Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

SERVICES PROVISION AND HYGIENE INTERVENTIONS BY CITY GOVERNMENT DURING COVID-19 WAVES: IMPACT ON BEHAVIORAL RESPONSE IN INFORMAL URBAN SETTLEMENTS

KALSOOM Sumra[1], Muhammad Mumtaz[2*], Nasra Dahir Mohamed[3] and Rashid Aftab[4]

[1] Assistant Professor, Assistant Professor, Center for Policy Studies, COMSATS University Islamabad, Pakistan, kalsoom.sumra@comsats.edu.pk
[2]Assistant Professor, (Correspondence Author), Department of Public Administration, Fatima Jinnah Women University Rawalpindi, Pakistan.
[3]MPhil Student at Riphah Institute of Public Policy, Riphah International University Islamabad, Pakistan, nasra4488@gmail.com
[4]Director, Riphah Institute of Public Policy, Riphah International University Islamabad, Pakistan
Rashid.aftab@riphah.edu.pk
*Corresponding Author: mumtaz86@hotmail.com

Abstract

COVID-19 has intensified role of city governments to provide basic services to control the spread. This pandemic has changed the extents of hygiene and behavioral response in informal urban settlements where limited access to basic services is key concern throughout four waves of COVID crisis. The study aim is to know how services provision and hygiene interventions affects the promotional campaigns and resilience compliance activities delivered by city government among communities living in informal urban settlements. A questionnaire-based survey is conducted from 490 households of ten informal urban settlements in Islamabad city, Pakistan. PLS-SEM regression is used to test the relationship of services provision and hygiene interventions provided by the city government stimulating hygiene consciousness subsequently leading to healthier behavioral responses. Specifically, this study identifies that water services provision and hygiene interventions are strongly linked with promotional campaigns and resilience compliance activities which in turn enhance hygiene consciousness pushing better behavioral response. This research commends that city government has to anticipate effective policies regarding informal urban settlements. The better policy issues have to be resolved like infrastructure, budget allocation, innovating positive hygiene messages and rapid response during outbreaks.

Keywords: water services, hygiene interventions, city government, COVID-19, risk communication

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

1. Introduction

COVID-19 has brought hygiene interventions to the forefront in reducing infection. The hygiene interventions are consisting of both hardware and software elements on the availability of water sources and awareness campaigns (UNICEF, 2020; Jamie, 2020). The best hygiene interventions include hand washing, use of hand sanitizers, and behavioral response (Larson, 2007; Aunger et al., 2016). The effective hand hygiene practices such as hand washing for 20 to 30 seconds are next to impossible especially in low- and middle-income countries due to lack of awareness water scarcity and poor sanitation systems (Jamie, 2020; A. Prüss-Ustün, et al. 2019). This indicates the grit of poverty directions on the people's capacity to maintain hand hygiene by use of water with soap or sanitizers for defense purposes from the virus. The poor system of sanitation and intensified population growth in these countries also have tremendously alarmed the availability of water, purchasing power to sanitizers, and maintaining social distancing in urban crisis (WHO, 2020; A. Prüss-Ustün, et al. 2019). These nations are well qualified for the international poverty line that is $1.90 per day (Will, 2020).

