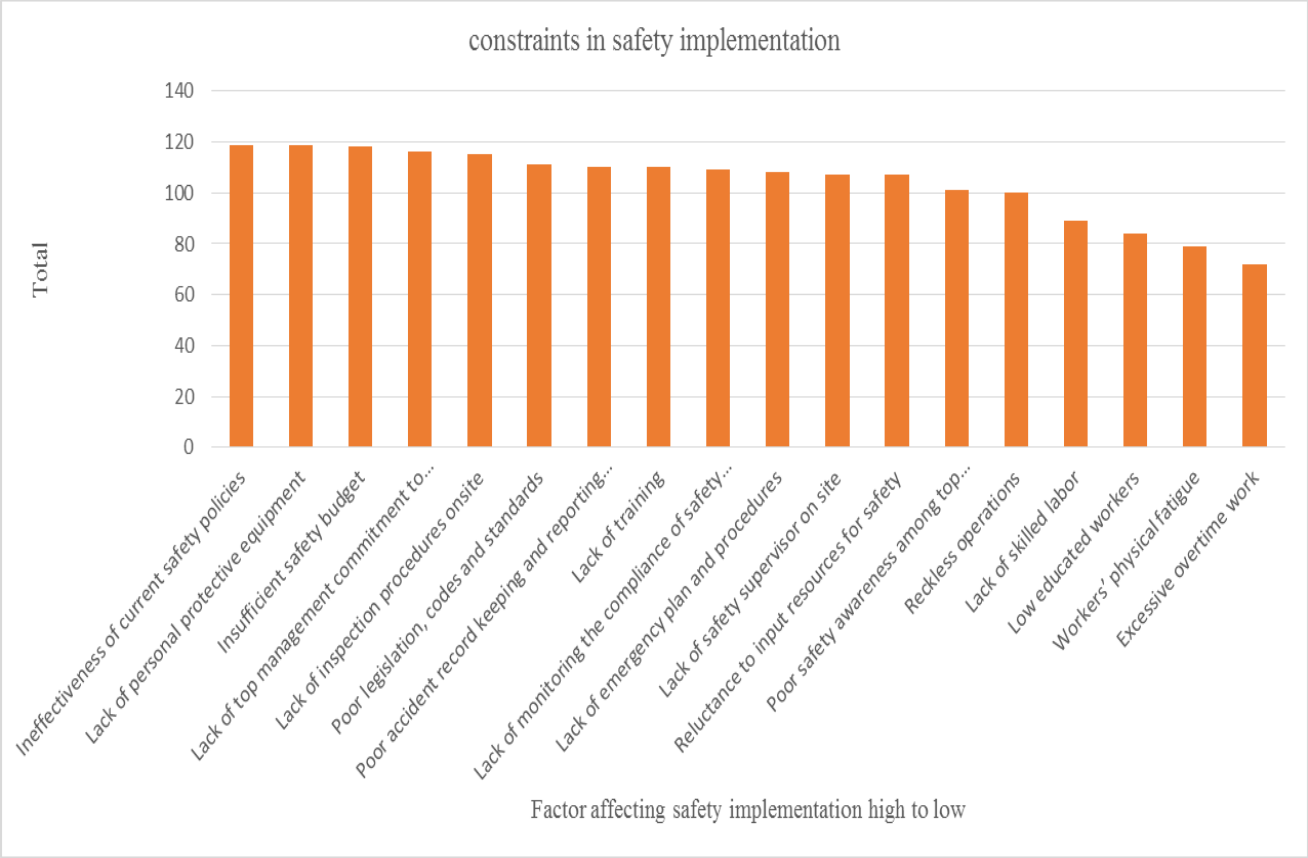

Figure 25 - Constraint in safety implementation for Foreign Contactor

Constraints in safety implementation in Own force project

The below figure respondents were asked to differentiate the factors that affecting the implementation of safety, how likely it affects and then the result ranked. Among the factors the first chosen by respondents of own force is lack of personal protective equipment's, second lack trainings, third lack of safety supervisor on site, fourth poor legislation, codes and standards and insufficient safety budget in fifth.

