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## Covid-19 among laborers in Jubail industrial city, the effectiveness of active visual screening and box it in

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### Abstract

Jubail is the world's largest civil engineering project, which is home to the largest city in the Middle East. It is the fourth largest petrochemical company in the world and the largest in the Middle East. Apparently, the COVID -19 pandemic has had a devastating impact on the global economy. This study tends to investigate the extent at which "the box it in" strategy has been effective in containing the spread of the pandemic. The investigation seeks to know if there is any statistical

association between the most prevalent symptoms and the confirmatory test result, nasopharyngeal PCR. Furthermore, it identified that there was significant association among URT symptoms like cough, sore throat, fever, shortness of breath and COVID-19 PCR result. However, it shows no significant relationship between anosmia or nausea and vomiting.

**Keywords:** Covid-19 pandemic, Jubail Industrial Community, Coronavirus

### Introduction

In the midst of this covid 19 pandemic, humanity and society at large have been drastically battered. In particular, in the area of the economy which is a key determinant of a country's development? In the light of the above, depicts the importance of this study as it focuses on two key issues which are currently the subject of discussion : COVID-19 pandemic and the economy represented by Jubail Industrial community specifically on how effective it has been in containing the situation.

The key here is to manage the crisis which presupposes that, strengthening all four corners of the crisis circle; the ability to test, the safe isolation of everyone infected, vigorous and extensive contact tracing, and safe and attractive quarantine of those who are exposed. (Fraser, M., Lane, J. T., Ruebush, E., Staley, D., & Plescia, M. (2020) <sup>[4]</sup>.

Where this research studied COVID-19 in one of the biggest industrial cities in the world, the Study focuses on the prevalence of the signs and symptoms of COVID-19 disease among laborers, study the mechanism used to treat the crisis and share it with the globe so as to be able to benefit from it and discuss the challenges and circumstances.

It is important to note that cases among the laborers started to pop up at the initial stage of the crisis. Precautionary steps were initiated and the situation was promptly managed as a result of the timely intervention of health management institutions such as WHO, CDC, Saudi MOH (Weqaya) through the establishment of guidelines. Meanwhile, there were challenges mainly related to the accessibility of the industrial sites and its residential camps. When the decision was made to box it in the cases and its contacts appear.

Fears dominated the community at the initial phase of the containment approach and questions such as: "is it possible to manage and control this crisis? Do the proper criteria being used? Is there any possible outbreak among staff? We're being raised.

Such robust approach yielded dividen as contact tracing and screening exercise led to the identification and quarantined of 1004 cases in over two months. This in itself represents an example of a success story. The objective of this research is to measure the effectiveness of the measures put in place to contain the COVID-19 among laborers at Jubail Industrial City using box it in model. To achieve this purpose, the study outlines the following related objectives:

- To measure the prevalence of symptoms associated with COVID-19 among laborers at Jubail Industrial City and Ras Al-Khair.
- To examine the effectiveness of -Box it in- model in containing COVID-19 infection spread among laborers.
- To identify the mortality rate among COVID-19 confirmed cases

## Literature review

On January 7, a novel titled as coronavirus, originally abbreviated as 2019-nCoV by WHO, was identified from the throat swab sample of a patient (Hui, D. S., Azhar, E. I., Madani, T. A., Ntoumi, F., Kock, R., Dar, O., & Zumla, A. (2020)). This pathogen was later renamed as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by the Coronavirus Study Group (Gorbalenya, A. E., Baker, S. C., Baric, R., Groot, R. J. D., Drosten, C., Gulyaeva, A. A.,... & Penzar, D. (2020) [6]. And the disease was named coronavirus disease in 2019 (COVID-19) by the WHO (Harapan, H., Itoh, N., Yufika, A., Winardi, W., Keam, S., Te, H.,... & Mudatsir, M. (2020)).

“On January 30, 2020, the World Health Organization declared the outbreak as a Public Health Emergency of International Concern.” “Perceived risk of acquiring disease has led many governments to institute a variety of control measures” (Harapan, H., Itoh, N., Yufika, A., Winardi, W., Keam, S., Te, H.,... & Mudatsir, M. (2020)).

