

Analysis of Facility and Home Isolation Strategies in COVID 19 Pandemic: Evidences from Jodhpur, India

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Purpose: Jodhpur administration directed its efforts to control and mitigate COVID 19 infection by implementing and monitoring facility isolation (FI) and home isolation (HI) measures. This study is conducted with a hypothesis that there is no difference in the quality of life and cost-effectiveness of mildly symptomatic or asymptomatic patients in HI and FI.

Patients and Methods: A mixed-method study was conducted in Jodhpur in September 2020. The purposive sampling technique was used and data from 120 individuals admitted in HI and FI were collected. The information about the status and functioning of isolation facilities was collected from various sources. Multi-stakeholder interactions with 15 personnel engaged in managing isolation facilities were done. EQ-5D version (EQ-5D-5L) which consists of the EQ-5D descriptive system and the EQ visual analog scale (EQ-VAS) was used to assess health-related quality of life.

Results: The strength of HI strategy is demonstrated by its ability to provide psychological and social support with minimal logistic requirements but the issue of sufficient household infrastructure, adequate family and societal support for implementing this strategy is of concern. The strength of FI strategy includes its ability to provide support to patients who have issues of sufficient household infrastructure, adequate family and societal support, but this strategy poses a threat of increasing human resource constraints and financial load on the health system. The respondents from HI obtained a mean EQ-5D index score of 0.90 and a mean VAS score of 85, whereas it was 0.80 and 78.5, respectively, for FI. The cost estimated for home isolation was Rs 549 (7.43 US \$) per person, whereas it was Rs 2440 (33.02 US \$) for facility Isolation.

Conclusion: Though HI seems advantageous in terms of a better quality of life and cost-saving over FI, both the strategies are context-specific having their own trade-offs.

Keywords: COVID 19, patient isolation, quality of life, public health, cost savings

Introduction

Jodhpur district is one of the highly populated districts of the western part of Rajasthan state in India.¹ In March 2020 the first case of a novel, severe acute respiratory syndrome (SARS) coronavirus was registered in Jodhpur, Rajasthan.² This COVID 19 virus rapidly started spreading throughout Jodhpur and the number of cases increased to 2793 cases in June 2020.²

Many efforts are being undertaken by Jodhpur officials to contain the spread of COVID-19. One of the major components of these efforts is Isolation.³ According to the Centers for Disease Control and Prevention (CDC), Isolation is the

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“separation and restriction of movement of persons, who, while not yet ill, have been exposed to an infectious agent and therefore may become infectious”.⁴ Public health authorities of Jodhpur adopted a structured approach in making Isolation decisions. This approach involves facility and home-based Isolation.

Various studies suggest that Isolation is useful in limiting the spread of a contagious illness and can be carried out voluntarily or imposed by government authorities.⁵ Though isolation is different from quarantine, most of the time people wrongly use these terms interchangeably. Isolation refers to the people who have a specific infectious illness.⁵ Movements of these individuals are restricted and they are separated from individuals who are healthy or asymptomatic.⁵ Isolation can be carried out at home, in hospitals, or at another healthcare facility. Literature mentions that there are various challenges associated with Isolation such as compliance, cost, productivity, quality of life, etc.^{6,7}

Jodhpur administration directed their efforts to control and mitigate COVID 19 infection by implementing and monitoring health facility and home Isolation measures but there is a lack of evidence about the implication and public health benefits of these measures. Different studies conducted in various countries have varied opinions about the feasibility of isolation strategies.⁸⁻¹⁰ Therefore, it is imperative to systematically document and assesses the effect of facility and home Isolation measures to provide an evidence-informed basis for formulating future strategic directions. So, this study is conducted with the purpose to analyze the effectiveness of the health facility and home Isolation approach adopted by public health authorities in Jodhpur. As Rajasthan lacks sufficient health infrastructure to support surge during pandemics, we hypothesize that there is no difference in the quality of life and cost-effectiveness in Home Isolation vs Facility Isolation, for addressing mildly symptomatic or asymptomatic patients.