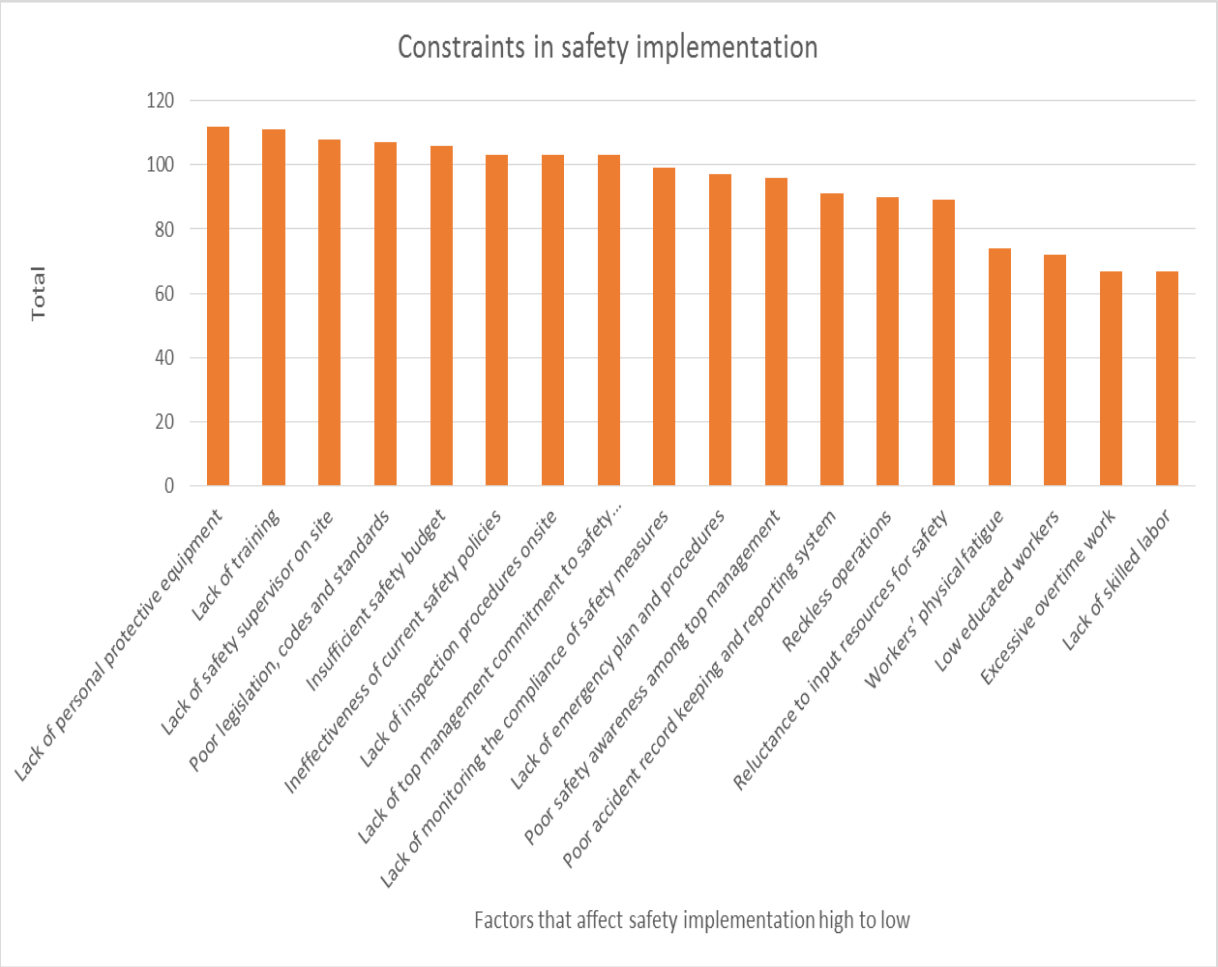

Figure 26 - Constraint in safety implementation for own force project

4.5 Frequently Occurring Accidents

This section presents information on the frequently occurring accidents of the Addis Ababa road construction projects at the execution phases by local contractor, own force (the client act as both client and contractor) and Foreign Contractor. The data analysis were collected from the questionnaire and analyzed in detailed result were displayed graphically in tables and figures.

Frequently occuring accident	Local Contractor respondents		Foreign Contractor respondents		Own force respondents	
	N	Percent	N	Percent	N	Percent
falling in to excavated pit	16	17%	9	11%	9	13%
falling in to hot asphalt(leg or hand burn)	11	12%	8	10%	7	10%
falling from scaffolding	8	9%	8	10%	6	9%
nail piercing	7	7%	5	6%	6	9%
car/truck overturning	13	14%	13	15%	6	9%
hit by Equipments/machinary	10	11%	12	14%	11	16%
Rock/ soil slide	17	18%	14	17%	17	24%
machinary accidents in loading and unloading	12	13%	15	18%	8	11%

