# Factors Influencing MCI Preparedness of Paramedic in XYZ Industrial City

**Kohar Sulistyadi[1], Soehatman Ramli[2], Saiful Uddin[3].**
Lecturer in Post Graduate Sahid University, Jakarta, Indonesia[1,2]
Student Magister Program of Occupational, Health Care Sector, HSE Department, Oil and Gas Com, Qatar[3].

***Abstract***

*Mass casualty incident (MCI) in industrial area is a definite threat that can result in environmental damage and loss of property and life. The causes of MCI can range from traffic accidents, industrial accidents, fires, toxic gases and terrorism. Paramedics, along with others emergency response team is among the first to reach at the incident scene to provide aid. Preparation is vital in ensuring that the response is fast, effective and efficient. The objective of the study is to analyze the relationship between knowledge, skills, attitudes and training on MCI Preparedness of paramedic in the XYZ Industrial city. Methodology of this paper is quantitative descriptive with cross sectional approach, while data analysis used the partial least square-structural equation model (PLS-SEM). 108 paramedics in XYZ industrial city involved and completed the survey. The research consist 5 latent variable models with 31 indicator variables. Data retrieval use a direct-share questionnaire. The result from data analysis revealed there is a positive and significant relationship between knowledge, skills, attitudes and training on MCI preparedness at t-value<1.96. Meanwhile, Skill has the most influence on MCI preparedness. Paramedics in the XYZ industrial city have the knowledge, skills, attitudes, training and preparedness that are in the "high category". Exogenous variables; knowledge, skills, attitudes and training explain 65.8% of the preparedness (endogenous variables). Continual commitment from paramedics and management is needed to maintain and enhance preparedness, knowledge, skills, attitudes and training in order to provide better medical emergency services.*

*Keywords: PLS-SEM, MCI, preparedness, paramedics, industrial city.*

I.  INTRODUCTION

The industrial and technological developments may increase the toll of disasters. Industrial accidents in the oil and gas industry have a high incidence rate since naturally it is related to flammable, explosive, corrosive, and toxic materials. Based on Indonesian energy ministry statistics (2017) the number of upstream oil industry accidents reached 138 events in 2016 alone, while the downstream area happened 43 accidents in the whole Indonesia. Whereas, in XYZ industrial city from January 2008 to December 2018 there were 15 industrial accidents which categorized as mass casualty incident (MCI). When the number of workplace accident is high, it will provoke the possibility of MCI as well.

XYZ industrial city, where just like all other downstream oil and gas industrial areas, is vulnerable to accidents that can trigger disasters with mass casualties. Emergency medical services (EMS) are part of the emergency response team, playing a role in responding to medical emergency. Paramedics as part of the EMS system are responsible for responding to the accident scene providing medical assistance, evacuation and transferring patients to the hospital. A research conducted by Ahmed (2016) on health care staff handling hajj pilgrims, showed paramedics EMS personnel had better knowledge of preparedness than doctors and nurses.

The accomplishment of an emergency response operation is greatly influenced by the personnel themselves, including their preparedness. As mention that paramedic's role is very critical compared to other health professions in handling the victims in the scene, since paramedic is the first party to treat patients as well as being the coordinator of other health teams in the field. One of the key factors to lessen the death toll of MCI victims is to reduce pre-hospital time. For this reason, an efficient organizational and command system is needed, which is influenced by how fast receiving information about the disaster and how quickly the emergency response team responds (Yu et. Al., 2018)

These phenomena make the writer interested to know how paramedics should prepare to respond to MCI in their daily duty. The general objective of the paper is to analyze the factors influencing MCI preparedness of paramedic in the XYZ industrial city. More specific, in this study want to explore more about the condition of *Knowledge, Skills, Attitudes, Training* and MCI *Preparedness* of paramedic, and also identified exogenous latent variables that meaningfully impact preparedness of paramedic on MCI.