The World Health Organization (WHO) on March 11, 2020, has declared the coronavirus virus (COVID-19) outbreak a global pandemic.

“In particular, patients who recover from SARS-CoV-2 show evidence of an effective immune response to clear the infection and stop viral shedding within approximately 3 weeks” (Nemunaitis, J., Stanbery, L., & Senzer, N. 2020).

“Preliminary investigation of the first 191 patients in Jinyintan Hospital and Wuhan Pulmonary Hospital revealed that 54/191 (28%) died and 137/191 (72%) were able to be discharged. Analysis of these first 191 patients determined that several factors significantly correlated with risk of death, including age >63 years old, high sequential organ failure assessment score (>1), high D dimer (>1 ng/ml), respiratory rate >24 breaths/min, lymphocyte count  $>0.6 \times 10^9/l$ , elevated LDH (median 521 u/l) and elevated IL6 (median 11  $\mu g/ml$ ) as well as comorbidities, hypertension, diabetes, coronary artery disease and COPD. Ninety-three percent of the deaths were associated with ARDS” (Nemunaitis, J., Stanbery, L., & Senzer, N. 2020).

“The outbreak of coronavirus disease 2019 (Covid-19) on the cruise ship *Diamond Princess* led to 712 persons being infected with SARS-CoV-2 among the 3711 passengers and crew members, and 410 (58%) of these infected persons were asymptomatic at the time of testing” Sakurai, A., Sasaki, T., Kato, S., Hayashi, M., Tsuzuki, S. I., Ishihara, T.,... & Doi, Y. (2020).

“A total of 96 persons infected with SARS-CoV-2 who were asymptomatic at the time of testing, along with their 32 cabinmates who tested negative on the ship, were transferred from the *Diamond Princess* to a hospital in central Japan between February 19 and February 26 for continued observation. Clinical signs and symptoms of Covid-19 subsequently developed in 11 of these 96 persons, a median of 4 days (interquartile range, 3 to 5; range, 3 to 7) after the first positive polymerase-chain-reaction (PCR) test, which meant that they had been presymptomatic rather than asymptomatic. The risk of being presymptomatic increased with increasing age (odds ratio for being presymptomatic with each 1-year increase in age, 1.08; 95% confidence interval [CI], 1.01 to 1.16).” Sakurai, A., Sasaki, T., Kato, S., Hayashi, M., Tsuzuki, S. I., Ishihara, T.,... & Doi, Y. (2020). “The group of persons with asymptomatic SARS-CoV-2 infection consisted of 58 passengers and 32 crew members, with median age of 59.5 years (interquartile range, 36 to 68;

range, 9 to 77). A total of 24 of these persons (27%) had coexisting medical conditions, including hypertension (in 20%) and diabetes (9%)” Sakurai, A., Sasaki, T., Kato, S., Hayashi, M., Tsuzuki, S. I., Ishihara, T.,... & Doi, Y. (2020). “More than 70% of our patients with SARS-CoV-2 infection had asymptomatic or mild disease. However, massive increase in case numbers has led to the collapse of health-care systems.” (Tabata, S., Imai, K., Kawano, S., Ikeda, M., Kodama, T., Miyoshi, K.,... & Sato, M. (2020).

“According to the National Health Commission of China, the mortality rate among confirmed cases in China was 2.1% as of February 4 and the mortality rate was 0.2% among cases outside China. Among patients admitted to hospitals, the mortality rate ranged between 11% and 15%” (Harapan, H., Itoh, N., Yufika, A., Winardi, W., Keam, S., Te, H.,... & Mudatsir, M. (2020).

## Methodology

As stated above, this research attempts to shed light on COVID-19 victims among Laborers in Jubail Industrial City; the effectiveness of active visual screening and box it in. This research applies a variety of qualitative research methods, including literature reviews. In doing so, data is being collected from Public health department, a department that is charged with the responsibility of supervising and monitoring all RCJ laborers accommodation including mandating all companies to check the temperature of their laborers before and after work for onward update at Farouq-Family medicine center and field direct monitoring and active surveillance of the index cases and their close contacts for accurate analysis. These are the dependent variables below:

- PCR result
- Final outcome (full recovery or death)

## Independent variables

Demographics (nationality, age, occupation), symptoms, location, presence of chronic diseases.

