Review Article

# *Impact of COVID-19 on community health: A systematic review of a population of 82 million*

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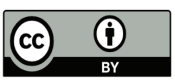
Keywords: COVID-19, pandemic, quarantine, hand hygiene, community health, PPE





Abstract

The novel coronavirus disease 2019 (COVID-19) outbreak, caused by the pathogenic severe acute respiratory syndrome-2 (SARS-CoV-2) virus, is exponentially spreading across the globe. As there is paucity of published literature, the influence of COVID-19 on community health remains unclear. Therefore, we aimed to conduct a systematic review of the literature on the impact of COVID-19 on community health. The current systematic review was performed utilizing electronic databases, i.e., PubMed, MEDLINE, and EMBASE. We searched for the keywords "COVID-19 AND "community health" between January 1, 2020, until May 10, 2020. Although, limited evidence is available regarding quarantine to prevent COVID-19, most studies considered quarantine as an essential public health measure to minimize rate of infection and mortality. Under these circumstances, people should focus on maintaining personal hygiene, proper nutrition, and extreme social distancing to reduce the risk of COVID-19. Besides, that there is a need to provide professional psychological support to reduce mental ill-health. We have highlighted two different public health approaches in South Asian countries, namely Nepal and India.

## Introduction

The recent pandemic of novel coronavirus disease (COVID-19) is a serious public health emergency due to the high rate of infectivity and mortality affecting all ages and both genders. There are over 3.5 million infections, with over 256,000 infection-related deaths worldwide.[1] Populations at risk of COVID-19 include pregnant women, the elderly, and people (especially adults) with co-morbidities (e.g., cancer, lung disease, immune-suppressed, obesity). The SARS-CoV-2 spreads very quickly between individuals having close contact or through respiratory droplets of infected individuals. The majority of the infected individuals suffer mild, flu-like symptoms, but few develop severe illness that may even lead to death. There are currently no effective vaccines or approved treatments for COVID-19; hence public health measures are key in reducing the spread of infection. As there is limited published data, the impact of COVID-19 on community health is unclear. [1-30] Therefore, we have conducted a systematic review of the contemporary literature to explore this important evidence.

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## Methodology

This systematic review was conducted and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement. We searched for the keywords "COVID-19" AND "community health" in electronic databases, i.e., PubMed, MEDLINE and EMBASE. Due to the rapid onset of COVID-19 pandemic, there is scarcity of literature specifically on community health, and therefore all articles under COVID-19 were considered. Search terms used were variants representing coronavirus such as "2019-nCoV"; "2020-nCov"; "2019-20 coronavirus*"; "2019-2020 coronavirus*"; AND "community health" in the title or abstract.

### Inclusion/exclusion criteria

All research articles published in English published during the period between January 1, to May 10, 2020, describing quarantine, hand hygiene, and community health of COVID-19 were included. Besides, electronic databases of specific institutional websites and bibliography of retrieved articles were searched for relevant articles.

### Data extraction

We have initially screened the titles of all the studies yielded in the systematic search and of out these relevant articles were selected to review the abstracts and full texts. Three authors [BS, MA, AM] independently appraised the retrieved articles. Extracted data included authors, the origin of studies, study setting and period, sample size, age/gender distribution, intervention, and outcome measure. The included studies were either based on nationally representative data or single or multi-center studies.

The methodological quality of studies was assessed using the five STROBE criteria: study design, setting, intervention, outcome measure, and study size. Descriptive statistics (median with interquartile range (IQR)) were used to summarize information estimated from individual studies. Data analyses were performed using R 3.5.1 software.

## Results:

The search generated 3,554 articles; of which 3,102 duplicates and review articles were excluded; relevant titles and/or abstracts underwent a detailed evaluation, and further 441 articles were eliminated from the analysis leaving finally 11 original studies that met the inclusion criteria (Figure 1 & Table 1).