Materials and Methods

A cross-sectional, mixed-method study was conducted in Jodhpur in the period of September 2020. The purposive sampling technique was used for the study. Data of 120 individuals who were admitted in Home Isolation and Facility Isolation in the month of September was received from the district administration for the purpose of calculating Quality of Life. Data for the study was obtained from two sources, District Health Administration and Nodal office managing isolation centers. Information

from both the centers was matched and checked for reliability. The data includes information about the functioning and status of health facility and home Isolation. Multi stakeholder’s interactions with 15 personnel engaged in managing Isolation facilities were done. SWOT analysis of both the strategies was performed on the collected information. SWOT analysis refers to an assessment of various strengths (S), weaknesses (W), opportunities (O), and threats (T). An attempt was also made to identify the health-related quality of life associated with different Isolation approaches using 5-level EQ-5D version (EQ-5D-5L) which consists of the EQ-5D descriptive system and the EQ visual analog scale (EQ-VAS) 11. EQ-5D-5L is a pre-validated and pretested questionnaire. For the comparison purpose, health-related quality of life of 120 mild symptomatic COVID-19 cases were assessed. Cost analysis of both strategies was conducted using available reports, documents, and stakeholders’ interviews.

Results

Situational analysis of Facility-Based Isolation and Home-based Isolation in Jodhpur was done to obtain a comprehensive overview of the on-ground situation. Jodhpur Municipal Corporation (JMC) has taken the responsibility for home Isolation and the Office of Medical and Health Services, Jodhpur is managing health facility Isolation. [Figure 1](#) shows a flow diagram of the management strategy adopted by the Jodhpur administration for COVID 19 cases.

Home Isolation (HI) Strategy

District Disaster Management Authority of Jodhpur in procession with Government of India, Ministry of Health & Family Welfare has developed the criteria for home isolation. According to these criteria, very mild/pre-symptomatic patients having the requisite facility at his/her residence for self-isolation will have the option for home isolation.

JMC is responsible for the execution of these guidelines. Surveillance Cell of JMC receives information about COVID 19 suspected or positive person through Office of Chief Medical and Health Officer, Contact Tracing Cell and Screening Cell. CMHO Office provides data of the positive person, positive family members, and discharge data; Screening Cell provides travel history data and Contact Tracing Cell provides data of contacts.

This information is then compiled and circulated to the home Isolation execution teams of JMC. Rapid