Nb. all our laborers are male gender

Data will be analyzed using SPSS version 26 using frequency table. For categorical data we will apply the cross tabulation and chi square test.

## Result and discussion

As Jubail Industrial city is one of the biggest industrial city in the world and

of high economic importance to Saudi Arabia, we used extra precautions during the visual screening that includes even minor symptoms like mild grade fever ( $\geq 37.5$ ) plus or minus any of the flowing symptom (dry cough, SOB, sore throat, body ache, runny nose, nausea and vomiting, diarrhea and anosmia). In addition to that a history of close contact in the past fourteen days with any suspected case or confirmed case. This is what the authority in China did to interrupt the transmission (Wang, C., Horby, P. W., Hayden, F. G., & Gao, G. F. (2020)

We have used PCR nasopharyngeal swab technique as confirmatory test for COVID-19 cases. A total of one thousand four subjects from fifty-six different companies, and two different zones (Ras Al Khair and Jubail Industrial city) which represent 57.3% and 42.7% consecutively. The result shows total of five hundred twenty-seven confirmed cases (52.5%) and four hundred seventy-seven non-confirmed cases (47.5%). The nationalities were from twelve different countries, India represents the majority of 43.6%

followed by Bangladesh 19.4% and Philippine 11.8% (graph 3)

Three hundred fifty-nine (35.8%) of the suspected cases were symptomatic versus six hundred forty-five (64.2%) were asymptomatic. Eighty-two (8.17%) of the whole sample were having chronic diseases i.e. hypertension, diabetes mellitus, ischemic heart disease, bronchial asthma and rheumatoid arthritis; the majority were hypertensive (69.5%).

A total of 1004 laborers have been included in this analysis and the first confirmed case is dated March 25, 2020. Our result shows a mean age of 37-year (SD  $\pm$ 9.2) that ranges between 21-year and 72-year. We used the disease age related group to classify our sample; A (19–33), B (34–48), C (49–64), D (65–78) Geifman, N., Cohen, R., & Rubin, E. (2013) (see graph 1 and 2). Eighty-six percent of the subjects fall between 19 and 48-year age groups and this is expected as majority of them being laborers who came from abroad (table 30). We did not find significant association between the age groups and COVID-19 result (table 30).

Six hundred forty-five laborers (64%) were asymptomatic, among them two hundred twenty-nine (35.5%) have confirmed COVID-19 test. And of the forty-two laborers who were asymptomatic with chronic medical problems, 18 (43%) have confirmed COVID-19 (table 29).

The most prevalent symptom was fever followed by cough, body ache and sore throat (37%, 31%, 14%, 13%) consecutively which is similar to the finding in Wuhan china (Li, Q., Guan, X., Wu, P., Wang, X., Zhou, L., Tong, Y.,... & Xing, X. 2020) and similar findings to (Grant, M. C., Geoghegan, L., Arbyn, M., Mohammed, Z., McGuinness, L., Clarke, E. L., & Wade, R. (2020), a systemic review of 148 articles, which shows the most prevalent symptoms among COVID-19 positive cases as following fever, followed by cough and fatigability (78%, 57%, 31%) consecutively.

The prevalence of smoking among laborers is 19% (graph 6). In a study done in India among productive and non-productive workers the prevalence was 23.5 and 19.2% consecutively (Pednekar, M., Nagler, E., Pawar, P., Sorensen, G., Narake, S., & Stoddard, M. A. (2016).

We have conducted a cross tabulation analysis and chi<sup>2</sup> test for the association between all independent variables and the COVID-19 result and we found that of the 111 cases who presented with cough symptom, 99 (89.2%) were confirmed COVID-19 and it was highly significant. In relation to fever, the total laborer who presented with mild or high-grade fever were 133, seventy-two percent have been tested positive for COVID-19, and the chi<sup>2</sup> test was highly significant (table 11, 12).