Figure 1: Flow diagram of study selection process for systematic review.

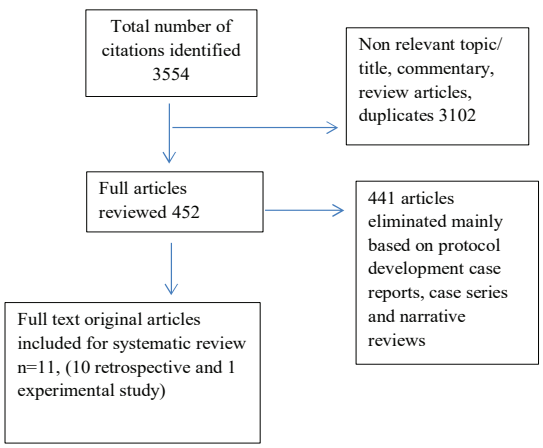


Table 1: Summary and quality assessment of eligible studies for the systematic review

| Author & year | Country | Study duration | Study design | Sample size | Age/ gender | Interventions | Outcome | STROBE |
|---|---|---|---|---|---|---|---|---|
| Cao et al, 2020 [21] | China | 23 January 2020 - 24 February 2020 | Modeling study | 59.17 million | ND | Combination of prevention and control measures; Quarantine | If, 40% fewer quarantined (e.g. less strict follow-ups of contacts), peak number would increase twofold compared to full quarantine in place. | COMPLETE |
| Choi et al, 2020 [22] | South Korea | 20 January 2020 -4 March 2020 | Modeling study | ND | ND | Package of epidemic prevention measures in South Korea (e.g. isolation, quarantine, social distancing) | Reducing transmission rate by 90% or 99% COVID-19 cases; only 0.05% or 0.04% of 5 million predicted for South Korea without any measures | COMPLETE |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Fang et al, 2020 [23] | China | ND | Modeling study | 1 million | ND | Spontaneous household quarantine; strict exit screening; online teaching; cancellation of mass gatherings | Implementing combination of containment measures reduced $R_0$ from 2.9 to 2.3 starting at 2 weeks after implementation. | COMPLETE |
| Ferguson et al, 2020 [24] | United Kingdom | ND | Modeling study | ND | ND | Case isolation at home; voluntary household quarantine | Estimated for 3 months, case isolation and household quarantine would decrease deaths in the UK by 31%–34%. | COMPLETE |
| Geng et al, 2020 [25] | China | Population of Wuhan at the end of 2018 | Modeling study | 8.8 million | ND | Community quarantine; school closure | Quarantine/ school closure reduced peak of transmissions by 45.7% and 29.9% | COMPLETE |
| Rocklov et al, 2020 [26] | Diamond Princess cruise ship | 21 January 2020 – 20 February 2020 | Modeling study | 3700 | ND | Isolation: removal of cases from ship Quarantine: people stay in cabins apart from 1 hr/day | Isolation & quarantine prevented (estimated) 2307 (67%) cases and lowered $R_0$ to 1.78 on ship | COMPLETE |
| Tang et al, 2020 [27] | China | 10 January 2020 – 22 January 2020 | Modeling study | 11.08 million | ND | Isolation; Quarantine; travel restriction | Reduced contact by 50% decrease cases (estimated) by 44%; reduced contact by 90% lead to 65% reduction. | COMPLETE |
| Yue et al, 2020 [28] | China | ND | Modeling study | ND | ND | Different extents of combined control measures | Worsening of epidemic's severity, if control measures relax. Strict control measures in place will control cases. | COMPLETE |
| Wu et al, 2020 [29] | China | ND | Modeling study | 1.5 million | ND | Combination and different intensity of ceasing public transport; citizens stay at home; isolation of confirmed and quarantine suspected patients | Stronger control measures are more effective. By reducing the contact rate and infection efficiency by >50% they predicted 3088 COVID-19 cases within 3 months in Wuhan. By reducing it only by < 45% they predicted 4719 cases. | COMPLETE |
| Zhao 2020 et al [30] | China | 20 January-21 February 2020 | Modeling study | 187,009 | ND | Combination of control and prevention measures (quarantine) | With prevention and control measures (e.g. isolation, quarantine, travel restrictions) cases could reduce and the duration could be shortened | COMPLETE |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ma et al, 2020 [31] | China | - | Experimental study | - | - | ***Treatment*** (1.00% soap powder, 0.05% active chlorine, or 0.25% active chlorine from sodium hypochlorite) vs ***Control*** (no wiping) repeated 3 times. ***Treatment*** (N95 masks, medical masks, and homemade masks) vs ***Control*** (polyester cloth) | Instant hand wiping using a wet towel soaked in water containing 1.00% soap powder, 0.05% active chlorine, or 0.25% active chlorine from sodium hypochlorite removed 98.36%, 96.62%, and 99.98% of virus from hands, respectively.<br><br>N95 masks, medical, homemade masks made of four-layer kitchen paper and one-layer cloth could block 99.98%, 97.14%, and 95.15% of virus in aerosols. | COMPLETE |

