

Two-intervention Social Distancing Strategy to Control COVID-19 in Salaheddine Province; A Comparative Study

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ABSTRACT

The COVID-19 pandemic, which is caused by a novel coronavirus, is a global health issue. A respiratory tract illness, acute respiratory distress syndrome, micro thrombosis, sepsis, and mortality are presented in this case. Early identification of suspected cases allows sufficient time for medical and local authorities to initiate an appropriate international and national infection transmission control protocols.

Assess the effectiveness of the two-way strategy for distancing social intervention that has been implemented to control COVID 19 in the city of Salaheddin as compared to Santa Clara in the U.S.

The COVID-19 mathematical model is used to estimate the expected burden of pandemic in Salaheddin City as well as in Santa Clara, US. This model provides numerical data on the number and time interval of the application of appropriate intervention control strategies by comparing one-strategy (social distancing) with a two-stage strategy (social distancing & light switch approach).

The two strategies show that, on average, in 12.3% of the population the baseline epidemic scenario affected 11.6%, with a 1-strategy contact rate of 70%. While only 0.11% of the population will have been infected by the two-intervention strategy at a rate of 20% of social contact, compared to 0.165% with the application of the one strategy. This will significantly reduce the spread of the infection and significantly delay the peak incidence of all hypotheses.

The two-way social distancing strategy is an efficient tool in Salaheddin to control COVID-19 and represents a major success for the Crisis Cell pandemic in the city of Salaheddin until the end of the study period.

Keywords: COVID-19, Salaheddin, Santa Clara, social distancing and light switch approach.

1. INTRODUCTION

In December 2019 the new coronavirus, what is now known as COVID-19, was spread worldwide in the city of Wuhan, China [1]. This virus represents the new mutant version of a family of known coronaviruses that has led to a severe form of infectious respiratory tract, 98% moderate fever, 76% dry cough and 44% fatigue. Symptoms start after a week of virus exposure and resolve 10-14 days after exposure. More serious complication may occur in immunocompromised patients, such as pneumonia, ARDS 29%, sepsis, thrombosis, shock, acute kidney or heart failure 7%, 14%

respectively and / or , acute organ failure[2,3]. Statistics from WHO indicate that around 81% of COVID-19 people suffer from mild uncomplicated conditions, 14% may have a severe disease which needs hospitalization and oxygen. Intensive respiratory treatment unit acceptance is needed and mechanical ventilation may be necessary only 5 per cent. It may take 12-18 months for a new vaccine to develop on the market [4].

Early recognition of suspected cases gives local health authorities enough time to take appropriate national and international measures to control infection spread. The measures are based mainly on restrictions on

social movement or what is now known as social distancing. It supports health facilities and infrastructure, collaborating with the media to provide accurate and scientific facts on the disease and precautions to reduce the spread of the disease [5]. Early COVID-19 identification provides both the patient and healthcare authorities with precious time to optimize patients' safety, speed and efficiency in healthcare needs. This may include: reference, hospitalization or even the acceptance of the national protocols and the patient's condition into an intensive respiratory unit. In addition, both health care authorities and local authorities have time to adopt appropriate actions, such as initiating urgent plans, supporting hospital facilities with adequate protective equipment, instruments and supplies, promoting public awareness and working with national and international bodies. This study aims to evaluate the effectiveness of the two- intervention social distancing strategy that was applied to control COVID-19 in Salaheddin city.

2. METHODS

Data about the COVID-19 infections were collected from the Directorate of Health in Ninawa and WHO/Iraq. These data were applied to an interactive model that produced by *Childs et al*, on 2020 in Santa Clara City in California, USA available at [6] and the applied setting is portrayed in Figure 1. The model recruits two non-pharmacological strategies to control COVID-19 infection in Salaheddin city. The first strategy was various degrees of social distancing that were categorized according to the proportion of baseline contact rate among people to; Extreme social distancing 25% contact, Strong social distancing 40%, Medium social distancing 50%, and Light social distancing 60%. The second strategy was a “light-switch method” which means when the number of infected persons exceeds the hospitalization bed capacity. Therefore, if strong social distancing 20% will be applied on and when this value lowered blow the hospitalization bed capacity in three successive weeks, the social distancing may be lowered to 40-50 %. Then, if the cases still below after three weeks, social distancing can be lowered to 60%. The model gives 15 January 2020 as the theoretical date for the start of infection break up the number of population number, hospital bed, date of starting strategy one, length of time for strategy.

The percentage of infected cases was calculated by dividing the simulated number of cases over the population of both Santa Clara and Salaheddin Cities respectively [6].