Of the Forty-seven presented with sore throat, eighty-three percent became positive for COVID-19 with high significant chi<sup>2</sup> test. All laborers with runny nose (11 cases) became positive for COVID-19. While for laborers with body ache symptom forty-two (84%) have been confirmed COVID-19 (table 13,14,15).

All subjects with headache, shortness of breath and diarrhea symptoms were confirmed COVID-19 with significant chi<sup>2</sup> test.

On the other hand, ten subjects with anosmia symptom, as a

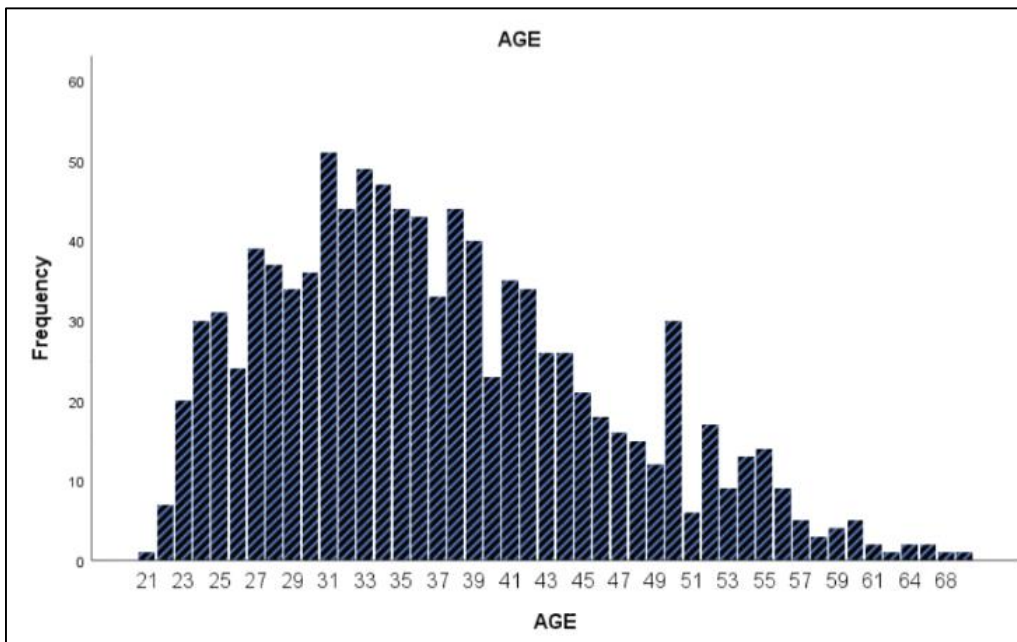
single symptom. Eighty percent of them have confirmed COVID-19 and none of them being smoker. The Odds ratio is 3.66 (95%CI 0.77-17.3). In a study “Meng, X., Deng, Y., Dai, Z., & Meng, Z. (2020)”. the author concluded that anosmia is one of the most common sign in patients with COVID-19. In our study nausea and vomiting symptom appeared in one case only who has been confirmed COVID-19. The Chi<sup>2</sup> test for association of both symptoms, anosmia and nausea and vomiting, were not statistically significant (table 16-20).

Another cross tabulation analysis has been conducted for symptoms and the final outcome (deceased or recovered). The total deceased is five subjects. The death rate among the laborers with confirmed COVID-19 was 0.95% (table 22-27). In general, there was high association between symptoms and the outcome (P-value 0.006), four of them were having cough, and the chi<sup>2</sup> test was highly significant (0.001). Concerning fever symptom four subjects were having fever and the chi<sup>2</sup> was highly significant (0.001). Shortness of breath symptom was found in four cases, chi<sup>2</sup> test was highly significant (<0.001). In relation to chronic medical illnesses two cases of the deceased cases were having diabetes mellitus with hypertension and hypertension with ischemic heart disease, the chi<sup>2</sup> test was highly significant (<0.001). A meta-analysis with available national reports on May 7, 2020 from China, Italy, Spain, United Kingdom, and New York State, a total of 611,1583 subjects were analyzed and 141,745 (23.2%) were aged  $\geq$ 80 years. The percentage of octogenarians was different in the 5 registries, the lowest being in China (3.2%) and the highest in the United Kingdom and New York State. The overall mortality rate was 12.10% and it varied widely between countries, the lowest being in China (3.1%) and the highest in the United Kingdom (20.8%) and New York State (20.99%). Mortality was <1.1% in patients aged <50 (Bonanad, C., García-Blas, S., Tarazona-Santabalbina, F., Sanchis, J., Bertomeu-González, V., Fácila, L.,... & Cordero, A. (2020)). Our finding was similar to this review as majority of our sample age groups has fallen in this category (86.5%<50 and only 0.4%>64). We conducted Fischer exact test to analyze the association between the presence of chronic medical illnesses and the final outcome, it shows high significant (table 28). This finding is similar to other articles” (Nemunaitis, J., Stanbery, L., & Senzer, N. 2020).