Table 3 - Frequently occurring accidents

The table above shows the replies, which work in local contractor, Chinese contractor and own force respectively comeback for to understand the hazards that frequently encountered accidents on road construction projects. From the total of respondents that work in local contractor 18 % of them said rock or soil slide, 17% falling in to excavated pit, 14% of them said car/trucks overturning, 13% of them said machinery accident in loading or unloading, 12% of them said falling in to hot asphalt (leg or hand burn), 11% of them hit by equipment's, 9% of them said falling from scaffolding and 7% of them said nail piercing. Also, from the total of respondents that work in Foreign Contractor 18 % of them said machinery accident in loading or unloading, 17% rock or soil slide, 15% of them said car/trucks overturning, 14% of them said hit by equipment's, 12% of them said falling in to excavated pit, 11% of them hit by equipment's, 10% of them said falling from scaffolding and falling from scaffolding, and 6% of them said nail piercing. Similarly, from the total of respondents that work in own force projects 24 % of them said rock or soil slide, 16% hit by equipment's, 13% of them said falling in to excavated pits, 11% of them said machinery accident in loading or unloading, 12% of them said falling in to excavated pit, 10% of them falling in to hot asphalt (leg or hand burn), and 9% of them said falling from scaffolding, nail piercing and car/trucks overturning.

4.5.1 Can frequently occur injuries are preventable

The below figure 25 respondents were asked about, are most of frequently occurring accidents in Addis Ababa road construction projects preventable and above 84% of respondents that work in all three projects replied yes they are preventable.

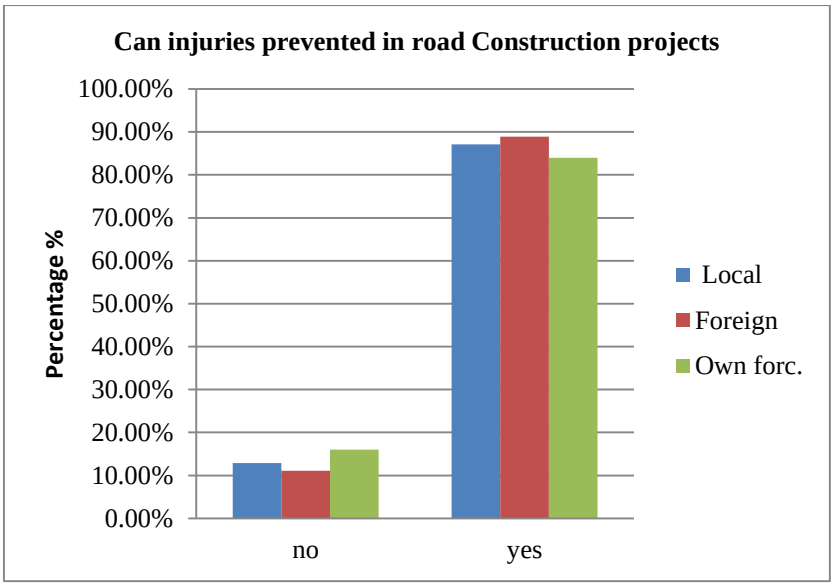

Figure 27 - Can frequently occurring a injuries are preventable

4.5.2 Critical Safety Precautions

The below figure shows that respondents were asked about the most critical safety precaution means for the preventable accidents that occur in road construction sites and from the total of respondents that work in local contractor 16.13% of them said awareness creation and trainings are most critical safety precaution means, 50 % of them said personal protective equipment's and 33.87 % of them said warning tape, warning sign/boards, safety barrier/ reflector cone are most critical safety precaution means for them. Similarly, from the total of respondents that work in Foreign contractor 16.67% of them said awareness creation and trainings are most critical safety precaution means, 56.25 % of them said personal protective equipment's and 27.08 % of them said warning tape, warning sign/boards, safety barrier/ reflector cone are most critical safety precaution means for them. Also from the total of respondents that work in own force projects 12.77% of them said awareness creation and trainings are most critical safety precaution means, 53.19 % of them said personal protective equipment's and 34.04 % of them said warning tape,

warning sign/boards, safety barrier/ reflector cone are most critical safety precaution means for them.