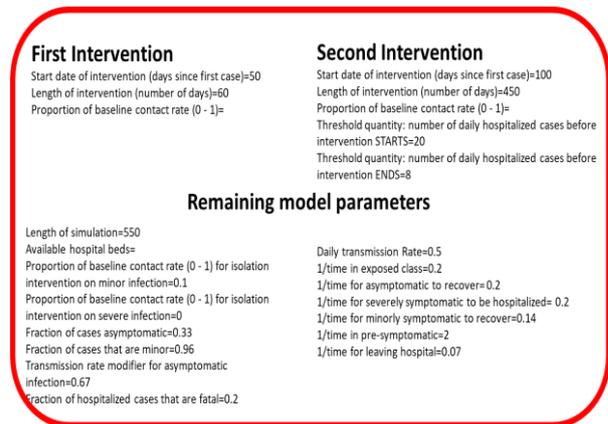


Figure 1 The sitting that applied in the simulation and comparison between Santa Clara and Salaheddin city.

3. RESULTS

The capacity of the hospital bed calculated by dividing the number of beds in the city by 1000. That capacity was taken into as passed when it was over (6.5) folds [7]. In Santa Clara, there were 2,32 beds / 1,000 patients in the hospital bed and 15 cases / weeks were deemed appropriate ⁶. In Salaheddin the capacity of the hospital bed was 0.043 beds/1000 people and was taken into consideration when there are 0.3 cases/week as illustrated in Figure2 and 3. This is a major challenge for the health and local governments, because any outbreak will have a devastating impact on society as a whole.

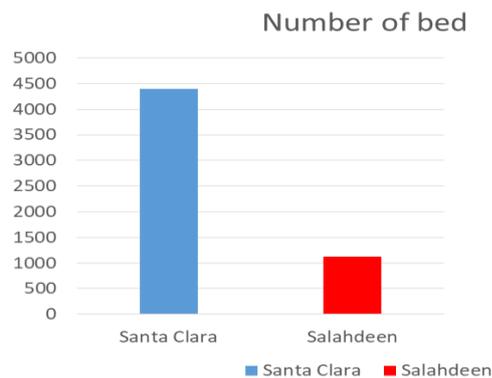


Figure 2 Comparison between Santa Clara and Salaheddin city in Hospital bed number.

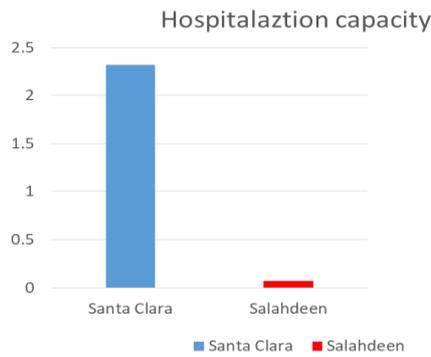


Figure3 Comparison between Santa Clara and Salaheddin city in hospitalization bed capacity

Use of two interference model strategies (Distance + Light switch) showed, on average, 12.3% of the populace infected with a baseline epidemic scenario compared with 11.6%, if no real distance exists (contact rate 70 percent). Although only 0.11%, of the population, in 20% of social contacts, compared to 0.165%, is infected. This results in a major decrease and significant delays in the peak time in all hypotheses, as shown in the following table 1 and 2

Table 1. Comparison between Santa Clara City and Salaheddin City in the expected number of infections according to a simulation model that produced by Childs et al, applying one strategy (restriction only)

Contact rate	% In Santa Clara	% In Salaheddin
20% (extreme restriction)	0.1	0.07
30% (extreme-strong restriction)	0.82	0.26
40% (strong restriction)	1	0.5
50% (moderate restriction)	4	3.5
60% (light- moderate restriction)	7.2	5.6
70% (light restriction)	9.3	10.4
80% (open restriction)	12.4	13.2

*The percentage calculated from dividing the simulated case number/ population of each city.

Table 2. Comparison between Santa Clara City and Salaheddin City in the expected number of infections according to a simulation model that produced by Childs et al, applying two strategies (Distancing and Light-Switch Approach)

Contact rate	% In Santa Clara	% In Salaheddin
20% (extreme restriction)	0.15	0.04
30% (extreme-strong restriction)	0.18	0.04
40% (strong restriction)	2	2.2
50% (moderate restriction)	5.7	4.1
60% (light- moderate restriction)	9	9
70% (light restriction)	12.4	12.5
80% (open restriction)	15	15

*The percentage calculated from dividing the simulated case number/ population of each city.

The simulation revealed a greater amount of control over the epidemic and preventing the tragic spread of infestation, including the restriction of movement and preventing movement in and out of the city, by the Crisis Cell in Salaheddin City. Only six cases have been reported within 60 days of measures for social distance and the expected number of new model's cases is over 190 000 every day.

Applying the Distance+ Light-Switch Model strategy for 60 days shows that first action (social distancing) has a vital role to play in the initial epidemic control until we reach the stability state. This second intervention will have a similar effect from 40 percent to 60 percent in a single strategy alone (see table 1 and 2). If we increase the contact rate to 70%, the single strategy looks more effective, at the expense of the freezing of the society as a whole.