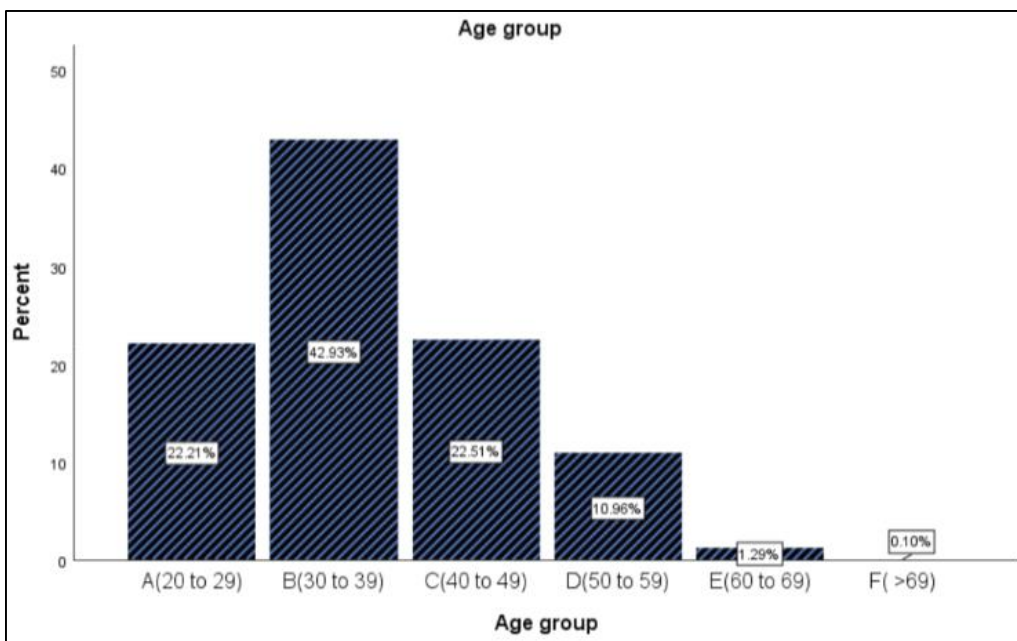
We calculated the total number of symptoms (zero to four symptoms) in each confirmed case to find any association with the test result and the final outcome. The result was highly significant (P-value <0.001) (table 31). This means a reciprocal relation between total number of symptoms and the fatality rate among confirmed COVID-19 subjects. In a healthcare study of total number of symptoms and the adjusted odds ratio, HCWs reporting three or more symptoms had an increased multivariate-adjusted odds of having positive assays, 1.95 (95% CI: 1.10–3.64), which increased to 2.61 (95% CI: 1.50–4.45) for six or more symptoms (Lan, F. Y., Filler, R., Mathew, S., Buley, J., Iliaki, E., Bruno-Murtha, L. A.,... & Kales, S. N. (2020).