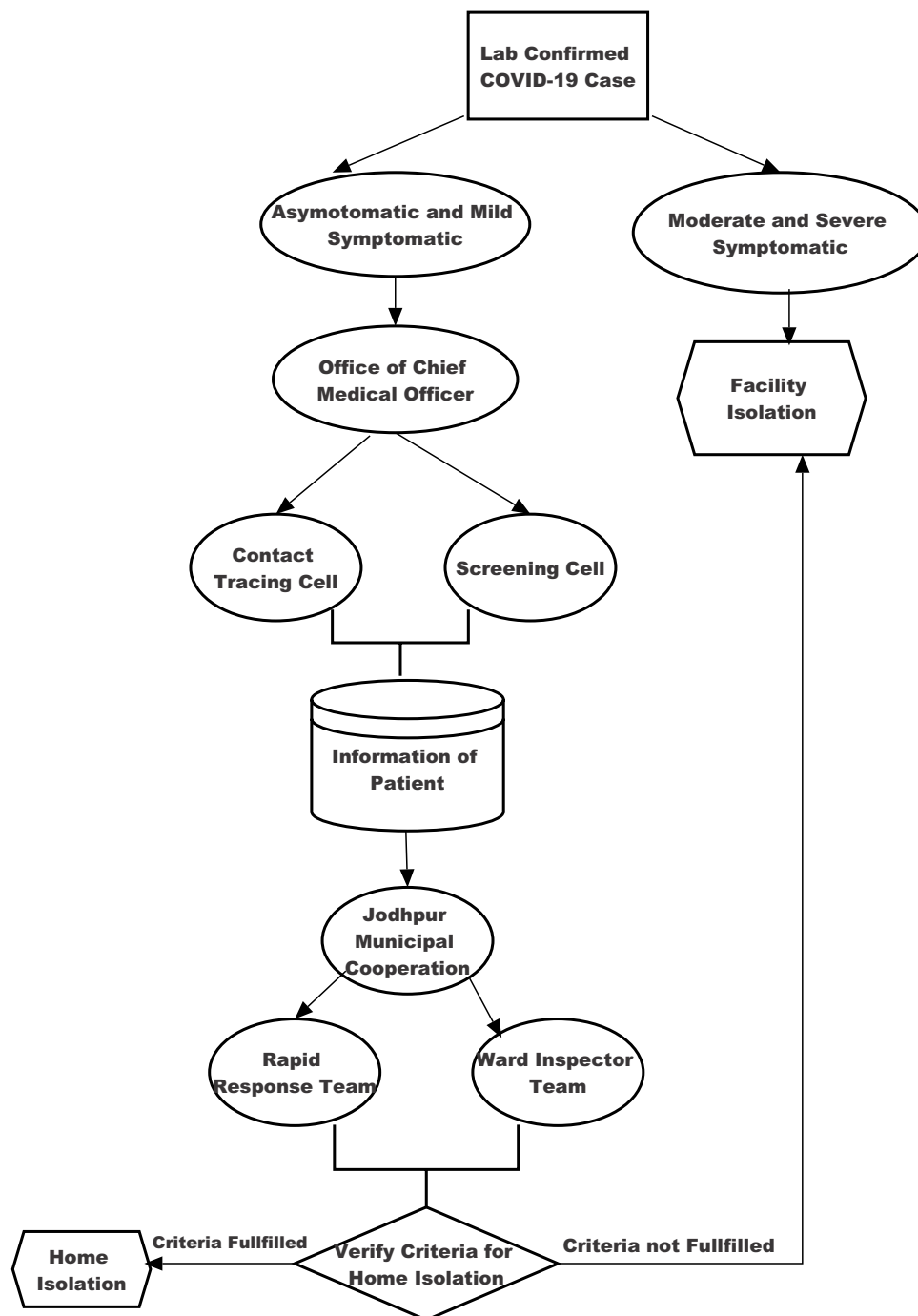


Figure 1 Management strategy adopted by Jodhpur administration for COVID 19 cases (Provided as separate high resolution PDF file).

Response Team of JMC is especially dedicated to home isolation of COVID 19 positive patients and CSI-Ward Inspector Team is dedicated to carrying out tasks related to all home Isolation people. JMC surveillance cell after executing task related to home Isolation by both teams provide information back about the tasks carried out to the Office of Chief Medical and Health Officer, Contact Tracing Cell and Screening Cell. Additionally,

information is also provided to Incident Commanders, who are administrative officers appointed by District Administration Authority and is responsible for the monitoring of home Isolation persons. Jodhpur city is divided into 9 zones (constituency) and 65 wards.¹² So, for each zone, there is one incident commander who monitors each patient daily telephonically or through video calls.

SWOT Analysis (HI)

Strength Analysis

The strength of the HI strategy is demonstrated by its ability to provide good psychological and social support with minimal requirement of logistic support. It is more beneficial for those who are performing work from home, hence reducing loss of productivity. Moreover, chances of cross-infection/nosocomial infection are less in HI and also contribute in reducing chances of exposure for medical and support staff deployed at various state facilities and hospitals.

Weakness Analysis

The issue of sufficient household infrastructure, adequate family, and societal support for implementing this strategy is of paramount concern. People who have relatively small households or do not have separate living rooms cannot be home isolated and, moreover, this strategy requires a supportive neighborhood that could provide legal assurance of taking care and monitoring of a positive person.

