Safety Measures Implemented at Site during COVID-19: A Case from Nepal

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ABSTRACT

Purpose: *The situation has been unexpectedly bad with the rise of the global pandemic Coronavirus Disease (COVID-19). Construction industry has been struck with the challenges like human fatalities, decrease in labor productivity, disrupted material supply, and an unsafe working environment due to COVID. However, some of the major construction projects in the Koshi Province of Nepal were in operation even during COVID. The research aims to compare the safety measures implemented at the site during COVID-19 of Birat chowk- Ghinaghat and Kisan Chowk – Tandi – Ramite khola Road Upgrading Project.*

Design/Methodology/Approach: *Data related to Safety Management Practices of construction projects at pre-COVID and COVID phases were collected by questionnaire survey. Data related to safety practices was collected through a checklist during field observation, questionnaire survey as well as key informant interview. The obtained data were analyzed using statistical tools such as correlation analysis and also general descriptive statistical tools and content analysis were performed.*

Findings/Result: *The safety practices adopted during COVID, both the construction projects were found to have adopted similar measures of precautions to maintain workplace safety. On the other hand, Kisanchowk- Tandi- Ramite Road Upgrading Project seems to be less affected by the pandemic as several indicators remained neutral as compared to earlier conditions. The basic approaches such as masks, face shields, social distancing, hand washing, and sanitization were found to be practiced whereas higher preventions like vaccination for workers, and provision of COVID insurance was not practiced. This indicated that the contractor primarily focused on work completion disregarding the safety of workers at the workplace.*

On the other hand general safety provisions were found different on comparing the two projects as on seven studied parameters, different parameters were found to be highly differing in rank.

Originality/Value: *A Comparative assessment of safety during COVID-19 highlights the preparedness needed in a similar pandemic.*

Paper Type: *Research paper*

Keywords: Case from Nepal, Safety measures, COVID-19, Projects comparison, Project Implementation

1. INTRODUCTION :

The new vocabularies of social distancing, quarantine, COVID-19, self-isolation, palliatives, and furlough have emerged in the entire world including the construction industry of Nepal. After a decade, human race was able to experience a pandemic. The outbreak of Corona Virus has announced in 2019 and within the span of four months, it hit all the nations present in the world. So, it was declared a pandemic in March 2020. The business around the globe was disrupted by this outbreak which also included built asset procurement. For responding to this unprecedented situation, the United Kingdom introduced Site Operating Procedure through Construction Leadership Council. This pandemic possessed various effects on different sectors of the country. It posed both negative and positive impacts

in Architecture, Engineering and Construction, Owner and Operator (AECOO) industry. An innovative and diverse use of various technologies was brought about due to the effect of the pandemic. The use of technology was presented in an exemplary manner which was able to change the course of construction and these changes could be applied even after the extinction of the coronavirus (Ogunnsi et al., 2020) [1].

Roads are one of the most prioritized developments focused on in Nepal [2 & 3]. Departments must include a plan for management to reduce the aftermaths of the COVID-19 Pandemic. And the period of lockdown could be utilized as an opportunity for improving technology, preparing better management plans, and safeguarding of the workforce in the case of transportation for operation construction projects [4].

2. RATIONAL OF THE RESEARCH :

Safety implementation is under question even in dangerous projects like hydropower and tunnel in Nepal [5, 6, &7]. In the recent context, the outbreak of coronavirus (COVID-19) has not only impacted the health of the worldwide population but also hampered economic activities to a great extent. This has pushed the entire civilization backward as the attention of the entire world has shifted to the control of the pandemic and bringing life back to normal. Hence in light of COVID-19, ongoing developmental activities are at great risk of being collapsed. So, the research targets to study the constructional phase of road upgrading projects and its indicators in light of COVID-19.

In this very context, construction projects are ongoing even amidst the outbreak of the pandemic. Due to the abnormal situation in the present time, there are several constraints as well as challenges in construction. Different projects may face similar or different challenges regarding worker safety. So, there is a need of a comparative study of projects of similar nature to access the condition and put forward a strong viewpoint about the impact of the pandemic on safety in the construction sector of Nepal with a view to have answer of central question is - What is the safety measures being implemented in the site during the COVID-19 pandemic?

3. OBJECTIVES :

The overall objective of the study is to compare the safety measures implemented at the site during COVID-19 of Biratchowk- Ghinaghat and Kisan Chowk – Tandi – Ramite khola Road Upgrading Project.