II. LITERATURE REVIEW

Disaster preparedness is necessary effort to anticipate the likelihood of a catastrophe in order to diminish casualties, property damages, and changes in people's lives. Damon (2015) gives a definition to disaster preparedness as all measures need to be done before a disaster arises, which aims to minimize the impact of disasters. In short, preparedness is a state ready to act when there is a disaster. Many factors play an important role in reducing the impact of disasters, in the opinion of some experts such as Schneid in Musyoki et al. (2015), and Damon (2015) it's can be concluded that the aspects that can influence the preparedness of emergency personnel in dealing with disasters are; *knowledge, skills, attitudes and training*.

*Knowledge* is a key factor in preparedness, that comes from experience and results from human thought. Ali and Asrori (2014) stated that knowledge is a gathering of all that is known and has been possessed by humans. The development of knowledge starts from knowing something, after sensing a particular object. Human sense plays a significant role in identifying the object through sense of sight, hearing, smell, taste and touch. The process of

known, then thought to be understood, analyzed in deepness, besides assessed if it is good then will be applied in day to day life.

*Skill* demonstrates how to achieve a goal in effective an efficient technique determined by speed, accuracy, form and ability to adjust. high quality result, fast or careful act with a relatively appropriate level are the character of someone that have good skill. The term skilled is generally used to define a person's varying level of ability. Sri and Nur (2010) make a simple definition of skill as the ability to do work easily and prudently.

*Attitude* can define as a form of response from individuals or communities based on their experience of an occurrence, which relates to perception, personality, and motivation towards something (Sutarjo, 2014). Good and favorable behavior of people in the community can be influenced by a positive attitude, according to Basar et al. (2019).

*Training* on MCI preparedness is designed to build the competencies of calamity relief volunteers and officer to advance preparedness and response to emergencies. This intended at all levels of readiness, Not only before but after the disaster as well. Nik et al. (2014) specified training is systematic phases to acquire knowledge and skills with the purpose of forming the competencies needed for effective performance in the workplace.

Hypothesis is the initial assumption of a temporary conclusion that this study attempted to explore. This research tries to proof whether there are relationships or influences between the exogenous variables (*knowledge, skill, attitude, and training*) and the endogenous variable (*Preparedness*). all constructed assumptions need to be supported by underlying theory or empirics, so conclusions need to be made through research. In this study, the hypothesis used in are as follows:

1. There is positive relationship for knowledge on MCI preparedness.
2. There is positive relationship for skill on MCI preparedness.
3. There is positive relationship for attitude on MCI preparedness.
4. There is positive relationship for training on MCI preparedness.


III. METHODE

Descriptive analytic method was applied in this study, with the time dimension of data collection using a cross sectional approach. The data were collected between June to August 2019, from 108 paramedics in XYZ industrial city.

The tool used to gather data was adopted from DPET (disaster preparedness evaluation tools) (Tichy et al., 2009), with slight modifications to match the subject, conditions and location of research. The finalization of this questionnaire involved five senior paramedics in the group discussion. Questionnaire disseminated to gather data regarding the characteristic individual, knowledge, skill, attitude, training and MCI preparedness. Respondent can choose the provided answer that use a Likert scale: 5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree. This questionnaire has 31 questions; 7 questions represent the variable preparedness, while the variables of knowledge, skills, attitudes and training each has 6 questions. Each question or statement represent indicators that have been prepared for each latent variable. For the purpose of facilitating statistical data processing, all latent variables and indicators are coded accordingly.

Next after the data is collected, the primary data analysis in this study used combination of two concepts namely the measurement model and structural model analysis, which is part of Partial Least Square Structural Equation Model (PLS-SEM) technique.