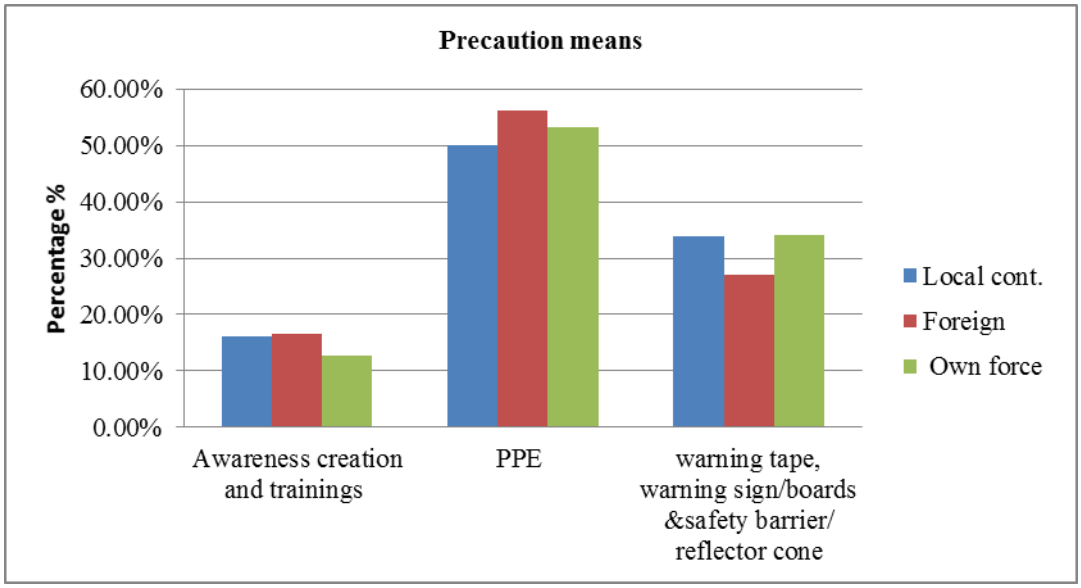

Figure 28 - Precautions means

4.6 Causes of Frequently Occurring Accidents

This section presents information on the causes of frequently occurring accidents of the Addis Ababa road construction projects at the execution phases by local contractor, own force (the client act as both client and contractor) and Chinese contractor. The data analysis were collected from the questionnaire and analyzed in detailed result were displayed graphically in tables and figures.

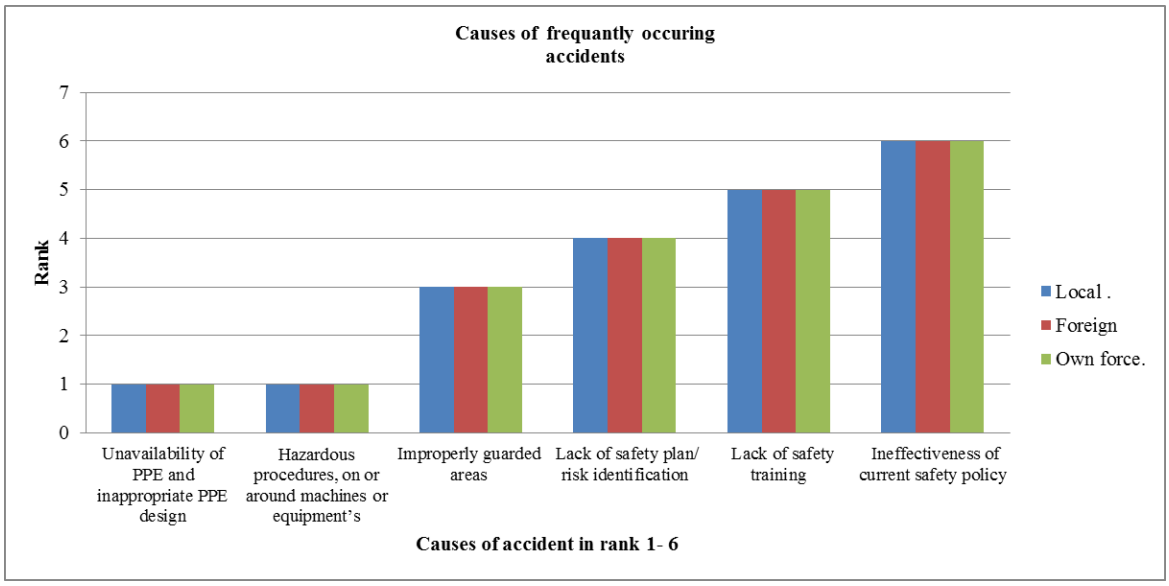

Figure 29 - Cause of Accidents

In the above figure respondents that work in local contactor; Chinese contractor and Own force projects were asked to rank the factors they think contribute for accidents occurring on road construction projects. Among the factors that are contribute for accidents the first chosen by respondents are hazardous procedures, on or around machines or equipment's and unavailability of PPE and inappropriate PPE design, improperly guarded areas comes third , lack of safety plan/ risk identification on forth, lack of safety training on fifth and ineffectiveness of current safety policy comes last.