Table 1

		AGE
N	Valid	1004
	Missing	0
Mean		37.11
Std. Deviation		9.173
Sum		37256
Percentiles	25	30.00
	50	36.00
	75	43.00



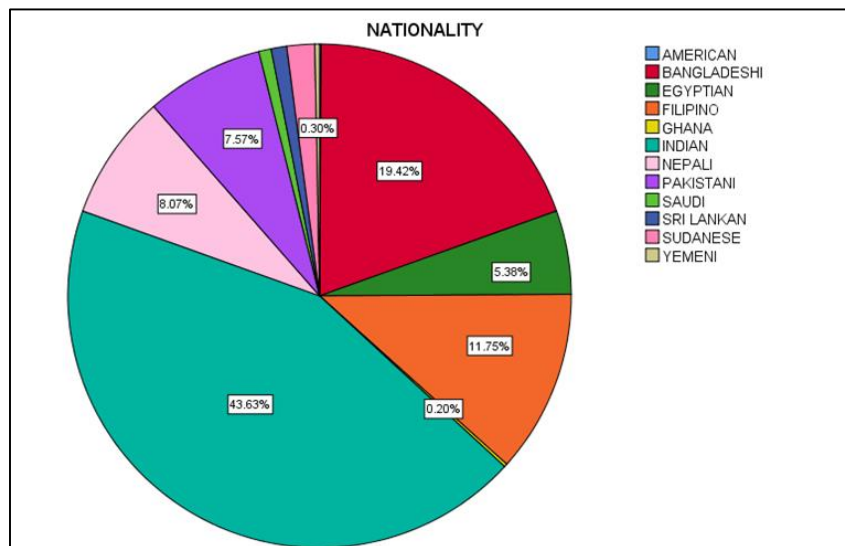
Graph 1



Graph 2

Table 3

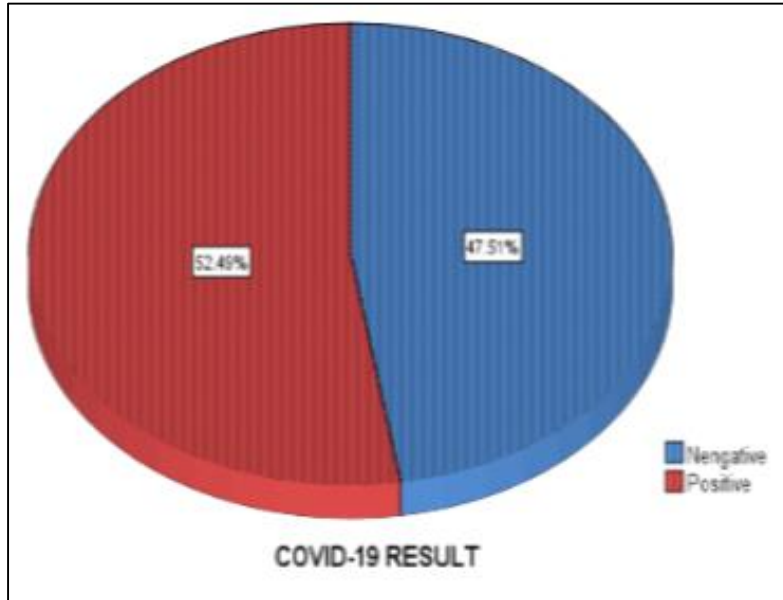
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	AMERICAN	1	.1	.1	.1
	BANGLADESHI	195	19.4	19.4	19.5
	EGYPTIAN	54	5.4	5.4	24.9
	FILIPINO	118	11.8	11.8	36.7
	GHANA	2	.2	.2	36.9
	INDIAN	438	43.6	43.6	80.5
	NEPALI	81	8.1	8.1	88.5
	PAKISTANI	76	7.6	7.6	96.1
	SAUDI	8	.8	.8	96.9
	SRI LANKAN	10	1.0	1.0	97.9
	SUDANESE	18	1.8	1.8	99.7
	YEMENI	3	.3	.3	100.0
Total		1004	100.0	100.0	