III.   RESULT AND DISCUSSION

**Data Analysis**

Data were collected from 108 paramedics in XYZ industrial city, all the data were included in data analysis. Gender, age, education level and years of service of respondent are summarized in table no. 1 below:

Table no. 1 Characteristics of Respondent (n108)

| Characteristics | Number | Percentage (%) |
|---|---|---|
| Gender | | |
| - Male | 108 | 100,0 |
| - Female | 0 | 0,0 |
| Age (year) | | |
| - ≤ 40 | 10 | 9,3 |
| - 41-45 | 54 | 49,8 |
| - 46-50 | 32 | 29,7 |
| - ≥ 51 | 12 | 11,2 |
| Education level | | |
| - Diploma | 36 | 33,3 |
| - S1 | 71 | 65,7 |
| - S2 | 1 | 0,9 |
| Years of service | | |
| - ≤10 | 16 | 14,8 |
| - 11-15 | 76 | 70,3 |
| - 16-20 | 14 | 13,1 |
| - ≥ 21 | 2 | 1,8 |

Based on gender, all respondents was male (100.0%), this is because of the nature of work in industrial areas. Whereas judging from the level of education, most of the respondents are bachelor graduates as many as 71 respondents (65.7%), then those who have Diploma level are 36 respondents (33.3%). Only 1 respondent has postgraduate education (S2)

represented 0.9% from total respondent. Based on data from table 4.1 it can be seen that most respondents aged 41-45 years are 32 respondents (49.8%). Furthermore, respondents aged 46-50 years were 29.7% (32 respondents), aged 40 and below 10 respondents (9.3%). While those aged ≥ 50 years were 12 respondents (11.2%). Majority of respondents have worked for 11-15 years, totaling 76 respondents (70.3%), moreover 14 respondent worked for 16-20 years, and paramedic who have worked for 10 years or less total 16 respondents (14.8%). The longest working period is 21 years and over there are 2 respondents.

The outcome of the scoring calculation, paramedics in the XYZ industrial area have Knowledge, Skills, Attitudes, Training and Preparedness that are in the "high" category. This outcome is obtained by equating the total score of indicators of each latent variable with the ideal score, which is then incorporated in the continuum line.

The hypothesized model is verified using Structural Equation Model – Partial Least Squares (SEM-PLS) in SmartPLS 2.0 program. First step of PLS analysis is the measurement model evaluation (outer model), it's used to determine the appropriateness of the theoretically defined construct. The outer model needs to be examined to ensure the survey questionnaire determines the variables that were supposed to be measured, and at the same time making sure that the instrument is reliable. In this process three components are looked into, which are loading factor, average variance extracted (AVE), and Cronbach's Alpha and Composite reliability (CR).

An indicator is assumed to be adequate if the loading factor value is above 0.5. (Siswoyo, 2017). Examination of loading factor for each items of the five unobserved variables revealed that the 31 observed variable had loading factor in the range of 0,61799-0,88971 and all the values are positive and greater than the recommended value, so it was concluded that all indicators in the latent variables; knowledge, skill, attitude, training and preparedness, are valid.

The Average Variance Extracted (AVE) value represents a sufficient convergent validity, which means more than half the variance of the indicators able to be explained by latent variables in average. According to Avkiran and Ringle (2018) the rule of thumb used for AVE is greater than 0.5. As presented in table no.2, reflection of the average variance extracted value for each latent variable. It can be seen that all constructs each have AVE values higher than 0.5 so that it is concluded that all constructs have good convergent validity.

Table no.2 Average Variance Extracted (AVE), Composite reliability dan Cronbach's Alpha

|      | AVE       | Composite Reliability | Cronbach's Alpha |
|------|-----------|-----------------------|------------------|
| X1   | 0,596414  | 0,898097              | 0,863714         |
| X2   | 0,551833  | 0,879428              | 0,834050         |
| X3   | 0,604306  | 0,900266              | 0,865881         |
| X4   | 0,586148  | 0,893993              | 0,857203         |
| Y    | 0,548243  | 0,894075              | 0,860866         |

Additionally, PLS also conducts a reliability test to measure the internal consistency of the measuring tools. Reliability testing in PLS can use two methods, that is Cronbach's Alpha or Composite reliability. The Rule of thumb value of Cronbach's Alpha and Composite reliability must be greater than 0.7 (Avkiran and Ringle, 2018). Based on the data above, it can be concluded that each variable has a Cronbach's Alpha value and a composite reliability greater than 0.7 means that each construct is reliable.

