

ORIGINAL ARTICLE

Relationship Between Gender, Smoking Habits, and Pregnancy Status and the Risk of Covid-19 Transmission in the Workplace for Workers in Surabaya

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ABSTRACT

Introduction: Workers are at higher risk of contracting COVID-19. The risk of COVID-19 transmission is affected by a number of factors, one of them is individual characteristics. This study aims to analyze the relationship between gender, smoking habits, and pregnancy status and the risk of COVID-19 transmission in the workplace for workers in Surabaya. **Methods:** As an observational study, this study used cross-sectional design. The population in the study was all workers living in Surabaya who use the internet. This study used purposive sampling technique with a total sample of 542 people. Data were obtained through questionnaires distributed online. Relationships between variables were analyzed using the chi-square or Spearman test. **Results:** Most of the study respondents were female (62.5%), did not have a smoking habit (87.6%), were not pregnant or breastfeeding (85.6%), and had a moderate risk of transmitting COVID-19 in the workplace (58.1%). No relationship was found between gender ($p = 0.859$) and pregnancy status ($p = 0.063$) with the risk of COVID-19 transmission in the workplace. However, there was a slight relationship between smoking habits with the risk of COVID-19 transmission ($p=0.028$, $rs=-0.096$), where workers with a smoking habit showed a higher risk of COVID-19 transmission in the workplace. **Conclusion:** Based on statistical result, smoking habits are a factor related to the risk of COVID-19 transmission in the workplace for workers in Surabaya. Implementing control strategies for COVID-19 using hierarchy of control methods is important for workers in Surabaya.

Keywords: COVID-19 transmission, Individual characteristics, Workers, Workplace

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to strive for comprehensive 3T (Testing, Training, and Tracing) implementation, including in the workplace, although massive testing is often hampered by several things, including cost and affordability of access (6).

INTRODUCTION

Corona Virus Disease 2019 (COVID-19) is an infectious disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) virus(1). It can spread directly or indirectly through contact with people who are infected persons or the exposure to droplets emitted through coughing, sneezing or breathing of infected persons(2). By 21 January 2021, there were 939,948 confirmed cases of COVID-19 with 26,857 deaths in Indonesia(3). In the same period, Surabaya, the capital city of East Java Province, recorded 19,291 positive cases(4) with 1,381 deaths. This makes Surabaya City the city with the highest number of COVID-19 deaths in Indonesia(5). Controlling the spread of the virus in Indonesia is carried out by the government by continuing

Workers are at higher risk of contracting COVID-19(7). Based on the report on occupational COVID-19 cluster in European Union and United Kingdom, the high risk can be attributed to workers being physically close to other people while working, be it with colleagues, patients, customers, etc.(8). Furthermore, an assessment of the risk of exposure to COVID-19 in a group of fishermen in the Surabaya area shows that there are several work-related activities that have a high risk of transmitting COVID-19(9). A study assessed the Personal Protective Equipment (PPE) use among workers in Surabaya during COVID-19 pandemic stated that most of the workers were in good category in using PPE, but there were some workers who were still in the poor category in using PPE(10). Based on several studies, occupational COVID-19 cluster plays a fairly significant

role in contributing to COVID-19 confirmed cases. In 6 Asian countries, occupational COVID-19 clusters accounted for a high rate of cases at the beginning of the COVID-19 pandemic(11). In addition, nearly a third of all COVID-19 cases in Vietnam are cases where transmission occurs in the workplace(12).

Several industries in Indonesia have implemented controls on the spread of COVID-19 in the workplace by tightening the use of personal protective equipment. Whereas, the use of personal protective equipment should not be the main thing that should be applied because PPE will be more effective when used as multiple layers of control not as primary control. From the results of previous research (13) there are recommendations for handling COVID-19 in industrial areas, including high and low risk mitigation. In high risk mitigation, the recommendations given include changes in production layout, installation of partitions between workers, limiting the capacity of employees to use office facilities or in certain rooms. While recommendations for low risk mitigation include the provision of bulkheads on circulation paths in industrial areas, namely by making a corridor. Therefore, the risk of COVID-19 transmission in the workplace can be controlled by implementing risk controls based on a hierarchy of control(14). According to International Labour Organization (ILO), control measures at the level of elimination, substitution, technical control, administrative control, and use of PPE are effective to a certain degree in decreasing the transmission level of COVID-19. Thus, this present research tried to determine the transmission risk of COVID-19 by analyzing the control efforts of the workers.