Graph 3

Table 4

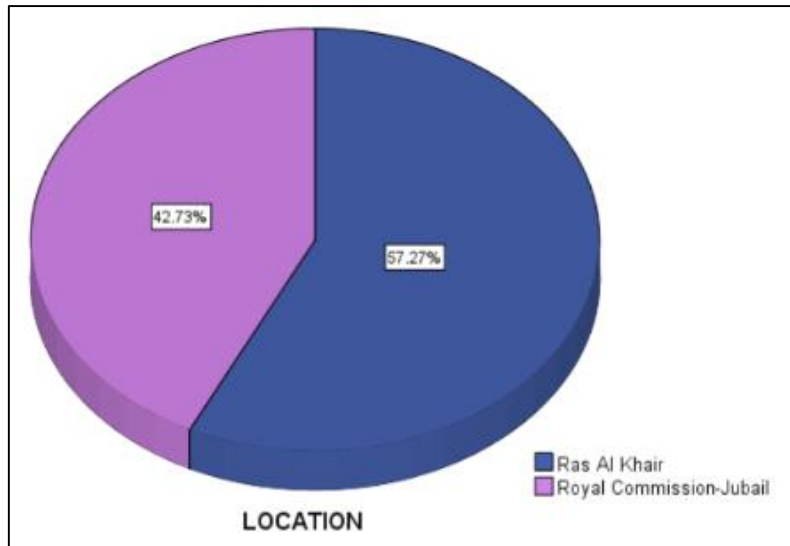
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NE	477	47.5	47.5	47.5
	PO	527	52.5	52.5	100.0
Total		1004	100.0	100.0	



Graph 4

Table 5

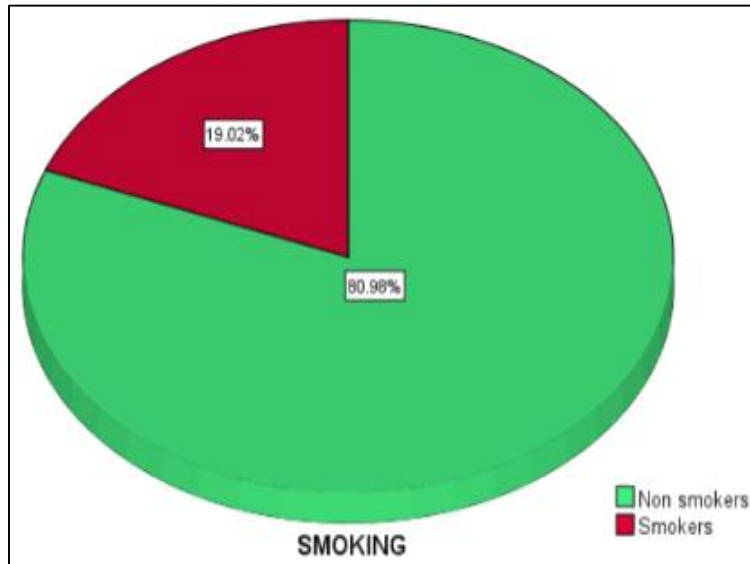
LOCATION					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Ras Al Khair	575	57.3	57.3	57.3
	Royal Comm	429	42.7	42.7	100.0
	Total	1004	100.0	100.0	



Graph 5

Table 6

SMOKING					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	N	813	81.0	81.0	81.0
	Y	191	19.0	19.0	100.0
	Total	1004	100.0	100.0	



Graph 6

Table 7

MEDICAL HX					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	BA	6	.6	.6	.6
	DM	6	.6	.6	1.2
	DM & HTN	5	.5	.5	1.7
	HTN	57	5.7	5.7	7.4
	HTN & IHD	1	.1	.1	7.5
	NON	922	91.8	91.8	99.3
	RA	7	.7	.7	100.0
	Total	1004	100.0	100.0	

Table 8

LOCATION * REMARKS * RESULT Crosstabulation						
RESULT				REMARKS		Total
				D	R	
NE	LOCATION	Ras Al Khair	Count		296	296
			% within LOCATION		100.0%	100.0%
	Royal Comm	Count		181	181	
		% within LOCATION		100.0%	100.0%	
	Total	Count		477	477	
		% within LOCATION		100.0%	100.0%	
PO	LOCATION	Ras Al Khair	Count	4	275	279
			% within LOCATION	1.4%	98.6%	100.0%
	Royal Comm	Count	1	247	248	
		% within LOCATION	0.4%	99.6%	100.0%	
	Total	Count	5	522	527	
		% within LOCATION	0.9%	99.1%	100.0%	
Total	LOCATION	Ras Al Khair	Count	4	571	575
			% within LOCATION	0.7%	99.3%	100.0%
	Royal Comm	Count	1	428	429	
		% within LOCATION	0.2%	99.8%	100.0%	
	Total	Count	5	999	1004	
		% within LOCATION	0.5%	99.5%	100.0%	