4. LITERATURE :

From 24 March to 21 July 2020, the government of Nepal imposed a statewide lockdown that forbade non-essential services, foreign and domestic movement and the closing of the border [8]. After this, COVID has become permanent member of society. The workers were unable to come as due to the lockdown created by COVID-19. The local government must manage the labor effectively and provide the masons in its own area. The dependent on outsiders must be reduced and local masons must be produced by providing proper training. The reconstruction work must be uplifted by following the health protocols as mentioned by health offices and WHO [9, 10].

Development industry is viewed as the foundation of the country working as more than that of 70% of the gross capital arrangement is contributed by this area. In Nepal, this industry offers more than 8% of Gross domestic product and has a development pace of more than that of the public normal (Pandey, 2069) [11]. In order to find the impact of COVID-19 on construction industry in Nepal, the financial impacts included, late payment, reduction of budget, the over cost runs of the projects and deteriorating financial situation of the contractors. The operational level of impact includes, problems in supply chains, delay in completion of project, health and safety maintenance of the workforce, and difficult in workforce management. No support and special package from the government were found from this study. The construction industry must be supported by the government for competent, resourceful sectors, and build efficient. The performance of the construction industry could be enhanced by addressing the issues and expectations of constructional professionals. And then only, construction professionals, the industry, and the government will be benefited [12].

All contentions are considered, the development area in Nepal is probably not going to return pre-lockdown liveliness before November 2020. Whether the area figures out how to resuscitate itself by November 2020 relies upon five circumstances: first, the public authority figures out how to contain

the normal spread of the pandemic after the lockdown facilitates and global boundaries open for traffic in 6 two months; second, the ongoing lockdown facilitates to the point of reestablishing homegrown store network of development materials inside 4 a month and a half from now; third, the public authority finds a way proper ways to diminish expected legally binding questions as fast as could really be expected and reestablishes the income into the area; fourth, the ongoing help and government assistance framework figures out how to forestall far and wide yearning and provincial trouble; and, fifth, the FY 21 financial plan figures out how to significantly18 increase distributions in the development area [13].

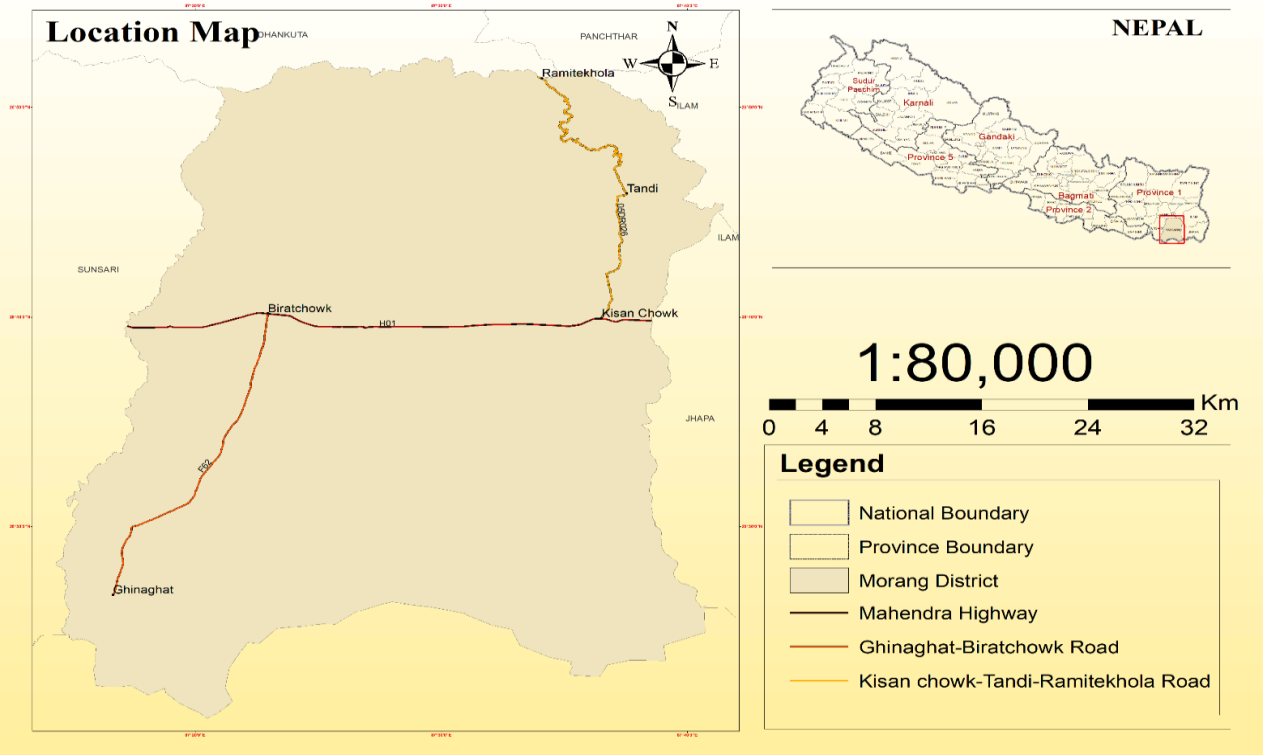
5. METHODOLOGY :