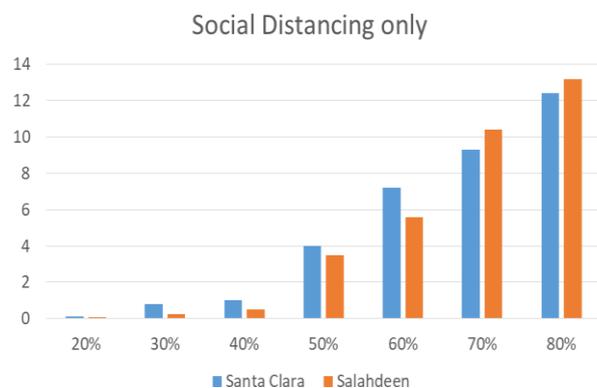


Figure 4 Comparison between Santa Clara City and Salaheddin City in the expected number of infections according to a simulation model that produced by Childs et al, applying one strategy (Distancing only)

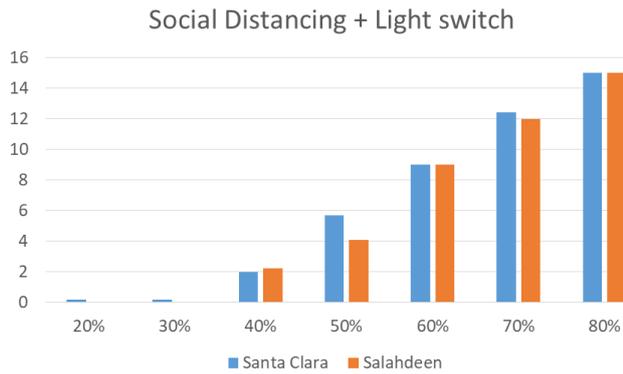


Figure 5 Comparison between Santa Clara City and Salahdeed City in the expected number of infections according to a simulation model that produced by Childs et al, applying two strategies (Distancing and Light-Switch Approach).

4. DISCUSSION

Non-pharmacological interventions (NPIs) encompass measures that may be taken by individuals and households (e.g., frequent washing of hands, coughing and sneezing) and social distance that communities can accept (e.g., closing schools, working from home, restricting public gatherings and movement). These are designed specifically to reduce the spread of a disease passed from person to person [8]. The NPIs help to reduce the effects of a pandemic by delaying the impact and give health and local governments more time to synchronize their response efforts. It also helps to reduce the number of people exposed to the infection and who may become ill or die. This will also reduce the pressure on health care facilities and healthcare workers as they deal with fewer people. Finally, such actions will have an impact on employment as NPIs help maintain local enterprises and municipal infrastructure such as water, electricity and transportation.

Distance is a cornerstone in the control of respiratory tract-related pandemics. There are several models or strategies used to examine the effect on the removal of any pandemic. In one Chinese study the number of COVID-19 cases could have been reduced by 66%, 86% and 95% respectively if a number of NPIs including social distancing have been carried out one week, two weeks, or three weeks before in the country, and by significantly lowering the number of areas affected by the problem [9].

The models used in this study based on Salahdeed city data suggest that averages of 12,3% of the population develop COVID-19 infection in a baseline epidemic (70% or more). If 20% of social contact is applied, the total attack rate will decrease to 0.11% and the peak time will be substantially delayed. On the other hand, the attack rate rose to 5,2 percent with a 50 percent social contact rate and the maximum time was short. This shows

that the number of people infected increases by 10 percent each time the distance rises. The city will also be safer as soon as we check the infected person. The same result is achieved if we use the one-intervention strategy, but with unbearable social and economic consequences.

By applying a severe restriction on movement early in the COVID19 pandemic and then changing the light-switch approach, the municipal authorities were successful in making their decision. The effects of the long distance will be reduced economic, social and psychological. Research has shown that living long distances in society may produce symptoms of post-traumatic stress.

There should be a clear justification for quarantine in order to minimize negative feelings in the community. Regular updates of the illness situation and other information should be provided, so that people know what to do and maintain adequate food and supplies[10].

Mass testing is one of the instruments used to assess the extent of infection spread, including the identification of asymptomatic people who can then isolate themselves before spreading the virus further. However, the focus of the public health response to COVID-19 is social distancing, in the absence of a broad testing. During the initial control period, the busy place of work such as markets, universities, schools and plants should be closed. The second phase should therefore minimize the number of employees, to only carry out the essential operations.

4. CONCLUSION

In conclusion, the two-way social distancing strategy is an efficient tool in Salahdeed to control COVID-19 and represents a major success for the Crisis Cell pandemic in the city of Salahdeed until the end of the study period

Recommendations may be made, since; the borders of Salahdeed should be closed in order to sustain achievement; the media must retain their messages of consciousness in order to maintain personal interaction control measures such as frequent hand washing; avoiding handshaking. The next step is mass screening in the city, where the health workers working in the field should find any hidden case or at least testing the situation. While many other factors than social distance may affect the level of spread, the social distance is obviously the most effective.

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