Opportunity Analysis

HI strategy has provided an opportunity of conducting more COVID testing as this strategy has reduced the fear and stigma of hospitalization. People are enthusiastically participating in testing. After implementation of HI with one month rate of testing in Jodhpur was doubled. This strategy also provides an opportunity of reducing the load on hospitals, covid care centers, and state-run Isolation facilities. The majority of patients under home isolation recovered successfully and only a few required hospitalization. All these patients would have been kept under the supervision of hospital/COVID care facilities if the HI strategy was not there.

Threat Analysis

Those patients who are home isolated, their Isolation cannot be monitored by health workers as they would have been in health facilities. This poses a threat to those patients who do not voluntarily disclose their symptoms when they eventually become symptomatic. HI strategy has a provision of monitoring home isolated/ Isolation persons on a daily basis through video calls or telephonically by an incident commander who solely depend on the information provided by the respondent for taking required actions.

Facility Isolation (FI) Strategy

Medical and Health Services, Zone Jodhpur developed health facility isolation centers based on interim guidance

for setting up of Isolation facilities provided by MOHFW: "Guidelines for Isolation facilities COVID-19 – MOHFW" with a capacity of 700 people.¹⁰ Facility Isolation has an administrative wing managed by administrative officer and a medical and health wing managed by the district In-charge officer.

SWOT Analysis (FI)

Strength Analysis

The strength of FI strategy is demonstrated by its ability to provide support to patients who have an issue of sufficient household infrastructure, adequate family and societal support for being Isolated.

Weakness Analysis

Contrary to HI, it is not suitable for those who are performing work from home, hence imposing loss of productivity. Chances of cross-infection/nosocomial infection are more in FI and it can also contribute to increased chances of exposure for medical and support staff deployed at various state facilities and hospitals. Till September 2020, around four Health workers who were posted at FI, became COVID positive. Stigma and loneliness due to lack of family support can cause mental stress and can cripple the psychological condition of the patient.

Opportunity Analysis

Patients in FI can be monitored regularly and if asymptomatic patients become symptomatic then attention and proper care or referral is provided immediately to avoid complication. These facilities also provide an opportunity for Isolation for migrant workers and travelers, thus limiting interstate spread of infection.

Threat Analysis

This strategy poses the threat of increasing human resource constraints and financial load on the health system. Till September 2020, more than 2600 patients were under FI, and staff of 40 personnel was deployed at the facility.

Effectiveness of the HI and FI Strategy

HRQoL outcomes were assessed using the EQ-5D-5L tool which consists of five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Overall health status was also recorded on a visual analog scale (EQ-VAS) from 0 (worst imaginable health state) to 100 (best imaginable health state). These health states were mapped to an index value (representing a quality-

adjusted life days-QALD weight). The QALD weights range between 1 (full health) and 0 (dead).¹¹

A total of 120 respondents were interviewed out of which 60 (females = 25, males = 35) were from home isolation and 60 (females = 23, males = 37) were from facility isolation. Mean age of participant from home isolation was 32.9 yrs (SD±7.8) and from the facility Isolation was 30.3 yrs (SD±9). Most of them (75%) were employed full-time.

The respondents from home isolation obtained a mean EQ-5D index score of 0.90 (SD: 0.02) and a mean VAS score of 85 (SD: ± 15.4) whereas respondents from facility isolation obtained a mean EQ-5D index score of 0.80 (SD: ±0.02) and a mean VAS score of 78.5 (SD: 14.5).

In home isolation, only 43% indicated that they were slightly anxious/depressed and none of them reported having a moderate or higher level of anxiety/depression, whereas in the facility isolation 87% reported having a slightly and moderate level of anxiety/depression.

Similarly, in home isolation none of the participants had difficulty in performing their usual activities, whereas in facility isolation 83% reported having moderate and severe difficulty in performing their usual activities.

A significant difference ($p \leq 0.05$) was seen in home isolation and facility isolation for EQ5D5L score, VAS score, performing usual activities, and anxiety/depression.