5.1 Study Area:

Road Upgrading Projects of Koshi Province are being implemented by Provincial Government through Infrastructure Development Office, Morang.

Biratchowk- Ghinaghat Road Upgrading Project

Biratchowk – Ghinaghat Road is a feeder highway with road code F062. The road is 23 km in length and it stretches from Biratchowk (Sundar Haraicha Municipality) at East-West Highway to Ghinaghat of Biratnagar Metropolitan City. The road serves as a bypass of Koshi Highway as it provides an easy link to the provincial capital with the eastern part of the province. The existing road has a two lane blacktopped carriageway while the project shall upgrade it to four lane carriageway with a footpath and drain (Ministry of Federal Affairs and Local Development, 2013)[14].



Fig, 1: Map Showing Morang District and the project location

Kisan Chowk – Tandi – Ramitekhola Road Upgrading Project:

Kisan Chowk – Tandi – Ramitekhola is a district road with road code 05DR026. The road is 35.5 km in length and it stretches from Kisan Chowk (Urlabari Municipality) at East-West Highway to Ramite Khola (Miklajung Rural Municipality, Morang) and further into Dhankuta District. This road is the connecting road of East West Highway and the under construction Vedetar- Rajarani- Rabi- Ranke road. The existing road is double lane and partially gravelled and major portions are earthen while the project aims to upgrade it to a double lane blacktopped road (DoLIDAR, 2016) [15].

5.2 Sampling:

The study population is the technical workforce of two public road construction projects within the province which are in operation during COVID as well. Given the relatively small number of the study

population as gathered from the road departments and the high number of responses required in order to use factor analysis for data analysis, the census sampling technique was employed for this study. The respondents for the study were project management team members (i.e., engineers and quantity surveyors) of consultants, contractors and clients involved in the management of the completed road projects under the road agencies.

5.3 Data Collection:

Primary data related to the project has been obtained by the following methods along with continuous support from literatures:

- Key Informant Interview (KII)
- Questionnaire Survey
- Field Observation

Focus Group Discussion (FDG)

5.4 Data Analysis:

The Spearman's rank coefficient of correlation is primarily used for data analysis.
It measures the strength and direction of the association between two ranked variables.
$\rho = 1- 6\sum d^2/(n(n^2-1))$, where
ρ = Spearman rank correlation coefficient
d = difference of ranks
n = number of parameters
In the study, spearman rank correlation is applied to study the relationship between safety practice parameters in two road upgrading projects. This method of analysis widely applied in research [16, 17, &18].