## Characteristics of the studies

### Population, settings & study design

Of the included studies, 10 were modeling studies based on data from China, South Korea, UK (United Kingdom), and a cruise ship.[21-30] There are no observational studies on quarantine of COVID-19. Median study duration was 1 with IQR (0.5-1.5). The 4 modelling studies from China, UK, and the cruise ship have stressed the isolation of confirmed COVID-19 cases and highlighted the effectiveness of quarantine of individuals who were in close contact with the positive case.[21,24,26,27] One of the study have utilized a modified individual-based model; the remaining three have used a susceptible–exposed–infected–recovered (SEIR) cohort model.[21,24,26,27] One study combined case isolation and voluntary quarantine.[24] Ten studies were retrospective, and one was experimental. Seven studies reported the sample size which ranges from 3700 to 59.17 million. [21,23,25,26,27,29,30]

The outcome measures included: quarantine; case isolation; voluntary quarantine; social distancing; physical personal protection measures (such as handwashing with soap, water, ash, soil gel); towels soaked in chemicals; personal masks (N95, medical or homemade masks), community engagement; dealing with misinformation (fake news); and strategic planning.

## Discussion:

To the best of our knowledge, the evidence based on the impact of COVID-19 on community health in this systematic review is limited because of the paucity of relevant studies. The current review has focused on disease transmission, hand hygiene, mortality reduction, and use of resource for quarantine. Very low-level evidence suggest that early implementation of the quarantine measures results in lesser disease transmission and mortality and greater cost savings as it reduces the need to quarantine travelers from abroad. But, these observations are based on earlier SARS (severe acute respiratory syndrome) outbreak which may not be completely generalizable to situation of COVID-19. Evidence suggest that the combination of quarantine with social distancing, travel restrictions, and school closings will reduce the COVID-19 transmissions than individual measures which is similar to SARS and MERS (Middle East respiratory syndrome). The prolonged extension of social distancing and other prevention and control measures may have adverse social and economic effects community health. So, the decision-makers must continuously assess the impact of the outbreak against the implemented public health measures. Generally, it is difficult to identify and isolate all infected cases as some remains unidentified due to asymptomatic infections, so early tracing of contacts of cases under quarantine may considerably reduce the disease transmission. Earlier pooled case-control studies on SARS infection have demonstrated that low-cost preventive measures for transmission such as isolation, face mask and general hygiene are effective to contain respiratory virus epidemics. Similarly, there is lesser evidence of the superiority and effectiveness of the N95 respirator in comparison to simple surgical masks to prevent infection.