Tables 1 and 2 show comparison of various parameters for in home isolation and facility isolation.

Cost Analysis

For facility isolation the Rajasthan government has set a daily limit of Rs 2440 (33.02 US \$) to be spent on each person in the state-run Covid-19 Isolation centers, according to an order of the disaster management department to district administrations. According to the order, Rs 600 (8.12 US \$) is to be spent on food and beverages.¹³ This includes Rs 100 (1.35 US \$) on breakfast, Rs 180

Table 2 Mean Score Comparison

| | Home Isolation | Facility Isolation | p-value (t-test) |
|--------------------|----------------|--------------------|------------------|
| EQ5D 5L Score | 0.90 | 0.80 | 0.00001 |
| VAS Score | 85 | 78.5 | 0.0027 |
| Mobility | 1 | 1 | 0.078 |
| Self Care | 1 | 1 | 0.078 |
| Usual activities | 1 | 3 | 0.00001 |
| Pain/Discomfort | 1 | 1 | 0.078 |
| Anxiety/Depression | 1 | 2 | 0.00001 |

(2.44 US \$) each on lunch and dinner, Rs 80 (1.08 US \$) on water and Rs 60 (0.81 US \$) on tea and snacks. The expenditure on linen and laundry is capped at Rs 60 (0.81 US \$).¹³ The expenditure also includes Rs 500 (6.77 US \$) on food for staff deputed at the Isolation centers and Rs 600 (8.12 US \$) for personal protective equipment (PPE) kit for health care workers. A sum of Rs 550 (7.44 US \$) is to be spent on cleaning and disinfection.¹³ The break-up includes Rs 50 (0.68 US \$) for cleaner, Rs 50 (0.68 US \$) for ward boy, Rs 70 for sanitizer (0.95 US \$), Rs 300 (4.06 US \$) for N-95 mask, Rs 50 (0.68 US \$) for triple-layer mask and Rs 30 (0.41 US \$) for hypochlorite solution. An amount of Rs 100 (1.35 US \$) has been earmarked for spraying machine and Rs 30 (0.41 US \$) for a guard.¹³

For calculating the cost of home isolation reference of Ministry of Statistics and Programme Implementation (MoSPI) was considered.¹⁴ According to the MoSPI report, consumer spending per capita was Rs. 77,085 (1043.05 US \$) in 2017–18.¹⁵ The largest spending category was groceries, representing Rs. 21,491 (290.80 US \$) or 28% of total spend. Housing & utilities came in second with Rs. 13,293 (179.87 US \$) (17%) and transportation ranked third at Rs. 12,333 (166.88 US \$) (16%).¹⁵ Fully discretionary spending, including alcohol, tobacco and narcotics, restaurants and hotels and recreation and culture, comprised 5% of the average Indian's budget.¹⁵

For this study, we considered spending on groceries and housing and utilities as per the MoSPI report for estimating home isolation expenditure. Additionally, for comparison purposes we considered Rs 70 (0.95 US \$) for sanitizer, Rs 300 (4.06 US \$) for N-95 mask, Rs 50 (0.68 US \$) for triple-layer mask and Rs 30 (0.41 US \$) for hypochlorite solution as per expenditure of facility isolation.¹³

So, after calculating expenditure per capita per day and adjusting for inflation in price for the year 2020, the cost estimated for home isolation is Rs 549 (7.43 US \$) per person.