Derived from several studies, individual characteristics including gender, smoking habits, and pregnancy status have a relationship with the possible risk of COVID-19 transmission. A previous research conducted in China found that gender has a relationship with the workers' knowledge on the prevention of COVID-19(15); specifically male gender is more prone to take actions that carry greater risk of contracting COVID-19(16). The results of other studies show that smoking behavior can be considered as a way of transmitting COVID-19 because when smoking, smokers exhale smoke, coughs and aerosols that may contain SARS-CoV-2 into the surrounding environment(17). Furthermore, regarding pregnancy status, a study found that pregnant women have a higher risk of being infected with COVID-19 because during pregnancy the body immune system is weakened(18).

This study aims to analyze the relationship between gender, smoking habits, and pregnancy status and the risk of COVID-19 transmission for workers in the several types of industries in Surabaya based on a hierarchy of control .

MATERIALS AND METHODS

This study was an observational research with cross-section design. The criteria of population in this study was infinite in nature, involving workers living in the Surabaya area that used the internet. The population in the study came from various work sectors, including formal sector (example: government employees, manufacturing, construction, health services, oil and gas, etc.) and informal sector (example: farmers, fishermen, online motorcycle taxis, entrepreneurs, etc.). The sampling technique used was the purposive sampling technique. The minimum sample size was calculated based on the Lemeshow proportion technique. With a significance level of 5% and the proportion of internet users in Indonesia of 62.6% (Internet World Stat, 2011), a minimum sample size of 360 respondents was obtained. The study was conducted from May to December 2020 in Surabaya City, East Java, Indonesia . Data were obtained through the distribution of an online questionnaire via social media to respondents. 542 individuals responded to the questionnaire . Error bias is reduced by validating 5% of respondents as many as 27 respondents who have filled out a random questionnaire. All questions on questionnaire have significant results on the Pearson Correlation value or Pearson Correlation value $< r$ table so that it can be said that all questionnaire items are valid. In addition, the results of Cronbach's Alpha for all questions on the questionnaire showed results > 0.6 so it can be said that all questions on the questionnaire were reliable. The variables studied in this study were sex, smoking habits, pregnancy status and risk of transmission of COVID-19 in the workplace.

The gender variable was divided into male and female. The smoking habit variable was categorized into "yes" and "no", depending on the acquisition of their smoking habits. The pregnancy status variable, applied only to female respondents, was divided into "pregnant", "breastfeeding", and "not both." The variable of COVID-19 transmission risk in the workplace was divided into three levels, namely "high", "moderate", and "low". This action was decided based on the total score of COVID-19 control in the workplace upheld by the respondents. The controls assessed include 2 items of elimination control, 3 items of substitution controls, 12 items of technical control, 13 items of administrative control and 1 item of personal protective equipment (PPE). Each control item granted 1 point if performed, except for the PPE use which was assessed based on its frequency of use, namely 3 points if it was frequently used, 2 points if it was rarely used, and 1 point if it was never used. The risk of transmitting COVID-19 in the workplace was categorized as high if the control score was within the range 1-11, moderate category if the control score was within the range 12-22, and low if the control score was within the range 23-33.

The relationship between gender, pregnancy status, smoking habits status and the risk of COVID-19 transmission in the workplace was analyzed with SPSS software version 21 using the Cramer's V test,. The significance level used was 5%. If the p-value was <0.05, it was concluded that there was a significant correlation between the two variables.

ETHICAL CLEARANCE

This research has got ethical approval by Health Research Ethical Clearance Commission Faculty of Dental Medicine, Universitas Airlangga with Number 408/HRECC.FODM/IX/2020.

RESULT

The frequency distribution of gender, smoking habits and pregnancy status of the respondent workers in Surabaya in this study is presented in Table I. It is known that the majority of the workers in this study are female (62.5%), do not have smoking habits (87.6%), and are not pregnant or breastfeeding (85.6%).

Table I. The Frequency Distribution of Gender, Smoking Habits and Pregnancy Status of the Workers in Surabaya

Individual Characteristics	Frequency	Percentage (%)
Gender		
Men	203	37.5
Women	339	62.5
Total	542	100.0
Smoking Habits		
Yes	475	87.6
No	67	12.4
Total	542	100.0
Pregnancy Status		
Pregnant	18	5.3
Breastfeeding	31	9.1
Not both	290	85.6
Total	339	100.0

Control measures of COVID-19 in the workplace enforced by workers in Surabaya is shown in Table II. It is known all two elimination controls have been performed by the majority of the workers, and avoiding shaking hands at work is the highest implemented measure with 98.7%. For substitution controls, avoiding public transportation and move to use private transportation is the least implemented with 97.6%. The most widely implemented technical control in workplaces in Surabaya is the availability of alcohol-based antiseptic fluids (such as hand sanitizer) with 93.7%, the availability of hand washing stations with running water and soap with 90.6% and sanitization or sterilization of workplaces using disinfectant with 80.1%. Furthermore, administrative measures that are most commonly applied in workplaces in Surabaya

are the hanging of posters related to the procedures for preventing COVID-19 in work areas with 77.3%, checking body temperature using a thermo gun at the workplace entrance with 73.1%, and prohibition of for sick workers to come to work (even if only mild flu) with 67.2%. Based on Table 11, the majority of the workers are at moderate risk of transmitting and contracting COVID-19 at the workplace, amounting to 315 workers or 58.1%. 54 workers (10%) have a high risk of contracting COVID-19 in the workplace and 173 other workers (31.9%) are at low risk.