### Update of community health status and preventive measures

The incubation period of COVID19 ranges from 2-14 days, and asymptomatic infected individuals can transmit the virus during this period. Therefore, community awareness for infection prevention, especially for vulnerable population is of prime concern. People at risk should avoid public transport, crowded places, contact with sick individuals, and should maintain appropriate social distancing and high personal hygiene standards.

Notably, urban populations had increased risk of COVID-19 outbreak due to denser populations, which possess a challenge to maintain social distancing. In addition, disparities in health-care services have negative consequences on the well-being of those living mainly in rural areas with generally poorer hygiene practices and lower literacy. Therefore, community participation is crucial for the collective response to prevent COVID-19, with strict compliance of lock-down, until proper steps that need to be adopted to ease restrictions are in place and, importantly, through voluntary community support.[2]

The coordinated inter-agency efforts as partners in the Risk Communication and Community Engagement (RCCE) Cluster is

essential to work strategically with the governments to address the critical demand for accurate information on COVID-19 in society.[3] There is a growing urgency for reliable information when the number of positive cases is increasing, and the implementation of a national lock-down makes the situation vulnerable for 'infodemic' of misinformation and rumors (so-called 'fake news') amongst the population. Therefore, a holistic RCCE strategy needs to develop a participatory community-based approach to provide accurate, timely, and lifesaving information to the masses. This needs proactive efforts to solicit and respond to feedback related to misconceptions, rumour, and misinformation, particularly concerning vulnerable groups. The RCCE should establish community networks /influencers and channels alongside the technical capacity building of local, provincial, and central government, and this approach could also help in shaping the provision of better care.

## Importance of community participation

Community participation in pandemic response, as identified in several international health guidelines, should incorporate insights from diverse communities as the central part of the co-production of health.[3,4] Therefore, health professionals should work along with communities to develop plans for evaluation of appropriate health promotion and health-care services.[5] Unfortunately, pandemic responses are general instructions from the governments towards individuals to follow, which involves minimal community inputs.

Vulnerable and marginalized communities can provide inputs to collective responses that address the circulating rumors, stigma, and structural barriers, which lead to low compliance with public health interventions. Lockdowns may increase the rate of domestic violence, abortion, unsafe childbirth and lower access to contraception.[6]

Previous experiences of HIV (Human Immunodeficiency Virus) suggest that better uptake of HIV testing and counselling, advocating for cheaper drugs, access to treatment, and minimizing social stigma are effective strategies for responding to an epidemic.[7-9] Experience with the Ebola virus disease in West Africa demonstrated that community engagement was crucial, especially in tracking and addressing rumors.[10] Likewise, community engagement in response to the COVID-19 pandemic in establishing a sustainable response.

## Evidence-based physical interventions

Simple and low-cost structured public health intervention programmes, which include instruction and education delivered together, always have a major role to play in minimizing the epidemic of respiratory infection. A Cochrane review provides essential insights for the effectiveness of the hygiene (frequent handwashing), preventive measures (face masks, gowns and gloves) and isolation of suspected cases.[11] It was found that vaccination or use of antiviral drugs might be inadequate to limit the disease spread. Cluster-randomized trials of high quality indicate that hygienic measures were most effective in the prevention of the disease in younger children.[12] Notably, younger children are less likely to maintain proper hygiene, more socially active, and are more susceptible to communicable diseases which can be easily transmitted to the household.[12,13] Another systematic review has assessed the benefits and harms of hand washing with ash in comparison to soap for reducing the spread of viral and bacterial infections.[14] Cleaning hands in the absence of soap, with other materials such as ash was also found to be effective in removing or inactivating the infectious agents. Unfortunately, skin could be damaged with the chemicals present in the ash. Hence other studies remain inconclusive about effectiveness of hand cleaning with ash in comparison to soap, soil, mud, water to reduce the spread of infections.[15-18] UNICEF suggests using ash in the absence of soap to prevent the spread of COVID-19.[19]

These preventive measures are of great importance in the current situation as there is no effective treatment or vaccine for COVID-19, and therefore other ways for controlling the spread of the virus remain central.[20] The World Health Organization (WHO) recommends to quarantine i.e., separation of healthy individuals who had contact with a contagious disease from other healthy individuals. Other recommendations are isolation (individuals with COVID-19 symptoms) and social distancing.