Table 1 Mean Score of EQ-5d-5L Dimensions

| | Home Isolation (Mean Score) | | Facility Isolation (Mean Score) | |
|--------------------|-----------------------------|--------|---------------------------------|--------|
| | Male | Female | Male | Female |
| Mobility | 1 | 1 | 1 | 1 |
| Self Care | 1 | 1 | 1 | 1 |
| Usual activities | 1 | 1 | 3 | 3 |
| Pain/Discomfort | 1 | 1 | 1 | 1 |
| Anxiety/Depression | 2 | 1 | 2 | 3 |

Discussion

COVID 19 is a novel pandemic that has spread rapidly, overwhelming the health care system and exerting devastating effects on public health and economies.¹⁶ During pandemics, the protocol for the management of any disease requires optimum utilization of health care infrastructure. Various isolation strategies are being adopted considering the national and regional context.¹⁷ One of the possible strategies to prevent straining of the health system and infrastructure is to hospitalize only moderately or severely ill patients. The mild and asymptomatic patient should be isolated at home. It is obvious that these adopted strategies which mitigate the risk of exerting the health system should not compromise clinical management, continuous monitoring, and quality of life of the patient. The results of this study provided a comprehensive comparative overview of two different strategies which are being implemented by the Jodhpur administration to control COVID 19 and we found that there was a significant difference in the quality of life, and cost-effectiveness in Home Isolation vs Facility Isolation, for addressing mildly symptomatic or asymptomatic patients.

HI strategy definitely helps to cope up with a surge of COVID 19 cases in developing countries like India with a deficit in healthcare infrastructure and funding. A survey in Telangana during August–September 2020 revealed that 94% of lab-confirmed COVID-19 patients who reported having mild disease underwent treatment in home isolation recovered well and only less than 6% required hospitalization.¹⁸ However, implementing this strategy has few real-world challenges. Taking the Jodhpur population into consideration, a large section is economically deprived and lives in cramped homes and does not have the space to exercise this option.

Isolation is a stressful experience and can have a significant impact on the quality of life of the isolated individual.¹⁹ Therefore, in this study, we tried to compare the HRQoL of patients kept under HI and FI. Patients in HI reported better quality of life and significant difference ($p \leq 0.05$) was observed among home isolation and facility isolation for EQ5D5L score, VAS score, performing usual activities and anxiety/depression. A study conducted by Sharma et al in Canada to assess the impact of isolation precautions on patient's Health-related quality of life illustrated that Isolation definitely has a negative impact on quality of life and may be associated with higher rates of anxiety and depression. Though isolation strategies have

their implementation constraints and they hamper the quality of life to a varied extent, but we also need to consider the benefits of these strategies in terms of controlling and limiting transmission of the diseases. Various studies including a study on “Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts”, published by Hellewell et al have utilized modeling process to provide evidence about the effectiveness of Isolation strategies in controlling disease transmission.²⁰

Additionally, this study compared the unit cost of care in the facility and home isolation. Due to data constraints, other healthcare cost perspectives associated with isolation such as societal perspectives were not examined in this study. In context to Jodhpur, the unit cost of home isolation is relatively low as compared to facility isolation. Though HI seems advantageous over FI in terms of HRQoL and unit cost of health care, both strategies are context-specific strategies having their own trade-offs. Combinations of both strategies seem appropriate for reducing infection transmission while taking into account limited resources and capacity to deal with the pandemic. According to a policy brief published by Development Research Group, World Bank, developing countries visage different trade-offs than developed countries because of their limited resources and capacity to deal with large unprecedented events.²¹ Therefore, public health policies should be tailored accordingly to the reality of developing countries. In this novel pandemic when governments of developing countries are facing difficulty to make choices on the best approach to contain the spread of the disease, Jodhpur administration in midst of uncertainty have adopted a reasonably appropriate strategy of HI and FI in concordance with effective testing, tracing, and tracking for controlling COVID 19.

Conclusion

This document provided a comprehensive analysis of HI and FI containment strategies using a comparative perspective. SWOT, HRQoL and Unit Cost analysis of both strategies were performed to generate evidence which can be used to guide policy decisions. Though HI seems advantageous in terms of a better quality of life and cost-saving over FI, both the strategies are context-specific strategies having their own trade-offs.

Ethical Approval

Approval for this study was obtained from Institution Ethical Committee of All India Institute of Medical

Sciences, Jodhpur, Rajasthan. [Reference No: AIIMS/IEC/2020-21/2049].

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Disclosure

The authors report no conflicts of interest in this work.

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