5 CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMENDATION

5.1 Summary of the Finding

This study has analyzed the safety practice on Addis Ababa road construction projects. The finding revealed that;

- 90.32- 96% of workers on all sites value road construction safety but no trainings on road construction safety are provided on job, and are not frequent.
- Above 90% of the site personnel, if it is provided for them likely - very likely to use it but insufficient in provision of PPE are common in all the three sites,
- More relevant PPE in road construction projects are safety shoes and reflector jacket, most seen PPE in road construction projects are reflector jacket, gloves and safety shoes.
- About 42.31% of site personnel's do not use PPE continuously is because of discomfort to wear/ use in Own force projects and Chinese contractors while, 54.84% of the workers in local contractor said it is because it is not provided. On the hand, lack of awareness got the second reason in all site.
- 43.91% - 91.66% of the respondent don't have the information or does not know if the construction firms they are working have safety policy. Also most of the respondent don't have the information or does not know whether or not the company has a written safety rules & regulations which reflect management concerns.
- The result shows that above 68% of the respondents in all the three construction site said written circular/brochure that aware workers about the risk associated with their work does not prepared.
- Managers does not encourage and support worker Safety programs in both Local Contractor and Own force executing projects, a little encouragement and support of worker in Safety programs seen in Chinese Contractor executing projects. Also, more than 78% of respondents witnessed Managers do not encourage and support safety trainings for new employees in all of the three project sites. Similarly no training is given to workers how properly care & use of PPE.
- In all of the three projects do not have safety supervisor or officers but in Chinese Contactors project sites sometimes the site engineer's act like one.

- The finding indicated for minor injuries that occur in the road construction sites most of them treated by going to nearby clinic, some of them treated on traditional means and few of them treated by site clinic. Almost of all of the major injuries taken to nearby clinics and few treated in site clinic.
- 68% - 82% of the accidents that occur in road construction site didn't report to site or safety supervisors.
- The result shows that lack of personal protective equipment's, lack of top management commitment in safety programs, insufficient safety budget, lack of safety supervisor on site and ineffectiveness of current safety policies are the top five constraints in the implementation of safety programs.
- The finding indicated that 17% - 24% of the accidents occur in road construction sites are rock or soil slide, 11% -18% of them are machinery accident in loading or unloading, 11% - 17% of them falling in to excavated pit; hit by equipment's, 9%- 15% of them car/trucks overturning, 10% -12% of them falling in to hot asphalt (leg or hand burn), 9% -10% of them falling from scaffolding and 7% - 9% of them nail piercing are the frequently occurring accidents in road construction projects top to bottom.
- Hazardous procedures, on or around machines or equipment's, unavailability of PPE; inappropriate PPE design, improperly guarded areas, lack of safety plan/ risk identification, lack of safety training/ lack of awareness and ineffectiveness of current safety policy are major causes of injuries/accidents in descending order on the road construction sites.

5.2 Conclusion

Road construction projects are vital for developing countries like Ethiopia in general and Addis Ababa city in particular as infrastructure development is key for economic development of those countries. Construction safety on road construction project sites is of utmost importance due to the nature of the construction industry. However, it is usually a secondary concern in a market-driven society where the main concern is completing projects at the required quality with minimum time and cost. Thus, safety issues are considered only after an accident occurs at a construction site with follow up measures to improve working conditions, especially in developing countries. The main objective of this research is to assess safety practices in Addis Ababa road construction projects.

When looking at the results of the analysis the following conclusions are drawn:-

No trainings on road construction safety are provided, insufficient provision of PPEs, discomfort to wear/ use and lack of awareness for not continuously applying PPE, lack of enforcement of safety policy, lack of appointment of safety personnel, lack of top management commitment & involvement in safety programs and they are not providing safety training for new employee, poor accident record keeping and reporting system. These shows that they are not up to expectation in all the three road construction projects.

The constraints in successful safety program implementation in Addis Ababa road construction projects are lack of personal protective equipment's, lack of top management commitment in safety programs, insufficient safety budget, lack of safety supervisor on site and ineffectiveness of current safety policies are the top five.

The finding indicated rock or soil slide, machinery accident in loading or unloading falling in to excavated pit, hit by equipment's, car/trucks overturning, , falling in to hot asphalt (leg or hand burn), , falling from scaffolding and nail piercing are the frequently occurring accidents in road construction projects top to bottom.

Major causes of injuries/accidents in road construction projects in descending order are hazardous procedures, on or around machines or equipment's, unavailability of PPE; inappropriate PPE design, improperly guarded areas, lack of safety plan/ risk identification, lack of safety training/ lack of awareness and ineffectiveness of current safety policy.

5.3 Recommendations

Based on the findings of the research, the following recommendations are forwarded which is expected from key stake holders of road construction projects in Addis Ababa city administration.