Recently, several studies have been published on public health measures to control COVID-19, focusing quarantine alone or together with other measures can reduce mortality, incident cases, and transmission.[20] Although, limited evidence is available regarding quarantine to prevent COVID-19, most studies considered quarantine as an essential public health measure to minimize rate of infection and mortality. [21-30]

Another concern is wearing face masks by healthy individuals in the community to prevent COVID-19 infection.[32] The US Centers for Disease Control and Prevention (CDC) and countries like Canada and South Korea recommend the wearing of cloth masks in public.[33,34] Howevver, the major concern is the shortage of face masks, if everybody starts wearing them particularly in developing countries. So, if supplies are limited medical masks should be judiciously used and conserved for frontline healthcare professionals.

## Establishing community participation

Governments must set up a specific community engagement taskforces to integrate the response across health and social care and coordinate links with other sectors such as health policy and community education.[35-38]

To develop constructive co-production for COVID-19 emergency responses the key recommendations include: (a) financial investment for dedicated staff and facilities to bring the public and policymakers together as well as investment for long-term preparedness; (b) work with community groups to develop expert networking and capacity building to mobilize communities as stakeholders; (c) focus on diversity to acquire a broader range of knowledge, experiences, and involvement of the most marginalized groups; (d) be responsive and transparent to the concerns of community members, and have collaborations to assess outcomes based on diverse groups and strive for improvement. [2]

Personals working to address COVID-19 in the health and social care sectors should identify the existing community groups and networks to build co-production. Policymakers should ensure to focus on income guarantees for the self-employed, implement road closures for safer walking, and use of abortion medication at home.[39-41] Community participation may reduce immediate damage from the COVID-19 pandemic, so institutional cultures that support co-production must be implemented in health and political systems.[42]

A model for community health workers from Brazil suggests that one-to-two weeks of the elementary training and public health surveillance programme on COVID-19 may cover basic skills and knowledge, if especially combined with ongoing training and mentoring by experts.[43-45] Moreover, online accredited courses are available for community health workers from dedicated academic institutions for the implementation of COVID-19 emergency response.

## Nepal

Until May 6, 2020, Nepal reported a total of 99 confirmed cases of COVID-19, of which 22 have been recovered, and none of them died.[46] The SARS-CoV-2 testing is primarily performed at the Nepal Public Health Laboratory in Kathmandu, and most of the positive cases are managed at the Sukraraj Tropical and Infectious Disease Hospital. Initially, Nepal failed to capture the significance of this global problem.[47, 48] However, with the upsurge in the number of cases, Nepal is increasing its effort to combat COVID-19 through international travel restrictions, banning of public gathering, border closure, and finally, a long country-wide lock-down.[47] Nepal is trying to increase the number of isolation and quarantine facilities, essential personal protective equipment, along with rapid diagnostic tests and COVID-19 confirmative tests.[46]

Nepal implemented social-distancing in the name of a complete lock-down. Disruption in mobility, disturbed socialization alongside confusion, rising fear, uncertainty, and economic constraints has been frustration and panic in its population. This was expressed in different forms of violating government measures against COVID-19. Showing exactly why it is essential to create an environment in which the disease and its impact can be openly discussed.

