Kurniawan et al., Int J Pub Health Safe 2019, 4:1

International Journal of
Public Health & Safety

Research Article Open Access

The Effect of Implementation SMKP (Occupational Health and Safety Management System) and Safety Leadership to Safety Performance

Kurniawan JS[1], Kholil K[2*] and Sugiarto S[3]

[1]*Post Graduate School of Sahid University, Jakarta, Indonesia*
[2]*Department Environment Faculty of Engineering, Sahid University, Jakarta, Indonesia*
[3]*Research Center of Health and Occupational Safety, Jakarta, Indonesia*

Abstract

A primary focus of Survival analysis in medicine is modelling time to surviving of a particular disease. In this paper, survival analysis was carried out on the neonatal jaundice data modeling time to surviving the disease. The data was gotten from collected from University College hospital (UCH), Ibadan, Nigeria. The Kaplan-Meier approach was used to describe the survival functions of the neonatal jaundice patients and Log-rank tests was used to compare the survival curves among groups. Different kinds of models such as Cox Proportional Hazard Model and Accelerated Failure Time (AFT) models like Weibull AFT model, Logistic AFT model, Log-normal AFT model, Log-logistic AFT model and Exponential AFT model are considered to be used for modelling the time to surviving neonatal jaundice. Models selection criteria were used as a guide to unravel the best model for modeling neonatal jaundice. The result revealed that the fitted cox proportional hazard model suggested that there were 0.2708 chances of male neonates having higher median time of surviving jaundice compared to female neonates. Based on the mother's health history, neonates whose mother had illness during pregnancy will have 0.5329 chance of having higher median time of surviving the Jaundice compared to neonates whose mother do not have any illness during pregnancy. The log-logistic AFT model out-performed the other models since it has the lowest AIC and the highest log-likelihood value with 1131.461 and -550.7305 respectively.

Keywords:

Implementation of SMKP; Safety management; Safety leadership; Safety performance

Introduction

Indonesia is a rich country in energy and mineral resources consist of oil, natural gas, coal, nickel and others. Based on the Ministry of Energy and Mineral Resources, coal has the greatest potential among other resources, resource 166 billion tons. Due to coal mining is the importance sector and considering that the coal mining sector is a capital intensive, risk-intensive, technology intensive sector, good management is needed. Coal mining is a sector that has a high risk, violations caused by negligence and indifference to the application of K3LH (health, safety, occupational and the environment) can be fatal, causing a disaster that has a very serious impact. Therefore the issue of occupational safety and health become special attention in a coal mining industry which has the same aspects as the aspect of production.

Safety work is part of safety performance and is also very closely related to improving the overall performance of mining projects. Safety performance must get special attention from every mining company. Good safety performance can be a benchmark for the success of a mining project in realizing zero accident and smooth work during the mining project. To be able to improve safety performance, it must consider factors that can affect safety performance in a mining project, safety management system and leadership behavior in terms of work safety leadership. The biggest problem of coal mining sector is fatality when accident an occurred, which not only causes of economic loses but human causalities. The purpose of this research is to analyze the application of SMKP (Occupational Health and Safety Management System) and safety leadership to safety performance at PT Bukit Makmur Mandiri Utama, Jakarta Indonesia; one of the national coals mining company that operates mining business in several mining area in Indonesia, with workforce reaching 500 peoples.

Literature Review

Safety management can be interpreted as an effort to achieve work safety goals starting from the process of planning, coordinating and controlling workers and the work environment. Theory of accident causes has developed through several stages in an effort to identify root causes of system failure. First stage, occur between 1940-1960, focused on repairing machinery and hardware, because of rapid development of new machines, most accidents were caused by mechanical malfunctions [1]. Second stage; occur in-between 1960-1980, focused research attention on human factors, because employees are seen as the weakest link of system [2]. Third stage considers the interaction of human and technical factors [1]. The latest stage considers organizational culture as influential factor.

Occupational health and safety is still a big problem in Indonesia [3]. Safety management implemented at PT Bukit Makmur Mandiri Utama refers to Minister of Energy and Mineral Resources No. 38 of 2014, which is a regulation that regulates the Implementation of SMKP in Mining Safety Management System. SMKP is a management system that is part of the company's management system in order to control mining safety risks which consist of mining K3 (healt, safety, and occupational) and mining safety operation. Mining Safety Management

***Corresponding author:** Kholil Kholil, Department Environment Faculty of Engineering, Sahid University, Jakarta, Indonesia, Tel: +628128101156; E-mail: khollillppm@gmail.com

Received March 06, 2019; **Accepted** May 03, 2019; **Published** May 10, 2019

Citation: Kurniawan JS, Kholil K, Sugiarto S (2019) The Effect of Implementation SMKP (Occupational Health and Safety Management System) and Safety Leadership to Safety Performance. Int J Pub Health Safe 4: 173.