**Table 9**

<b>RESULT * MEDICAL HX</b>										
<b>Crosstab</b>										
			MEDICAL HX							Total
			BA	DM	DM & HTN	HTN	HTN & IHD	NON	RA	
RESULT	NE	Count	4	2	0	20	0	448	3	477
		% within RESULT	0.8%	0.4%	0.0%	4.2%	0.0%	93.9%	0.6%	100.0%
	PO	Count	2	4	5	37	1	474	4	527
		% within RESULT	0.4%	0.8%	0.9%	7.0%	0.2%	89.9%	0.8%	100.0%
Total		Count	6	6	5	57	1	922	7	1004
		% within RESULT	0.6%	0.6%	0.5%	5.7%	0.1%	91.8%	0.7%	100.0%

**Table 10**

<b>RESULT * SYMPTOMS</b>					
<b>Crosstab</b>					
			SYMPTOMS		Total
			NO	YES	
RESULT	NE	Count	416	61	477
		% within RESULT	87.2%	12.8%	100.0%
	PO	Count	229	298	527
		% within RESULT	43.5%	56.5%	100.0%
Total		Count	645	359	1004
		% within RESULT	64.2%	35.8%	100.0%

<b>Chi-Square Tests</b>					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	208.703 <sup>a</sup>	1	.000		
Continuity Correction <sup>b</sup>	206.802	1	.000		
Likelihood Ratio	222.959	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	1004				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 170.56.  
 b. Computed only for a 2x2 table

**Table 11**

<b>RESULT * cough</b>					
<b>Crosstab</b>					
			cough		Total
			N	Y	
RESULT	NE	Count	465	12	477
		% within RESULT	97.5%	2.5%	100.0%
	PO	Count	428	99	527
		% within RESULT	81.2%	18.8%	100.0%
Total		Count	893	111	1004
		% within RESULT	88.9%	11.1%	100.0%

<b>Chi-Square Tests</b>					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	67.399 <sup>a</sup>	1	.000		
Continuity Correction <sup>b</sup>	65.755	1	.000		
Likelihood Ratio	76.877	1	.000		
Fisher's Exact Test				.000	.000
N of Valid Cases	1004				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 52.74.  
 b. Computed only for a 2x2 table



## Conclusion

Covid-19 pandemic has had a devastating effect on the world economy. It has led to the loss of lives and restriction of movement across the globe. Though strides have been to contain the virus, yet it remains extremely difficult to contain it. As a public Health Emergency, various governments have instituted variety of control measures. The study attempts to focus on Covid-19 victims among laborers in Jubail Industrial City: the effectiveness of active visual screening and box it in. Box it in strategy and early isolation symptomatic and the close contacts with either symptom or pre symptomatic is important to contain the spread of Covid-19 infection among communities.

The findings of the research shows a total of five hundred and twenty seven confirmed cases (52.5%) and four hundred and seventy seven none confirmed cases (47.5%). Three hundred and fifty nine (35.8%) of the suspected symptomatic as against six hundred and forty five (64.2%) asymptomatic cases. Eighty-two (8.17) of the whole sample were having chronic diseases. The most prevalent symptom was fever followed by cough, sore throat and body ache- (37 %, 31%, 14%, 13%) respectively. There was significant association in most URT symptoms e.g. cough, sore throat, fever, shortness of breath and Covid-19 PCR result. However, there is no significant association in symptoms like anosmia or nausea and vomiting. The death rate among the laborers with confirmed Covid-19 is 0.95%.

## Recommendations

- For mass gathering areas like dormitories and factories, the Box it in plus visual screening are effective measures to slow down the spread of infection during outbreaks and hasten recovery phase.
- For industrial cities, a well establish preparedness plan (e.g. allocation of Quarantine area and proactive preventive measures) should be in place prior to such outbreaks that might impact their operational activities and economy.

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