6. RESULTS AND DISCUSSIONS :

6.1 Frequency of Periodic Meetings during COVID:

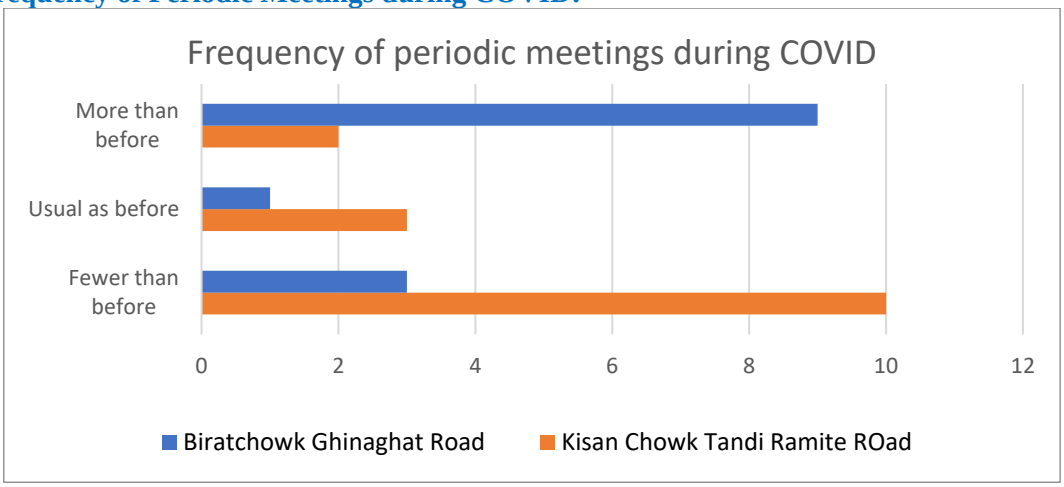


Fig. 2: Frequency of periodic meetings during COVID

Better communication and teamwork within any project help to achieve better project objectives. Periodic Meetings are effective method for monitoring and evaluating the process within the project. COVID has introduced new and greater challenges to tackle with in the construction industry as well. So there needs to be more communication and coordination among the project team to overcome the challenges put forward by COVID.
The chart of figure 2 shows contrasting results among two projects. Frequency of periodic meetings increased in Biratchowk- Ghinaghat road project whereas in Kisanchowk – Tandi – Ramite road, the frequency of periodic meetings was found to be lesser than before. This may be due to the fact that the major area of effect of COVID 19 was seen in the location of Biratchowk- Ghinaghat road project. So the project team needed more frequent communication to deal with the problems occurs whereas the site location of Kisanchowk- Tandi- Ramite road was in quite safer zone where less number of transmissions was reported. The situation of COVID has not left health sector also which is more

organized as that is expert industry then we can think for non-formal sector where casual worker deployed [19, 20, 21, 22, & 23].

6.2 Adoption of Emergency Procurement Techniques during COVID:

During the course of emergency or any abnormal situation, the procurement techniques can be shortened in order to procure the item as soon as possible.

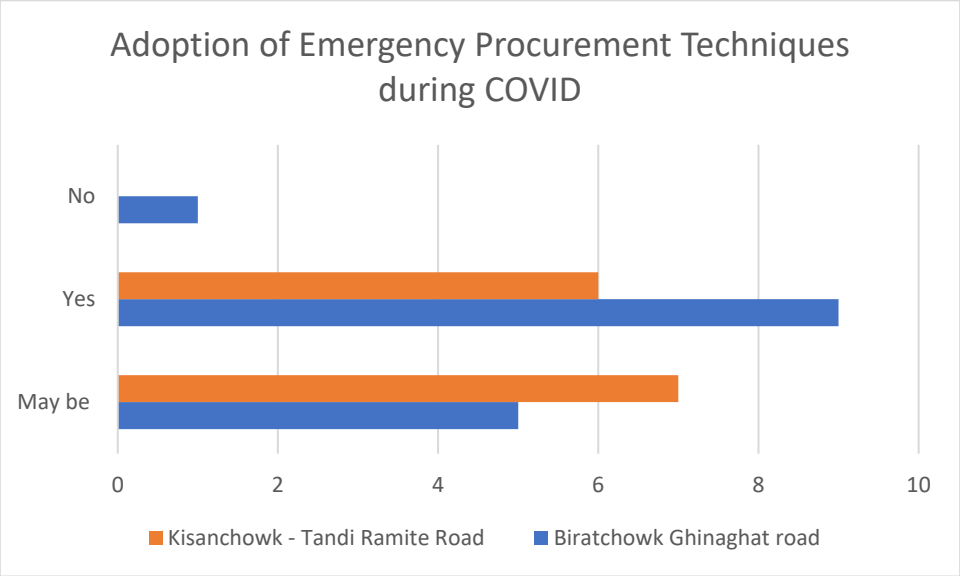


Fig. 3: Status of emergency procurement techniques

For any public entity, there is a formal process for emergency procurement stated in public procurement act and regulation. However, a contracting firm may also practice any sort of emergency procurement method in case of material crisis or any undesirable situations. COVID had created such situation as there was crisis of construction materials in the market. So the respondents were asked about the adoption of any such procurement technique adopted during the period.