System must be implemented by all mining companies, which include mining companies and mining service companies. This is regulated in Minister of Energy and Mineral Resources Regulation No. 38 of 2014 concerning Application of SMKP.

Indicators of safety management were used to explain safety management variables (Table 1).

Leadership may be considered as the process (act) of influencing the activities of an organized group in its efforts toward goal setting and goal achievement [4]. Empowerment behaviors refer to leader actions that emphasize the development of follower self-management or self-leadership skills [5]. Safety leadership can be defined as a process of interaction between leaders and employees, where leaders can influence employees to achieve organizational safety goals. Leadership behavior is an important factor in achieving work safety performance within the organization. Leadership behavior is an important factor in achieving safety performance [6-8]. The empowerment leadership questionnaire considering factors: lead by giving examples, participating in making decisions, conducting guidance, providing information, and showing attention [9].

Safety leadership is the key to success in building a strong safety culture in high-risk industries such as Mining, airlines and others, because the development of safety starts with top management and the management team in the organization. Indicators were used to explain the safety leadership (Table 2).

Safety performance is the behavior of employees in safety work, which plays a role in increasing or decreasing the number of accidents. Effective occupational health and safety management requires precise and reliable performance measurement. Tools used for measuring performance safety performance can use indicators of safety compliance and safety Participation.

Safety performance is a construct triggered by Neal et al, which is rooted in the theory of job performance; it is relevant to safety that can be conceptualized similar to other behaviors in the working area. Safety performance is used to evaluate safety work management in mining projects. Research on safety performance increases as interest in this construct develops because safety performance is considered to have strong relationships with workplace accidents [10,11].

There are 2 indicators in measuring safety performance, safety compliance and Safety Participation. Safety compliance is an item that assesses how employees carry out their main work in accordance with applicable safety and security regulations Neal et al. Safety participation is an item that assesses how employees participate in every activity that supports their work related to safety work and security (Table 3).

Based on Tables 1-3 the thinking framework of this study is shown in Figure 1.

Research Methodology

Data analysis using Structural Equation Modeling (SEM), carried out to explain thoroughly the relationships between variables in the study. SEM is a statistical technique that is able to analyze the pattern of relationships between latent constructs and indicators, latent constructs with each other, and measurement errors directly. SEM allows direct analysis between several dependent and independent variables [12,13].

According to Hair et al. in Hartono, there are 7 (seven) steps to be taken when using SEM, namely [12]

Statistical hypothesis testing using t-value; Accepted H1 and H2, if t-value>t-table (1.96)

Development of theoretical models

In the step of developing a theoretical model, what must be done is to carry out a series of scientific explorations through literature review to obtain justification for the theoretical models to be developed.

Development of flowcharts (Path Diagram)

In this second step, the theoretical model that has been built in the first stage will be depicted in a flow chart, which will make it easier to see the causal relationship that you want to test. In the flow diagram, the relationship between constructs will be expressed through arrows. A straight arrow shows a causal relationship directly between one other construct. While the curved lines between constructs and arrows at each end show a correlation between constructs.

Convert flowcharts into equations

The equation obtained from the converted flow diagram consists of:

- Structural equations are formulated to express causality between various constructs.

No	Dimension	Indicator
1	Fundamental Safe Work Practice (FSWP)	1.1 SOP used in application of work. 1.2 I know and follow SOP at work. 1.3 I have attended Occupational Safety and Health training. 1.4 Placement of safety signs and emergency gates has been clearly made. 1.5 There is a team that supervision the work, by that it is carried out safely and follows every work procedure that has been set.
2	Behaviour Based Safety (BBS)	2.1 I behave safely while working. 2.2 I have never been reprimanded for behaving safely while working. 2.3 I have been briefed to behave safely while working. 2.4 I have never had an accident because I stopped working when you found out about unsafe work conditions.
3	Hazard Identification (HAZID)	3.1 I have received training on hazards and how to deal with them. 3.2 There is a team that oversees the identification of hazards in the work environment. 3.3 I get directions about the dangers found in the work environment. 3.4 There is a team that periodically tests the work environment (testing engine noise quality, air quality in the work environment, testing the quality of lighting).
4	Stop Work Authority (SWA)	4.1 The company gives a quick and precise reaction to deviant conditions. 4.2 The company will give an order to stop working if the work conditions are not safe. 4.3 I have colleagues in my workplace stop working due to unsafe work conditions.
5	Self-Stop Work Authority (SSWA)	5.1 I will stop doing work if the job is not safe. 5.2 I do not continue work, which I think is risky.