Second step in PLS-SEM is the calculation of the structural model (inner model). Inner models are used to examine the hypothesized relationships between constructs of knowledge, skill, attitude and training towards MCI preparedness. Initially, the weights or path coefficients of the relationships are seen and tested for their significance through t-values obtained from the bootstrapping method. Also, the coefficient of determination, R2 for dependent variables are measured in order to find the total of variance in each construct, which are described by the model. In addition, predictive relevance (Q2) are also verified through the bootstrapping analysis process, where T-statistic test parameters are obtained to predict the causative relationship. Structural model with t-value achieved from statistical processing by SmartPLS software displayed in figure no.1. below:
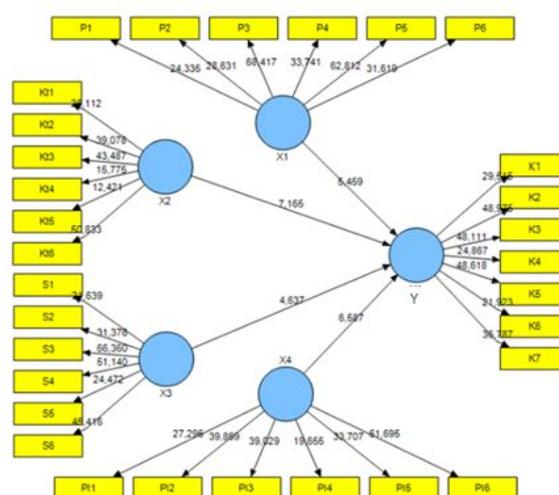


Figure no. 1 structural model with t-value.

Figure no.1 supported by table no. 3 revealed that the smallest t statistic value is 4,636837 which is greater than t table (1.96), so all exogenous variables: Knowledge, Skills, Attitudes and Training have a significant effect on preparedness (endogenous variables). Significance test results acquired from the t-statistic value, if the t-statistic value is greater than 1.96 indicates that the latent variable is significant at the 95% confidence level (α = 0.05).

In this study, the R-square value of endogenous variable (Preparedness) was 0.658613, which means 65.86% of the preparedness variable was influenced by an exogenous variable with a "moderate" level of influence. Whereas, Q2 value (Q-square predictive relevance) obtained is 0.6586, since the value is greater than 0 (zero), it means the model has a predictive relevance value.

Next is Hypothesis Testing using path coefficient, which has values closest to absolute 1 (one) reflect the strongest paths and weights closest to 0 (zero) mean the weakest paths (Garson, 2016). Table no. 3 presents the path coefficients and their significance values. All path coefficients, which presented relationships between each exogenous and endogenous variable, were found above zero or significant. The significant paths suggested that all hypotheses were supported.

Table no. 3 Hypotheses Testing

| Hipotesis | relationship | Original Sample (O) | T Statistics (\|O/STERR\|) | T table | decisions |
|-----------|--------------|---------------------|-------------------------|---------|-----------|
| H1 | X1 -> Y | 0,209026 | 5,458920 | 1,96 | supported |
| H2 | X2 -> Y | 0,346441 | 7,165444 | 1,96 | supported |
| H3 | X3 -> Y | 0,218875 | 4,636837 | 1,96 | supported |
| H4 | X4 -> Y | 0,263471 | 6,587061 | 1,96 | supported |

Above, all the path weight has positive value or above 0. hypothesis relationships are supported even though not reflected by the strongest path but it is significant at p < 0.05. In other words all exogenous variables: Knowledge, Skills, Attitudes and Training have a significant and positive effect on preparedness.