- Road construction safety needs to be treated as obligation rather than an option on road construction site. All stake holders in this sector should have to give priority for safety as they give for Time, cost, and quality. Sufficient budgets should be allocated in the contact to stop struggle for the lack of personal protective equipment's.
- Risk assessment, based on policy, regulations and standards should be in place that will help to identify the risks workers face and also to appropriately and effectively implement safety rules and programs.

- Comprehensive safety plans need to be in a place and the safety officer/ supervisor need to follow up implementation of the same on site is very important in Addis Ababa road construction projects.
- Training on road construction safety need to be provided to all level workers on the job frequently
- All relevant PPE needs to be provided for workers after they trained how to properly care & use them. Also PPE provided on the road construction sites needs to be good quality, fitting size.
- The road construction firm needs to have a way that their works know about safety policy, regulation and safety procedures. Similarly written Safety rules & regulations which reflect top management concerns should be in place to make sure safety get the attention it's needed.
- That role that top management plays a very important for efficient and effective safety program. Management must fully and actively give details ideas into safety actions managers should have to encourage and support worker in safety programs, safety trainings for new employees and must be a role model for works by wearing PPE and by following standard procedures. Construction professionals (top management) should take more responsibilities for further improvements in safety performance on road project sites.
- Frequently occurring injuries that encountered in road construction sites are preventable by providing personal protective equipment's , by creating awareness; giving training for works on job and by using warning sign/ boards, using safety barriers and reflector cones.
- Road construction firms should have to improve accident record keeping and reporting system because information on accidents and incidents can be used as an aid to risk assessment, helping to develop solutions to potential risks.
- We can reduce causes of frequently occurring injuries/accidents on the road construction sites by increasing top management commitment, emphasize on safety, establishing a safety policies, reduce unsafe acts through selection, providing safety training, using posters and other propaganda, using positive reinforcement, using behavior based safety

programs, encouraging worker participation and by conducting safety inspections regularly.

5.4 Future Work

- Research can be conducted to evaluate the current practice of Safety performance on Ethiopia road construction projects.

- Research can be conducted to compare the Road construction safety practice with Building construction safety practice.

- Research can be conducted to evaluate the current practice of safety by including the health aspect in Addis Ababa road construction projects which not covered in the present study.

- Research can be conducted by comparing the safety practice between the local Contractor with foreign Contractor and Own force projects.

.

Reference

Adane MM, Gelaye KA, Beyera GK, Sharma HR, Yalew WW (2013). Occupational injuries among building construction workers in Gondar City, Ethiopia.

Al Haadir, S. and K. Panuwatwanich.2011. Critical success factors for safety program implementation among construction companies in Saudi Arabia. Procedia engineering. 14: p. 148-155.

Aksorn, T. and B. Hadikusumo.2008. Critical success factors influencing safety program performance in Thai construction projects. Safety Science. 46(4): p. 709-727.

Anton TJ (1989). Occupational Safety and Health Management, New York, McGraw-Hill, Second Edition.

Brown, I. D. (1995). Accident reporting and analysis. Evaluation of human work, J.R. Wilson, and E. N. Corlett, eds., Taylor & Francis, LondonBrown (1995).

Choudhry, R. M., Fang, D. P. and Mohamed, S. (2007) Developing a Model of Construction Safety Culture. Journal of Management in Engineering, ASCE, SCI Journal.

Culture. Journal of Management in Engineering, ASCE, SCI Journal.

GIBB, A., Hide, S., Haslam, R., Gyi, D., Pavitt, T. and Atkinson, S., 2005. Construction tool and equipment – their influence on accident causality, Journal of Engineering, Design and Technology (Emerald), 3(1), 12-23.

Hashem M.A., 2002. Anayzing Construction Site Accidents in Kuwait. KuwaitJ.Science.29 (2).

(Hanna Mersha, Seid Tiku Mereta and Lamessa Dube, 2016). Prevalence of occupational injuries and associated factors among construction workers in Addis Ababa, Ethiopia.
Hinze JW (1997). Construction Safety, New Jersy, Prentice-Hall.

Hinze, J. & Gambatese, J., 2003. Factors that Influence Safety Performance of Specialty Contractors. Journal of Construction Engineering and Management, 129(2), pp. 159-164. (Need to download).

Jannadi, O. & Bu-Khamsin, M., 2002. Safety factors considered by industrial contractors in Saudi Arabia. Journal of Construction Engineering and Management, 37(5), pp. 539-547.

Jaffar, N., Abdul-Tharim, A.H.,Mohd-Kamar, I.F. and Lop, N.S.,2011. A Literature Review of Ergonomics Risk Factors in Construction Industry. V ScientDirect.20 (2011), 89-97.