Table 1: Implementation of SMKP (Safety management).

No	Dimension	Indicator
1	Competent	1.1 Having managerial, emotional and spiritual competencies. 1.2 Have an optimistic and visionary nature.
2	Trust	2.1 A successful leader always believes in his team.
3	Engagement with employee	3.1 Involving employee in K3 implementation. 3.2 Open (transparent) or asks for opinions from the team. This character shows that leaders value and trust them, to proactively apply K3 in every job.
4	Integrity	4.1 Clear about K3 policies and regulations. 4.2 Undertaken continuous improvement in K3 performance.
5	Accountable	5.1 A leader acts as a starting point for a change in OHS culture must understand his responsibility to ensure every operation in his company. 5.2 Competent and responsible leaders understand the measurement and monitoring methods to measure the effectiveness of K3 performance in the company.
6	Innovation	6.1 Visionary leaders always innovating in creating an OSH culture and a safety work environment in their company, drawing up various strategies.

Table 2: Variable of safety leadership.

No	Dimension	Indicator
1	Safety compliance	1.1 I always follow the work procedures set by the company. 1.2 I do work in accordance with the authority given. 1.3 I always work to operate equipment/machinery in accordance with the authority given. 1.4 I always work following work procedures when operating a tool. 1.5 In operating the machine so far, I have always been in good health and never been drowsy. 1.6 I use APD in the work area according to the standards that apply in the company. 1.7 I never use APD that has been damaged while working. 1.8 I always use a safety device while operating a tool. 1.9 I use work equipment according to its function. 1.10 I have never damaged work equipment.
2	Safety participation	2.1 I always keep my work equipment to function properly. 2.2 I work with operating tool or machine with safety equipment on a good machine. 2.3 I return tools or equipment in their place after work. 2.4 I maintain neatness in the area of my work. 2.5 I maintain cleanliness in the area of my work.

Table 3: Indicator of safety performance.

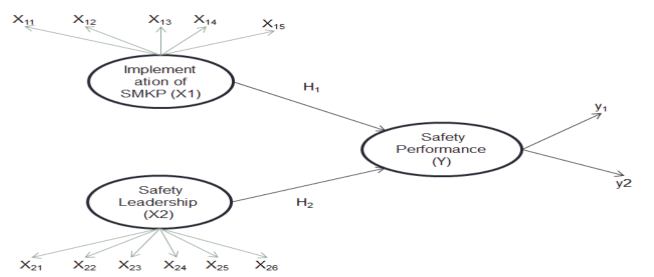

Figure 1: Frame work of thinking of the study; X1: indicators of implementation SMKP; X2: indicators of safety leadership; Y: indicators of safety performance; H1: SMK effect to safety leadership; H2: Safety leadership effect safety performance.

Variable endogen=variable eksogen+variable endogen+error

- The measurement model must be determined variable that measure the construct and determine a series of matrices that show correlation between constructs or variables.

Selecting the input

Selecting the input and estimation matrices of the SEM model uses input data that only uses the variance/covariance matrix or correlation matrix for the overall estimation made.

Possibility of identification problems

The problem of identification in principle is about the inability of the model developed to produce unique estimates. If each time an estimate is made an identification problem arises, then the model should be reconsidered by developing more constructs.

Evaluation of the criteria for goodness of fit

Testing of the suitability of the model is carried out by examining various criteria for goodness of fit. The following are some measure of suitability of the model used to assess the feasibility of a model as described below: Chi-Square (χ^2) is expected to be small with p>0.05, Root Mean Squares Error of Approximation (RMSEA) with cut-off value ≥ 0.08, Goodness of Fit Index (GFI) ranges from 0-1 with a cut off value>0.90, Adjusted Goodness of Fit Index (AGFI) ranging from 0-1 with a cut off value>0.90, CMIN/DF is The Minimum Sample Discrepancy Function divided by Degree of Freedom with chi-square value is relatively less than 2.0 or 3.0. Tucker Lewis Index (TLI) ranges from 0-1 with a cut off value>0.90 and Comparative Fit Index (CFI) ranging from 0-1 with a cut off value>0.90.