Table II. Control Measures of COVID-19 in the Workplace Enforced by Workers in Surabaya

No.	Control Measures of COVID-19 in the Workplace	Frequency	Percentage (%)
Elimination			
1.	Avoiding shaking hands at work	535	98.7
2.	Refraining from traveling outside the region/city	441	81.4
Substitution			
1.	Implementing electronic attendance system without direct contact	305	56.3
2.	Avoiding public transportation	529	97.6
3.	Use private dining facilities	423	78.0
Technical			
1.	Sanitizing (sterilization) of all public facilities in the workplace using disinfectants regularly	434	80.1
2.	Providing of alcohol-based antiseptic solutions (such as hand sanitizer)	508	93.7
3.	Establishing several hand washing stations with clean running water and soap that is always fully filled	491	90.6
4.	Regulating the distance of standing position by making a marker on the elevator floor	283	52.2
5.	Limiting on the number of workers who can use the lift	183	33.8
6.	Instructions for going up and down the stairs	196	36.2
7.	Establishing separate, dedicated area/room for the observation of workers suspected with COVID-19 symptoms	120	22.1
8.	Installing glass barrier or screen for workers who serve customers directly	244	45.0
9.	Changing the workplace layout to one-way entrance and exit	139	25.6
10.	Arranging of seats (chairs) between workers so that they are approximately 1 meter apart during meetings, breaks, or while in the canteen	302	55.7
11.	Setting the queue distance at the entrance and exit	174	32.1
12.	Ensuring an adequate circulation system for the exit and entry of air in the workplace (windows are opened, regular cleaning for air conditioners)	324	59.8

CONTINUE

Table II. Control Measures of COVID-19 in the Workplace Enforced by Workers in Surabaya (cont.)

No.	Control Measures of COVID-19 in the Workplace	Frequency	Percentage (%)
Administrative			
1.	Hanging posters related to COVID-19 prevention procedures in the work area	419	77.3
2.	Counseling or Communication, Information and Education (IEC) related to COVID-19 to all workers and management	334	61.6
3.	Rearranging work shift or the number of workers involved in one shift	293	54.1
4.	Prohibiting sick workers from coming to work (even if only mild flu)	364	67.2
5.	Setting a maximum working time of 40 hours a week with a daily working time of 7-8 hours and not exceeding 12 hours	210	38.7
6.	Requiring every worker who has just traveled from outside the area/region affected by COVID-19 to carry out self-quarantine for 14 days at home	167	30.8
7.	Joint sports activities before work while maintaining a safe distance	61	11.3
8.	Forming a COVID-19 Handling Team at work	239	44.1
9.	Requiring workers to report if they feel symptoms of COVID-19 (fever or cough/runny nose/sore throat/shortness of breath) to the COVID-19 Handling Team at work	294	54.2
10.	Checking body temperature using a thermometer at the entrance to the workplace/company	396	73.1
11.	Establishing a routine health check policy to detect early signs of COVID-19 in the workplace	154	28.4
12.	Halting business travel for workers	161	29.7
13.	Monitoring worker areas using manual reporting methods to superiors or using an application developed by the workplace.	155	28.6
Personal Protection Equipment			
1.	Frequency of Use of Masks		
	Never	5	0.9
	Infrequent	6	1.1
	Frequent	531	98.0
Category of the Risk of COVID-19 Transmission in the Workplace			
1.	High	54	10.0
2.	Moderate	315	58.1
3.	Low	173	31.9

Table III shows cross tabulation and results of analysis of the relationship between gender, smoking habits, and pregnancy status and the risk of COVID-19 transmission in the workplace for workers in Surabaya. Gender shows no significant correlation with the risk of COVID-19 transmission in the workplace (p=0.859). Pregnancy status also similarly show no significant correlation (p=0.063). however, smoking habits show a significant correlation with the risk of COVID-19 transmission in

the workplace in Surabaya (p=0.028) with a correlation coefficient of -0.096, meaning that the correlation between the two is faint and negative, where workers who have a smoking habit have a higher level of risk of getting infected from COVID-19 in the workplace than non-smoking workers.