Kin Dorji and Bonaventura H. W. Hadikusumo(2006) "Safety Management Practices in the Bhutanese Construction Industry" Journal of Construction in Developing Countries, Vol. 11, No. 2, 2006.

Kines, P., Spangenberg, S. & Dyreborg, J., 2007. Prioritizing occupational injury prevention in the construction industry: Injury severity or absence? Journal of Safety Research, 38(1), pp. 53-58. (Need to download)

Lehto, M., and Salvendy, G. (1991). Models of accident causation and their application: Review and reappraisal. J. Eng. Technol. Manage., 8, 173-205.

Lehtola, M. M., Van Der Molen, H. F., Lappalainen, J., Hoonakker, P. L. T., Hsiao, H., Haslam,

R. A., Hale, A. R. & Verbeek, J. H. (2008). The effectiveness of interventions for preventing injuries in the construction industry - A systematic review. American Journal of Preventive Medicine, 35, 77-85.

Lingard,H. Rowlinson, S., (2005) Occupational Health and Safety in Construction Project Management, Spon Press.

Mwombeki, F. 2005. Occupational Health & Safety Challenges in Construction Sites in Tanzania. Rethinking and Revitalizing Construction Safety, Health, Environment and Quality, CIB138 (1), pp. 778 -789.

Nyirenda V, Chinniah Y, Agard B (2015). Identifying Key Factors for an Occupational Health and Safety Risk estimation Tool in Small and Medium-size Enterprises. IFAC-Papers On Line 48, 541 – 6.

Pipitsupaphol T.,Watanabe T. (2000). Identification of Root Causes of Labor Accidents in the Thai Construction Industry. Proceedings of the 4th Asia Pacific Structural Engineering and Construction Conference (APSEC 2000)". University Technology Malaysia, Malaysia.

Radlinah Kunju Ahmad (2000). Developing a Proactive Safety performance Measurement Tool (SPMT) For Construction Sites. Loughborough University: Degree of Doctor of Philosophy.

Tam, C., Zing, S. & and Deng, Z., 2004. Identifying elements of poor construction safety management in China. Safety Science, 42(7), p. 569–586.

Teo, E., Ling, F. & Chong, A., 2005. Framework for Project Managers to Manage Construction Safety. International Journal of Project Management, 23(4), pp. 329-341.

https://www.dbkrieginc.com/onsite-work-safety.php safety tips for minimizing risk on highway & road construction sites for workers.

William M.K. Trochim. 2005 Research methods

Addis Ababa University

School of Commerce

MA Thesis Questionnaire

A Survey on Assessment of Safety Practices in Addis Ababa Road Construction Projects

Dear Sir/Madam,

The purpose of this survey is to obtain data for the specified study being conducted as a partial fulfillment of MA Degree in Project Management at Addis Ababa University. The questionnaire is designed to obtain professional opinion on issues of the Safety Practices in Addis Ababa Road Construction Projects. The study is presumed to assess the safety practices, factors that affect the implementation of safety program, to identify the causes of accidents and what are frequently occurring accidents in Addis Ababa road construction projects. It intends to critically assess the safety practice; to create awareness among the different stakeholders of the projects, to identifying areas of safety deficiencies in road construction projects and to recommend possible remedial measures in mitigating them. All data included in this questionnaire will be used only for academic research purpose and will be strictly confidential.

Thank you for your invaluable time and cooperation in advance.

Regards, Betelehem Bekele

Tel: 0913-281577

E-mail: bety2035@*yahoo.com*

PART One: - The background information of the respondents

Direction One: Dear respondents questions raised in this section are related to the background of the respondents (you). Therefore, please encircle your appropriate response.

1. Gender a/ Male b/Female

2. Age a/ 25-30 b/31-35 c/36-40 d/41 and above

3. Education Level a/ PhD b/ Masters c/ Degree d/ Diploma e/ Other

4. Your total work experience in year a/1-5 years b/6-10 years c/11-15 years d/above 16 years

5. Your Job title ……

PART Two: - Safety Practice

Direction two: Dear respondents questions raised in this section are related to the safety practices in your work experience please put **"X"** sign for your appropriate response.