Final step

The final step is to interpret the model and modify the model for models that do not meet the testing requirements.

Results and Discussion

The subjects of this study were employees of PT Bukit Makmur Mandiri Utama Job Site Kideco, 250 respondents were selected randomly of all workers, representing all production department employees up operator level to Superintendents, active engaged in mining activities.

Test of validity factor

According to recommendations from Hair et al. that the appropriate observation variable is used as an operational construct or latent variable must have loading factor greater than 0.4, so that the model used has a good match, in addition to the t-value. The loading factor must be greater than the critical value (>1.96). The implementation of SMKP, Safety Leadership, Safety Performance, can be accepted/valid because the factor loading value all has a good match (>0.50) [12].

Test of construction reliability

The reliability of the model can be tested by calculating construct reliability and extracted variance, using the following formula:

$$\text{Construct Reliability} = \frac{(\sum \text{std loading})^2}{(\sum \text{std loading})^2 + \sum \varepsilon_j}$$

$$\text{Variance Extracted} = \frac{\sum \text{std loading}^2}{\sum \text{std loading}^2 + \sum \varepsilon_j}$$

Good reliability requirements that value of reliability constructs>0.60 and variance extracted>0.50 [12]. Using the calculation all variables have met the reliability requirements, the value of construct reliability in Implementation of SMKP is 0.95, Safety Leadership 0.95 and Safety Performance 0.96. In the value of variance extracted, the implementation of SMKP is 0.51, Safety Leadership is 0.52 and Safety Performance is 0.60, where all the values of variance are extracted>0.50, so it can be accepted/valid [14-18].

The next analysis is to see the goodness fit of model; some criteria used for this test are Chi-square (χ^2), RMSEA (Root Mean Square Error of Approximation), ECVI (Expected Cross Validation Index), AIC (Akaike Information Criterion), CAIC (Consistent Akaike Information Creterion), Fit Index, Critical N and Goodness of Fit produced. The value of the goodness fit of the research model can be explained in Table 4 as follows:

The results of goodness of fit indicate that the model tested in the research is good fit. Chi Square value: 2643.35. The smaller value of the model, the more appropriate between the theoretical model and sample data (Chi-square value divided by Degree of Freedom). The ideal value of good fit is<3; the results of the divider obtained a value of 2.24. This shows a good match, because the value is smaller<3. RMSEA=0.074, the match is good fit. (Where RMSEA<0.05 is close fit, RMSEA<0.08 is good fit, RMSEA<0.10 marginal fit, and RMSEA>0.10 poor-fit). ECVI model (12.30) compared with ECVI saturated model (10.65) and ECVI independence model (251.95). AIC model (3062.86) compared with AIC saturated model (2652.00) and AIC independence model (62735.43). The AIC model is slightly larger than the AIC saturated model and the difference is far greater than the AIC independence model, the smaller value indicates a good match. CAIC model (3741.08) is far from CAIC saturated model (8647.46) and further from CAIC independence (62966.02), the smaller value indicates a good match. Fit index testing with the Tucker-Lewis Index or Non Normed Fit Index (NNFI)=0.97 (>0.90) (above 0.90) indicates good fit. Critical N (CN)=122.68<200, the model does not represent the sample size of the data or marginal fit (>200, the model represents the data size or good fit). Goodness of Fit Index (GFI)=0.70 shows marginal fit, above 0.70 indicates goodness fit and Adjusted Goodness of Fit Index (AGFI)=0.65 shows marginal fit, above 0.70 indicates goodness fit. Furthermore the analysis produces the path diagram as follows (Figures 2 and 3)

Group	Indicator	Value	Keterangan
1	Degree of freedom	1176	Good fit
	Chi-square	2643.35	
	NCP	1586.86	
	Confidence interval	1437.23;1744.15	
2	RMSEA	0.074	Good fit
	Confidence interval	0.070;0.077	
	P-value	0,00	
3	ECVI model	12.3	Good fit
	ECVI saturated	10.65	
	ECVI independence	251.95	
	Confidence interval	11.70;12.93	
4	AIC model	3062.86	Good fit
	AIC saturated	2652	
	AIC independence	62735.43	
	CAIC model	3741.08	
	CAIC saturated	8647.46	
	CAIC independence	62966.02	
5	NFI	0.96	Good fit
	CFI	0.98	
	NNFI	0.97	
	IFI	0.98	
	RFI	0.95	
	PNFI	0.88	
6	Critical N	122.68	Marginal fit

Citation: Kurniawan JS, Kholil K, Sugiarto S (2019) The Effect of Implementation SMKP (Occupational Health and Safety Management System) and Safety Leadership to Safety Performance. Int J Pub Health Safe 4: 173.