The result showed that the even being a private sector organization, the contractors applied quicker methods of material procurement. This result is supported by the fact that majority of the suppliers were out of stock during COVID and the contractors procured goods randomly from wherever and whatever price. So it can be said that emergency procurement techniques were adopted but not on a formal way. The further digging research of health sector made it more relevant to take concern in construction sector [24, 25, 26, & 27].

6.3 Change in Labour productivity during COVID:

Labour productivity is directly related with the yield of the project. Higher the productivity of workforce/ labours, better quality is achieved in shorter time. However different factors affect labour productivity to a great extent. One of such factors is health condition of labourers. Healthy labourers can yield better performance in the assigned task. The greatest impact of COVID is on human health as it has caused millions of casualties all around the world.

In the similar context, the respondents were asked about the status of change in labour productivity during to the pandemic and they responded as such:

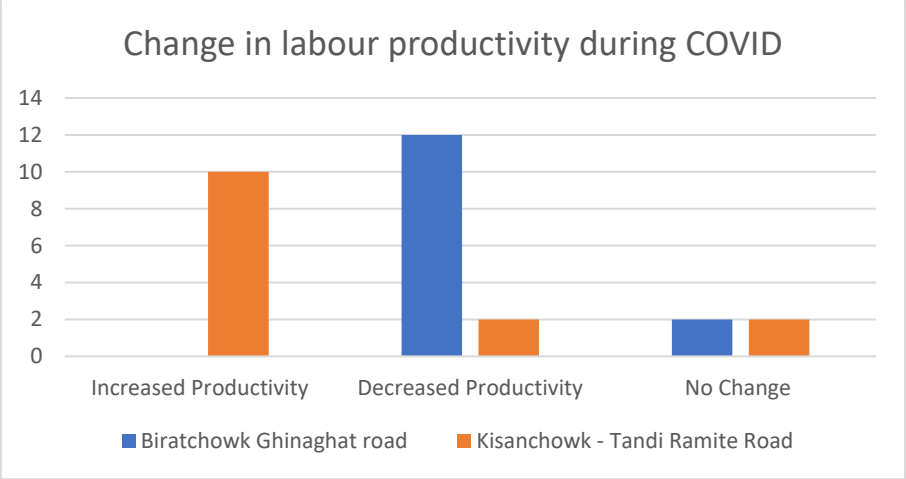


Fig. 4: Change in labour productivity during COVID

The results indicated that labour productivity in Biratchowk – Ghinaghat road decreased significantly as majority of the labours were found to be either infected or in close contact of the infected ones. But the condition of labour productivity in Kisanchowk – Tandi – Ramite road was found absurdly increasing. On further inquiry, the respondents answered that the effect of COVID was not observed significantly in the hilly areas on the one hand and on the other productivity had increased as labourers had no other option of working other than the construction site as all other major areas of labour employment was closed.

6.4 Number of Technical Workforce Employed:

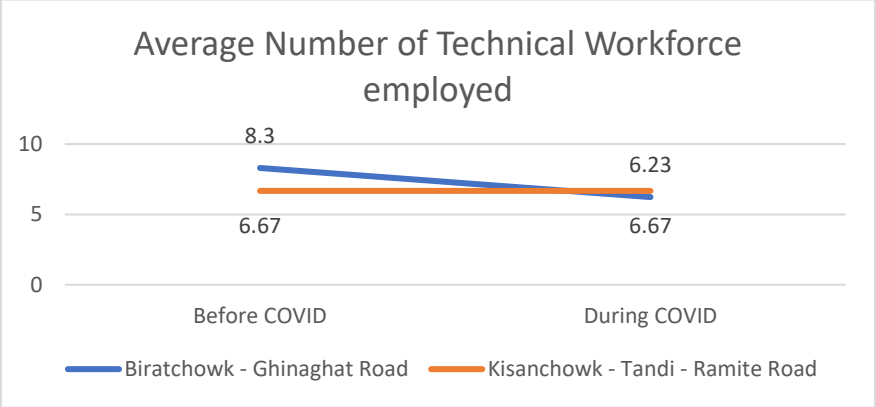


Fig. 5: Average number of technical workforces employed during COVID

The impact of the pandemic can also be observed by observing the available healthy or non-infected personals who can deliver output in the construction process with equal efficiency as earlier. Those employees who have a greater impact of their presence in the site are the technical persons assigned for the task. So the availability of technical manpower was observed. Higher the availability of technical manpower at the site, better will be the construction safety.