IV.    CONCLUSION


The purpose of this research is to analyze the factors influencing MCI preparedness of paramedics in the XYZ industrial city. From the four hypotheses tested, all constructs are supported, and the t-value attained shows that they are statistically significant. Validity and reliability test of this study also examined the outcomes demonstrated good convergent validity and discriminant validity.

The finding on this study confirmed the impact of knowledge on MCI preparedness is statistically significant and positive in the structural model. This result is supported by previous research conducted by Laila et al. (2017) which said that there is a relationship between knowledge and disaster preparedness. According to Perry and Lindell in Laila et al, (2017) explained that the level of preparedness of a person can be formed by how often the person gets knowledge or information about disaster prevention and preparedness.

Again, the conclusion of this paper indicated that the relationship of skill on preparedness, value and statistics achievement are significant. These findings are similar to Nicole et al, (2014) study about emergency response personnel who had been deployed to the disaster site. It was disclosed that emergency personnel skills influenced preparedness in carrying out emergency response.

Based on the statistical analysis, this study validated that there is a positive and significant relationship between paramedic attitude and MCI preparedness. This finding is slightly different from the study of Laila et al., (2017) about the attitudes and efforts of the production department employees to prepare themselves in facing fire hazards at garment factories. The results of her study mentioned attitudes have not directly influenced disaster preparedness but act as predisposing behaviors. However, the attitude of employee has an indirect impact on disaster preparedness.

The effect of training on mass casualty incident preparedness found to be positive and statistically significant. This conclusion corroborates the outcomes of research conducted by Labrague et al. (2016) which stated; by sending nurses in training and disaster simulation, can boost self-confidence and ability to respond to disasters.

In conclusions, the outcomes of this study indicated that all the hypotheses are supported by empirical analysis and in parallel to the previous findings and theoretical framework.

REFERENCES

[1]     Ahmed Meaiwedh Al-Otaib, (2018) An assessment of the disaster preparedness knowledge of emergency medical services providers in Hajj of 2016. Disertasi. Doctor of Philosophy in Public Health Science Department of Health Management and Systems Sciences University of Louisville Louisville, Kentucky May 201

[2]     Ali, Mohammad dan Mohammad Asrori, (2014). Metodologi dan Aplikasi Riset Pendidikan. Jakarta : Bumi Aksara.

[3]     Avkiran N.K., Ringle C.M., (2018). PLSSEM Recent Advances in Banking and Finance. International Series in Operations Research and Management. Swiss:Springer

[4]     Basar Demir B., Özkan T., Demir S., (2019) Pedestrian violations: Reasoned or social reactive? Comparing theory of planned behavior and prototype willingness model. Journal Transportation Research Part F: Traffic Psychology and Behaviour Vol 60,

[5]     Damon P. Coppola, (2015) Introduction to International Disaster Management Book • 3rd Edition. Elsevier

[6]     Siswoyo Haryono, (2017) Metode SEM Untuk Penelitian Manajemen AMOS, LISREL, PLS. Jakarta: Luxima Metro Media

[7]     Hair J.F., Hult G.T.M., Ringle C.M., Sarstedt M., (2017). A primer on partial least squares structural equation modeling (2nd ed.), Sage, Thousand Oaks, CA.

[8]     Hair J.F., Hult G.T.M., Ringle C.M., Sarstedt M., (2017). A primer on partial least squares structural equation modeling (2nd ed.), Sage, Thousand Oaks, CA.

[9]     Indonesia Energy Ministry-ESDM (2017), Oil and Gas Statistic 2016. Jakarta: Direktorat Jenderal Minyak dan Gas Bumi Kementerian Energi dan Sumber Daya Mineral.

[10]    Labrague L.J., Yboa B.C., McEnroe-Petitte D.M., Lobrino L.R., Brennan M.G., (2016) Disaster preparedness in Philippine nurses. Journal of Nursing Scholarship, 48 (1), 98–105.