7	Standardized RMR	0.076	Good fit
	GFI	0.70	
	AGFI	0.66	
	PGFI	0.62	

Table 4: Goodness of fit analysis.

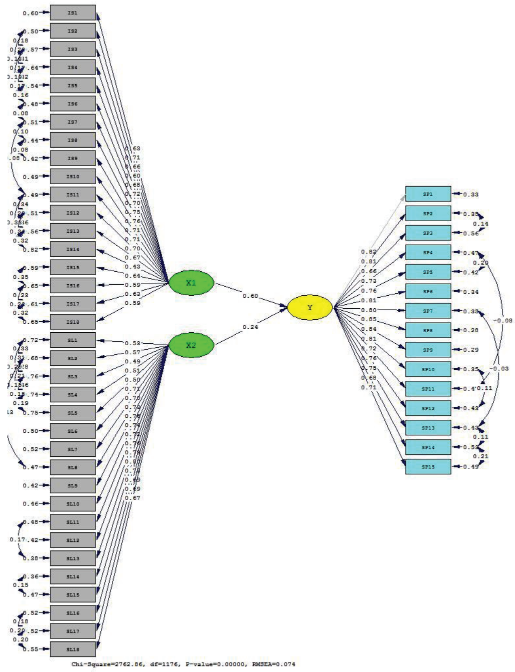

Figure 2: Path diagram standard solution; X1 (IS1, IS2, ………., IS18): Indicators of SMPK variable; X2 (SLI1, SLI2, SLI3, …., SLI18): Indicators of Safety leadership variable; Y (SP1, SP2, SP3, ….., SP15): Indicators of performance variable.

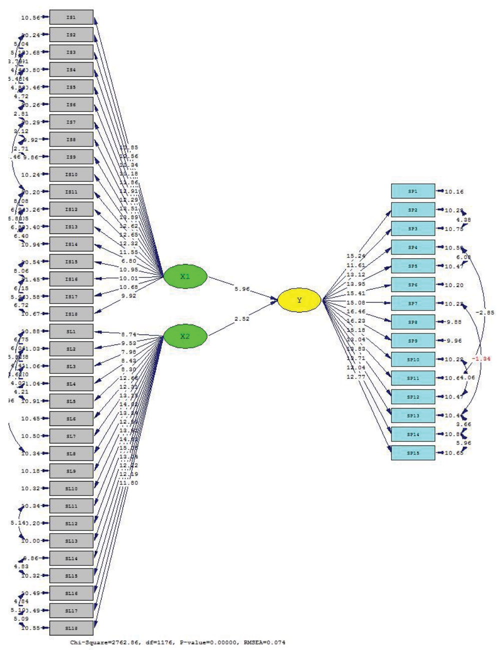

Figure 3: Path diagram t-Value.

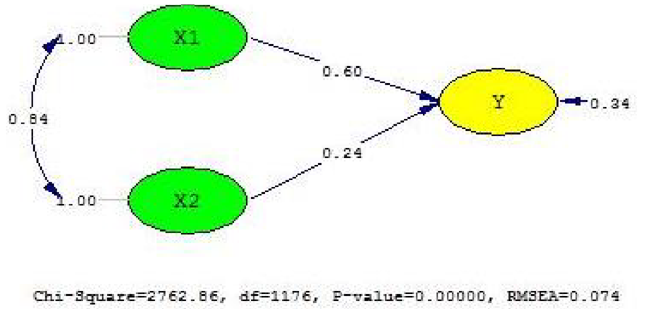

Figure 4: Structural model (Standarlized solution).

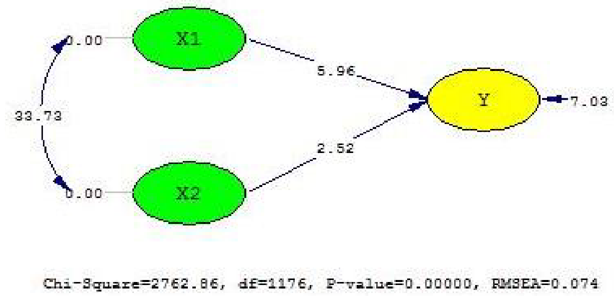

Figure 5: Structural model (t-value).