The result indicated that there was a significant decrease in average number of available technical workforce at site of Biratchowk- Ghinaghat road whereas the average number of available technical workforce was found to be constant in the case of Kisanchowk – Tandi – Ramite road. This indicated the higher impact of pandemic in the geography of former road project and lesser impact of the pandemic in the geography of latter road project.

6.4 Number of Site Visits per Month:

The effect of COVID on the specific project can also be analysed by the ease in periodic site visits by the technical persons. This frequency of site visit in turn affects the Safety performance as higher the inspections from technical people or concerned authority, better will be the safety act and conditions.

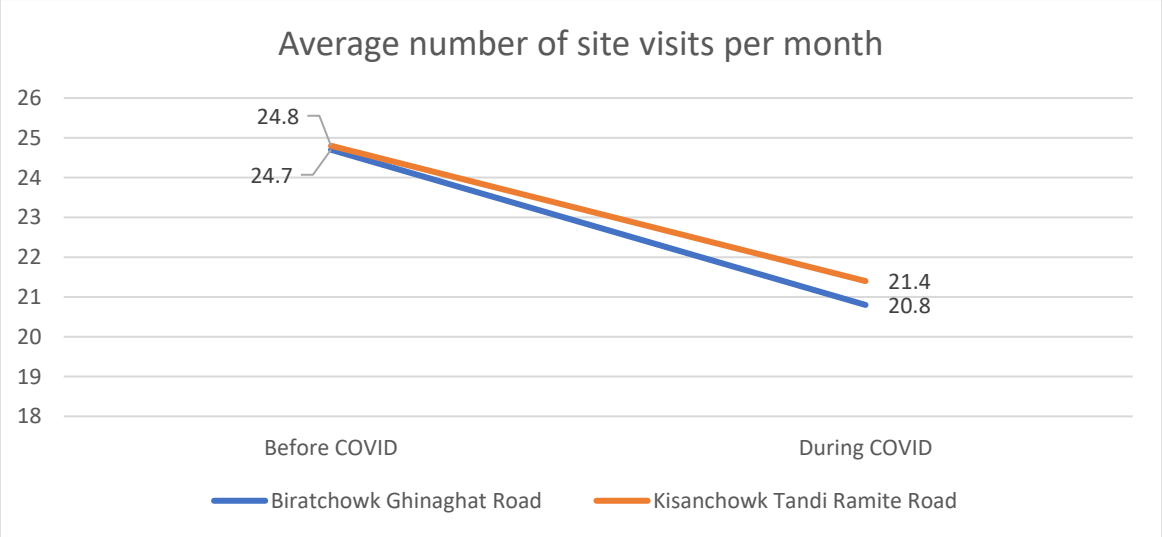


Fig. 6: Average number of site visits during COVID

On analyzing the result, it was seen that in both of the road projects, the frequency of site visits decreased. On comparison among the two, greater decrease in frequency of site inspection was observed in Biratchowk-Ghinaghat road project. Travel restrictions during the lockdown period and high-rate transmission of the pandemic forced the technical force to reduce their frequency of site visit.

6.5 Construction Safety Practices:

Table 1: Correlation analysis for COVID related safety parameters

Parameters	Biratchowk - Ghinaghat		Kisanchowk - Tandi - Ramite		Difference of rank	Squared difference
	Score	Rank	Score	Rank		
Workplace and tools sanitization at the start	2.33	7	2.33	6	1	1
Provision of hand wash before entering the workplace	3.00	4.5	2.67	4.5	0	0
Temperature check before entering the workplace	3.00	4.5	2.00	7	-2.5	6.25
Use of face masks / face sheilds during work	3.67	1	4.00	1	0	0
Use of gloves during work	3.33	2	3.00	2.5	-0.5	0.25
Keeping social distancing during work	3.00	4.5	3.00	2.5	2	4
Disposal of used items (masks/sheilds/gloves)	3.00	4.5	2.67	4.5	0	0
Record keeping of health status of workers / employees	1.67	8	1.33	9	-1	1
Vaccination for workers	1.33	9	1.67	8	1	1
Sum	24.33		22.67			13.5
Total Parameters	9.00					
Correction factor for first tie at Biratchowk Ghinaghat Road (4 ties at 4.5)	5					
Correction factor for first tie at Kisan Chowk Tanadi Ramite Road (2 ties at 2.5)	0.5					
Correction factor for second tie at Kisan Chowk Tanadi Ramite Road (2 ties at 4.5)	0.5					
Total Correction Factor	6					
Corrected Squared difference	19.5					
Correlation factor (rho)	0.8375					

Construction safety is an inevitable aspect of any construction project. Apart from timely, budgeted and qualitative construction, it should also incorporate the safety issues at workplace and address the issues of labours health and occupational safety. Safer the workplace condition, higher productivity is

expected to achieve which increases the overall project performance. Construction safety practice can be measured with respect to different terms like rate of workplace accidents, casualties and fatalities, frequency of periodic maintenance works, provision of first aids, etc.