Table III. Cross Tabulation and Analysis Results of the Relationship between Gender, Smoking Habits, and Pregnancy Status and the Risk of COVID-19 Transmission in the Workplace for Workers in Surabaya

Variable	Risk of COVID-19 Transmission in the Workplace						Total	p-value
	High		Moderate		Low			
	Frequency	%	Frequency	%	Frequency	%	N	%
Gender								
Men	22	10.9	116	57.1	65	32.0	203	100
Women	32	9.4	199	58.7	108	31.9	339	100
	Smoking Habits							
No	47	9.9	267	56.2	161	33.9	475	100
Yes	7	10.4	48	71.6	12	18.0	67	100
	Pregnancy Status							
Not Both	25	8.6	164	56.6	101	34.8	18	100
Pregnant	2	11.1	13	72.2	3	16.7	31	100
Breast-feeding	5	16.1	22	71.0	4	12.9	290	100

DISCUSSION

Based on the results of the study, it was found that gender has no correlation with the risk of COVID-19 transmission in the workplace in Surabaya. A study conducted a group of students at a university in Indonesia also showed that there was no relationship between gender and the implementation of COVID-19 control protocol(19). This result is supported by a similar prevalence of COVID-19 in both men and women in many of other studies(20). The distribution of COVID-19 in Indonesia also shows roughly equal percentage for both genders, 49.71% male and 50.29% female(21). However, the mortality and morbidity rates in men infected with COVID-19 are higher(20–22) mainly due to differences in enzyme expression, immune system, and lifestyle(21). The results of this study are also supported by previous research (23) on workers in the DKI Jakarta Provincial Health Office which shows that there is no relationship between respondent characteristics and the incidence of COVID-19 for the gender variable. The results of the study stated that the results of the chi square test showed that there was a

relationship between respondent characteristics and the incidence of COVID-19 for the variables of obesity, health conditions, and comorbidities (23).

Smoking habits have a significant but quite weak correlation with transmission risk of COVID-19 in the workplace in Surabaya. People who smoke are exposed to the risk of contracting of COVID-19 if they don't pay attention to hand hygiene since they tend to bring cigarette products close to their mouth(24). In addition, increased susceptibility in smokers is due to an increase in the angiotensin converting enzyme 2 (ACE2) gene expression which becomes the primary receptor for SARS-CoV-2 which can cause active infection(25). Aside from elevating the susceptibility against COVID-19 infection, smoking habits also exacerbate the probability of worse COVID-19 symptoms(16,26–28). Workers spend at least 8 hours per day at work so the workplace plays a very important role for the health of its workers. The workplace can also be a place to promote the health of employees against behaviors such as smoking, eating patterns, work stress that can trigger non-communicable diseases that increase the risk of COVID-19 (29) .

There is no correlation between pregnancy status and the risk of COVID-19 transmission in the workplace in Surabaya. This is in line with a number studies showing that pregnant women are not more susceptible to COVID-19 infection(30–32). However, theoretically pregnant women infected with COVID-19 may show worse symptoms due to changes in their immune system(33,34). In addition, there is no evidence of mother-to-baby transmission of COVID-19 through breast milk(35), though it is important to apply health protocol during breastfeeding(36). The results of research conducted by (37) found that work in pre-conception women affects the incidence of chronic energy deficiency, so that if pregnant women work but can still meet their nutritional needs, busy work is not an inhibiting factor to meet the nutritional needs of pregnant women who can be at risk of being infected with COVID-19.

The limitation of this study is that the individual characteristics studied are limited to gender, smoking habits and pregnancy status. Furthermore, COVID-19 transmission control items implemented in the workplace are solely based on respondents' statements since it is impossible to conduct field observation to the respondents' workplaces.

For future research, we recommend researchers to investigate into the relationship between the risk of COVID-19 transmission in the workplace and other individual characteristic variables. If possible, arrange for direct observation to the workplace to cross-check control measures of COVID-19 transmission that has been implemented in the workplace.

CONCLUSION

The majority of the respondents in this study are female, have no smoking habits, are not pregnant or breastfeeding, and show moderate risk of COVID-19 transmission in the workplace. Gender and pregnancy status present no significant correlation with the risk of COVID-19 transmission in the workplace. On the other hand, smoking habits has a significant correlation, though weak, relationship with the risk of COVID-19 transmission in the workplace. The implementation of COVID-19 control measures at various levels of hierarchy of control needs to be encouraged for workers in Surabaya, especially to those with smoking habits in order to reduce the risk of COVID-19 transmission. Based on the data, control measure on technical and administrative aspects are still lacking. Setting the distance at work, rearranging the HVAC system in indoor room with the installation of filters that can kill viruses and set up work hours so that workers do not get tired because it will affect on immune of the body need to be considered.

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