1. How important do you think safety is in road construction?

Very Important	Important	Somewhat Important	Not That Important

2. How many trainings have you been (on job) with respect to construction safety?

None	Some	Few	Many

3. How frequent are the trainings (on job) with respect to road construction safety?

Very Frequent	Frequent	Somewhat Frequent	Not Frequent	Not very frequent

4. In scale 0-10 how do you rate the safety culture of road construction firms you work for?

0-2	2-4	4-6	6-8	8-10

5. Have you ever worked in local or international road Construction Company that considers construction safety important? (Yes/No) _____

6. What type of safety equipment is more relevant to you in road construction project? (Rank them in order)

Safety Shoes	Helmet	Reflector	Safety Glass	Gloves	Other (Specify)

7. What type of safety equipment do you see in road construction projects?

Safety Shoes	Helmet	Reflector	Safety Glass	Gloves	Other (Specify)

8. Are there adequate Safety equipment's (PPE) on your construction projects/sites?

(Yes/No) _____ (Why or why not)

_____
_____
_____

9. Do your firm Provide Personal Protective equipment (PPE)?

If your answer is yes, what are they?

_____
_____
_____

10. If you are provided with safety equipment's, how likely are you applying them?

Very Likely		Likely		Somewhat Likely		Unlikely		None	

11. What factors are contributing for not continuing to apply PPE?

Not Provided		The Climate (too warm)		Discomfort to wear/use		Lack of awareness		Other (Specify)	

12. Does your construction firm have Safety policy?(for office only)

Yes		No		Don't have the information	

13. Does your Company have a written Safety rules & regulations which reflect management concerns for safety?

Yes		No		Don't have the information	

14. Does your Construction site provide awareness with written information about Safety procedures? (yes/no)

If yes, what are they?

_____

15. Does your Construction site prepare written circular/brochure that aware workers about the risk identification associated with their work? (Yes/No) _____

16. Do Managers encourage and support worker Safety programs?

(Yes/No) _____

17. Do Managers encourage and support Safety training for new employees?

(Yes/No/ don't have the information) _____

18. Do Workers get introduction Safety trainings before commencing work on a particular site?

(Yes/No/ don't have the information) _____

19. Are workers trained how properly care & use of personal protective equipment?

(Yes/No) _____

20. Does the project have safety supervisor on site?

(Yes/No) _____

21. How often does safety inspection done?

(Yes/No) _____

22. What action will be taken if minor injuries occur in the road construction projects?

Will be treated by traditional means	Will be taken to the site clinic	Will be taken to the nearby clinic

23. What action will be taken if major injuries occur in the road construction projects?

Will be treated by traditional means	Will be taken to the site clinic	Will be taken to the nearby clinic

24. Are injuries & fatalities reported to safety supervisor? (Answer by office)

(Yes/No) _____

If your answer is yes, is it done by Contractor/ Consultant?

_____

25. Do Managers ensure that the Safety budget is adequate? (Answer by managements only)

(Yes/No) _____

PART Three: - Constraints in safety implementation

Direction three: Dear respondents questions raised in this section are related to the constraints in safety implementation please put **"X"** sign for your appropriate response.

26. How likely do you think these factors affect safety performance in implementing on road construction sites?

Factors	**Very likely**	**likely**	**somewhat likely**	**Unlikely**	**Very unlikely**
Ineffectiveness of current safety policies					
Lack of inspection procedures onsite					
Poor legislation, codes and standards					
Lack of monitoring the compliance of safety measures					
Lack of skilled labor					
Workers' physical fatigue					
Excessive overtime work					
Lack of training					
Reckless operations					
Low educated workers					
Poor accident record keeping and reporting system					
Insufficient safety budget					
Lack of personal protective equipment					
Lack of safety supervisor on site					
Lack of top management commitment to safety programs					
Poor safety awareness among top management					
Reluctance to input resources for safety					
Lack of emergency plan and procedures					
Insufficient promotion of safety awareness					

PART Four: - Frequently Occurring Accidents

Direction Four: Dear respondents questions raised in this section are related to the frequently occurring accidents; please write your appropriate answers in the space provided.

Frequently occurring accidents

27. What are frequently occurring accidents on in road construction sites?

_____

_____

_____

28. Are most the frequently occurring accidents in road construction sites preventable?

(Yes/No) _____

Critical safety precautions means.

29. For road construction projects, what are the most critical safety precautions for you?

_____

_____

PART Five: - Causes of Accidents

Direction three: Dear respondents questions raised in this section are related to the Causes of accidents; please encircle your appropriate response.

30. Which factors do you think majorly contribute for accidents occurring on road construction projects?

Rank them in order_____

A. Improperly guarded areas
B. Lack of safety training
C. Lack of safety plan/ risk identification
D. Ineffectiveness of current safety policy
E. Unavailability of PPE and inappropriate PPE design
F. Hazardous procedures, on or around machines or equipment's

31. What do you want to see improved in relation to road construction safety?

_____

_____

_____