With the outbreak of pandemic, the issue of construction safety became even more prominent. As construction work is primarily on site work and needs to be performed physically, the transmission risk of the virus is even more. Poor health condition and infected working environment would affect in the project performance. So observation was done on both roads (3 chainages on each roads) about the COVID related safety parameters as well as general safety parameters and a mean rating (out of 5) was given to each parameter based on field observation.

The overall safety arrangement of both the road projects were compared against each other using Spearman Rank Correlation Test and an overall relationship of safety practices among the projects were calculated. The results of correlation analysis for both COVID related safety parameters and general safety parameters are shown IN TABLE 1:

The analysis resulted that the value of coefficient of correlation was 0.8375. This value indicates high correlation among the parameters adopted for arrangements made for COVID related safety at both the road construction projects. Among the nine selected parameters for observation, use of face masks, face shields and gloves, maintaining social distancing, etc were the found to be adopted fairly whereas immunization / vaccination of the workers was seen to been given less emphasis in both the road construction projects.

Table 2: Correlation analysis for general safety parameters

Parameters	Biratchowk - Ghinaghat		Kisanchowk - Tandi - Ramite		Difference of rank	Squared difference
	Score	Rank	Score	Rank		
Safety Warning Signage at workplace	4.00	1	3.67	3.5	-2.5	6.25
Use of PPEs (Helmets / Shoes / Gloves)	3.00	4.5	3.00	5.5	-1	1
Proper Storage of hazardous material (bitumen)	3.00	4.5	4.00	2	2.5	6.25
Properly maintained construction equipment	3.33	3	4.33	1	2	4
Availability of first aid services	2.67	6.5	3.67	3.5	3	9
Safety Warning Signage at place of material storage	2.67	6.5	2.67	7	-0.5	0.25
Use of barricades at places of high traffic flow	3.67	2	3.00	5.5	-3.5	12.25
Sum	22.33		24.33			39
Total Parameters	7.00					
Correction factor for first tie at Biratchowk Ghinaghat Road (2 ties at 4.5)	0.5					
Correction factor for second tie at Biratchowk Ghinaghat Road (2 ties at 6.5)	0.5					
Correction factor for first tie at Kisan Chowk Tanadi Ramite Road (2 ties at 3.5)	0.5					
Correction factor for second tie at Kisan Chowk Tanadi Ramite Road (2 ties at 5.5)	0.5					
Total Correction Factor	2					
Corrected Squared difference	41					
Correlation factor (rho)	0.2679					

The analysis resulted that the value of coefficient of correlation was 0.2679. This value indicates low correlation among the parameters adopted for arrangements made for general workplace safety at both the road construction projects. It was found the Biratchowk – Ghinaghat road focused on safety warning signage as primary task for workplace safety whereas Kisanchowk – Tandi – Ramite road project focused on maintenance of construction equipment as major activity to maintain workplace safety.

In overall it was found that both the road projects had followed similar precautions regarding safety

practices related with COVID whereas they had followed varying practices for general workplace safety issues. A comprehensive risk management needs to be adopted in any project as suggested by Mishra and Malik for assuring smooth operation of projects maintaining labour productivity similar to that of APF Building case suggestions [16, 17].

9. CONCLUSION :

The safety condition for COVID prevention maintained at both the sites was quite similar. The basic approaches such as masks, face shields, social distancing, hand wash and sanitization was found to be practiced whereas higher preventions like vaccination for workers, provision of COVID insurance, etc were not practiced. This indicated that the contractor primarily focused on work completion disregarding the safety of workers at the workplace.

On the other hand, general safety provisions were found different on comparing the two projects as on seven studied parameters, different parameters were found to be highly differing in rank. The contractor should not only be liable to the client but also to their human resource and make necessary safety arrangements to ensure safe and healthy work environment at the site. New methods and modern approaches for project management should be practiced so that the process of construction can be fluently carried out in abnormal situations as well.

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