[11]    Laila Fitriana, Suroto, Bina Kurniawan (2017) Faktor-Faktor Yang Berhubungan Dengan Upaya Kesiapsiagaan Karyawan Bagian Produksi Dalam Menghadapi Bahaya

Kebakaran, Jurnal Kesehatan Masyarakat (E-Journal) Volume 5, Nomor 3, Juli 2017 (ISSN: 2356-3346), http://ejournal-s1.undip.ac.id/index.php/jkm

[12]   Musyoki, Joseph & Joylyn Wagithi, Warui & Cheruon, Rebecca., (2015). Factors influencing effective disaster management in the hospitality industry, a case of selected hotels in the great rift region. African Journal of Tourism, Hospitality and Leisure Studies. 1.

[13]   Nicole K. Zagelbaum, Kevin C. Heslin, Judith A. Stein Nicole,(2014) Factors influencing readiness to deploy in disaster response: findings from a cross-sectional survey of the Department of Veterans Affairs Disaster Emergency Medical Personnel System

[14]   Nik Nazli, Nik Nadian Nisa & Sipon, Sapora & mohd radzi, Husni. (2014). Analysis of Training Needs in Disaster Preparedness. Procedia - Social and Behavioral Sciences. 140. 576-580. 10.1016/j.sbspro.2014.04.473.

[15]   Sri Widiastuti dan Nur Rohmah Muktiani. (2010). Peningkatan Motivasi dan Keterampilan Menggiring Bola Dalam Pembelajaran Sepakbola Melalui Kucing Tikus Pada Siswa Kelas 4 SD Glagahombo 2 Tempel. Jurnal Pendidikan Jasmani Indonesia. Volume 7 Nomor 1. Hlm. 47-59.

[16]   Sutarjo Adi Susilo, (2014) Pembelajaran Nilai Karakter, Jakarta : RajawaliPers,

[17]   Tichy M., Bond AE., Beckstrand RL.,  Heise B., (2009) Nurse Practitioners' perception of disaster preparedness education,- American Journal of Nurse Practitioners, Am J Nurse Pract, 1., pp. 10-22

[18]   Tzeng, W.-C., Feng, H.-P., Cheng, W.T., Lin, C.-H., Chiang, L.-C., Pai, L., & Lee, C.-L., (2016). Readiness of hospital nurses for disaster responses in Taiwan: A crosssectional study. Nurse Education Today, 47, 37–42. Retrived: http://doi.org/10.1016/j.nedt.2016.02.025

[19]   Yu W, Lv Y, Hu C, Liu X, Chen H, Xue C, Zhang L., (2018), Research of an emergency medical system for mass casualty incidents in Shanghai, China: a system dynamics model, Dove Medical Press journal ,31 January 2018 Volume 2018:12 Pages 207—222

[20]   Garson, G. David (2016), Partial Least Squares: regression and  Structural equation model, (3rd ed.), Statistical Publishing Associates, Asheboro: USA

[21]   Haris, H., & Priliasari, N. (2021). THE DESIGN OF WEB-BASED TRAINING MANAGEMENT INFORMATION SYSTEMS AT PT. SINTECH BERKAH ABADI. ADI Journal on Recent Innovation (AJRI), 2(2), 90-97.

[22]   Suryadi, A., Asmoro, P. T., & Solihin, A. (2019). Hybrid Electric Power Plant Using Wind Turbine Savonius Helix and Solar Cell as an Alternative Power Source in the Lightning Tower at Flashing Lights. ADI Journal on Recent Innovation (AJRI), 1(1), 1-6.

[23]   Setiawan, I. N. A. F. (2020). Balinese Script In Tattoo Media Commodity In Denpasar Bali. ADI Journal on Recent Innovation (AJRI), 1(2), 98-106.

[24]   Noburu, I., Himki, A., Dithi, A., Kano, K., & Anggraeni, M. (2020). Covid-19: Portrait of Preservation of the Batik Industry as a Regional Autonomy. Aptisi Transactions on Technopreneurship (ATT), 2(2), 143-152.