Hypothesis	Hypotesis statement	T-value	Explanation
H1	Implementation of SMKP has a significant effect to safety performance	5.96	H1 accepted
H2	Safety Leadership has a significant effect to safety performance	2.52	H1 accepted

Table 5: Hypothesis test result.

Figures 4 and 5 shows that SMKP has a strong positive correlation on safety leadership (r=0.84), the better the leader's knowledge about safety leadership the better implementation of SMKP; and implementation SMKP will contribute 60% to safety performance, while safety leadership only 24%. Hypotheses test results as shown in Table 5.

Conclusion and Suggestion

Based on the results, research to 250 respondents regarding analysis influence of SMKP Implementation and Safety leadership to Safety performance at PT. Bukit Makmur Mandiri Utama, conclusions can be drawn as follows:

- The implementation of SMKP and safety leadership has a significant effect on Safety performance, this mean that the implementation of SMKP and the leader's role is very significant to safety performance.

- Safety leadership has a strong positive correlation to safety leadership, the better of leader's knowledge about occupational safety, the better implementation of SMKP.

References

1. Cooter R, Lucki B (1997) Accidents in history: Injuries, fatalities and social relations. Rodopi Publishing Company, Netherlands.
2. Gordon R, Flin R, Mearns K, Fleming MT (1996) Assessing the human factors causes of accidents in the offshore oil industry. Paper Presented at the third International Conference on Health, Safety and Environment in Oil and Gas Exploration and Production, New Orleans, Louisiana, US.
3. Ramli S, Husjain J (2010) Occupational health and safety management system. Dian Rakyat, Jakarta, Indonesia.
4. Stogdill RM (1950) Leadership, membership and organization. Psychol Bull 47: 1-14.
5. Pearce CL, Sims HP, Cox JF, Ball G, Schnell E, et al. (2003) Transactors, transformers, and beyond. J Manag Dev Info 22: 273-308.
6. Künzle B, Kolbe M, Grote G (2010) Ensuring patient safety through effective leadership behavior: A literature review. Safety Sci 48: 1-17.
7. Yang CC, Wang YS, Chang ST, Guo SE, Huang MF (2009) A study on the leadership behavior, safety culture, and safety performance of the healthcare industry. World Academy of Science, Engineering and Technology 53: 1148-1155.
8. Andoh M (2013) The relationship between leadership style and safety climate: A case study of goldfields Ghana limited, Tarkwa-Cil Plant. School of Management, Blekinge Institute of Technology, Sweden.
9. Arnold JA, Arad S, Rhoades JA, Drasgow F (2000) The empowering leadership questionnaire: the construction and validation of a new scale for measuring leader behaviors. J Organ Behav 21: 249-269.
10. Griffin MA, Neal A (2000) Perceptions of safety at work: A framework for linking safety climate to safety performance, knowledge, and motivation. J Occup Health Psychol 5: 347-358.
11. Clarke S (2006) Safety climate in an automobile manufacturing plant: The effects of work environment, job communication and safety attitudes on accidents and unsafe behavior. Personal Review 35: 413-430.
12. Hair JF, Black WC, Babin BJ, Anderson RE (2010) Multivariate data analysis, 7th Edition. Pearson Prentice Hall Publishing Company, USA.
13. Br Dahlian G (2009) Structural equation model (SEM). SMK Media Informatika, Indonesia.
14. Khdair WA, Shamsudin FM, Subramanim C (2011) Improving safety performance by understanding relationship between management practices and leadership behavior in the oil and gas industry in Iraq: A Proposed Model. International Proceeding of Economics Development and Research 6: 85-93.
15. Khudeir HI (2016) The effect of leadership styles of managers on the loyalty of nurses in government hospitals level and its impact on the high level of quality of health care. Int J Soc Sci Res 7: 234-238.
16. Khasanah N, Kholil K, Sugiarto S (2019) Analysis the effect of leadership to safety climate, safety culture and safety performance. Asian J Adv Res Rep 4: 1-12.
17. Pant RR (2017) Occupational risk factors as causes of deaths among 15-49 years population in Nepal. Int J Occup Saf Health 7: 1-2.
18. Suryanto, Heryanto, Candra A, Akhyarul A (2018) The effect of safety behavior training on knowledge and attitude of small medium enterprises group. Int J Pub Health Safe 3 :165.