Social distancing may increase mental ill-health; therefore, the WHO has advised that the public fears and anxiety should not be ignored but be addressed at an individual, community, and government level.[49] However, to date, the struggle to control the spread of COVID-19 combined with a lack of community engagement has overshadowed the psychological impacts of the pandemic. Some have argued that the recent COVID-19 outbreak has challenged the social, economic, and political integrity of the country. The rise of social stigma and discrimination among COVID-19 patients has been seen to have a negative impact on its preventive strategies. The infection cannot be contained only by the scientific communities, health-care workforce and/or any political strategies. There is a need for community engagement alongside the togetherness of all concerned stakeholders.[47]

## India

Although the Government of India has taken ample measures of precaution, the country was not spared from the menace of the COVID-19 pandemic. As on 5 May 2020, India reported 46,433 confirmed cases and 1,568 deaths.[50] Late March 2020, India closed international commercial passenger flights and started a nationwide lock-down. This action was praised by WHO as "tough and timely" which helped to prepare for a possible surge in cases when the pandemic was forecasted to peak.[51] The preparedness across the Indian states differed based on their experience with previous different disease outbreaks. In India, the first case of COVID-19 was reported from Kerala on January 30, 2020, who was a student returned from Wuhan, China. Experience from Nipah virus in 2018 helped Kerala to contain the virus and maintain a meager mortality rate by implementing extensive testing, contact tracing, and community mobilization.

However, the nationwide lock-down had a severe impact on socially and economically vulnerable populations, especially among the migrants living on daily wages. This lock-down had the unintentional consequence that poor people without an income were now unable to survive in Indian cities, and for many, the only option is to go home, causing a mass migration of some 120 million people back to home birth villages to survive. Therefore, the economic costs associated with disease mitigation are of major concern. Of course, implementing public health strategies is difficult for poor people living in overcrowded and unhygienic accommodation. Also, misinformation about the disease led to stigma among the communities, which in turn led to violence, not only against specific communities, but even towards health professionals.[51] Another unintended consequence was the disruption of non-COVID health services; as many hospitals ceased non-essential care, postponed elective surgeries, and management of non-communicable diseases namely cancers, diabetes, cardiovascular and chronic kidney diseases. The latter are all important determinants of health condition of a country. The new normal of social distancing may affect physical activity and increase unhealthy eating habits, thus increasing the potential risk of non-communicable diseases.

## Limitations & strengths

To date, there is paucity of high quality studies on COVID-19 and community health, which make it impractical to conduct a meta-analysis. Moreover, quarantine brings many negative health and socio-economic impacts that has not been assessed in this review such as compromise of quality of life, domestic violence and unemployment. However, despite these limitations, to the best of our knowledge, this is the first systematic review on the impact of COVID-19 on community health which will be the basis for researcher to conduct evidence-based research on this topic in future.

## Conclusion

Quarantine, hand hygiene, and face masks can potentially minimize the infection rate and mortality in the community. Moreover, community participation is essential for a collective and socially acceptable response to prevent COVID-19. Engagement of local communities is essential to ensure compliance of lockdown until necessary measures are in place to ease the restrictions. In addition, there is a need for tailored national, regional, and community-based solutions for infection prevention taken into consideration the need of our diverse population.

## Future research

Public health interventions could be highly effective through structured programmes especially focusing on education and co-production of health involving community participation. There is an urgent need of more extensive community-based trials to identify the effective combinations of various preventive measures in the community and health-care settings utilizing the experience from other similar respiratory viruses. Non-randomized interventions studies are also warranted to evaluate the effectiveness of quarantine either alone or together with other proposed preventive measures to control COVID-19 and improve public health. Worldwide, several countries have implemented the infection prevention and control measures at varying intensity and resources. Therefore, mitigation of infection through preventive strategies will help the researchers to gain more evidence for preparedness and benchmarking for the future pandemics.

## Authors' contribution:

All authors have made substantial contributions to all of the following:

(1) the conception and design of the study, or acquisition of data, or analysis and interpretation of data,

(2) drafting the article or revising it critically for important intellectual content,

(3) final approval of the version to be submitted.

The authors have no financial issues to disclose.
This study did not receive any funding.

## Publication History:

Date of submission: May 5, 2020
Date of acceptance: May 22, 2020

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