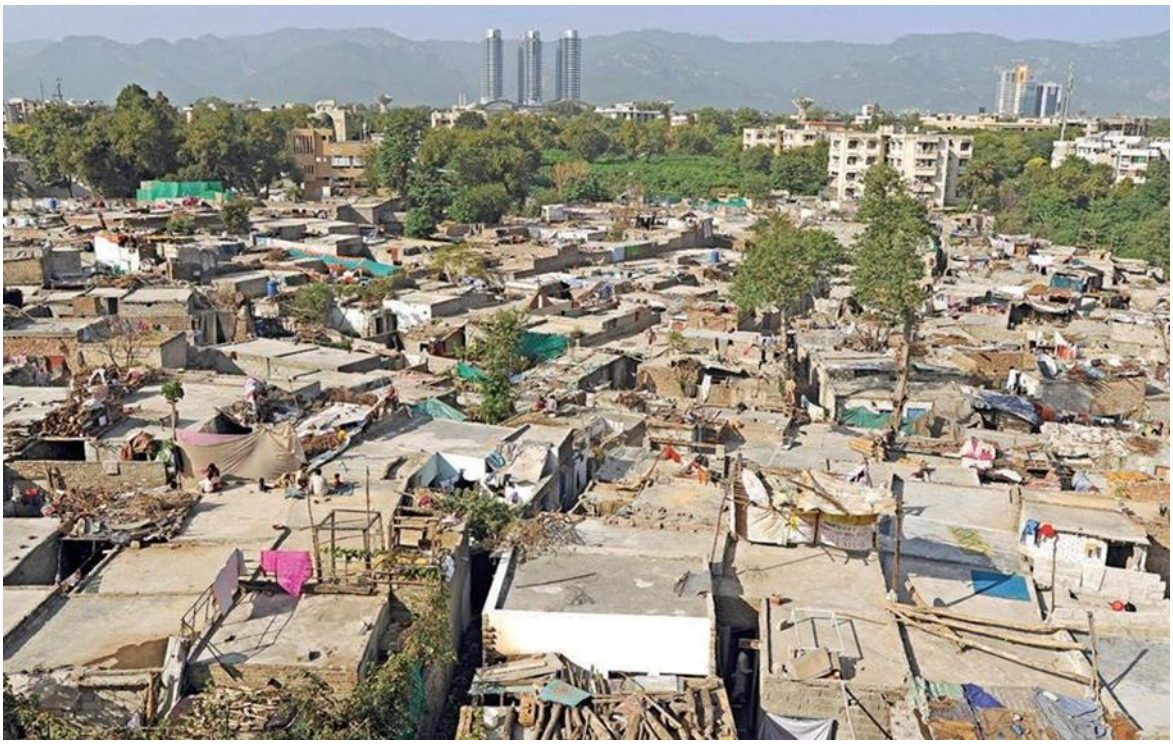
In urban cities of developing countries, COVID-19 has unraveled the prevailing disparities in informal urban settlement (Paul, 2020; UN-Habitat, 2020). Usually, informal settlements grow unsystematically, unplanned, overcrowded, and congested. Poor living conditions and infrequent basic public services in informal urban settlements vary not only from one city to another in a country but also from one settlement to another within the same city. Around one billion informal urban settlements are the most vulnerable people to COVID-19(UN-Habitat, 2020), with limited access to basic public services that restrict preventive measures in such dense localities (Annie, 2020).The basic preventive measures of handwashing practices and physical distancing in urban informal settlements are a critical factor to avoid the spread of COVID-19 (UN-Habitat, 2020; Edkarl& Alexandra, 2020). Handwashing hygiene interventions in response to emergencies are the most critical edifice to form hygiene behaviors in informal settlements (WHO, 2020; Paul, 2020; Heijnen& Greenland, 2015). The same is the case with Pakistan where significant problems of hygiene are due to lack of facilities. In the rapidly urbanizing flux, the vast population is flocking so rapidly to the biggest cities in Pakistan. Messy sprawl of informal settlements grows in peri-urban areas beyond planned boundaries in major cities. According to the United Nations (2015), 45.5% of the urban population is living in informal settlements in Pakistan; these informal settlements are also called 'katchiabbadis' or urban informal settlements. With the divested inequalities, COVID-19 is bringing enormous strain on poor urban informal settlements. These communities are at the most vulnerable edge due to scarce of basic services and income constraints in pandemic lockdown.

The water and sanitation facilities and hygiene promotion by city administration improve and influence handwashing behavior more generally. Improving behavior change is difficult with a short period but some hygiene interventions have a much stronger influence on handwashing practices during pandemics (Bavel et al., 2020; Lunn et al., 2020; UN-Habitat., 2020). The study aim is of two fold;first how services provision and hygiene interventions affects the promotional campaigns and resilience compliance activities delivered by city government leading towards hygiene consciousness and consequently impacting behavioral response among communities living in informal urban settlements,second, the study also examines the mediating impact of

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

promotional campaigns and resilience compliance. It is based on a rapid survey on water services provision and hygiene interventions impact on hygiene consciousness leading to behavioral response in informal urban settlements amid COVID-19.

Figure 1. Glimpse of one informal settlement/katchiabbadi in Islamabad



Source: Pakistan Today, APRIL 16, 2020. https://www.pakistantoday.com.pk/2020/04/16/75-families-left-homeless-capital-admin-tears-slum/

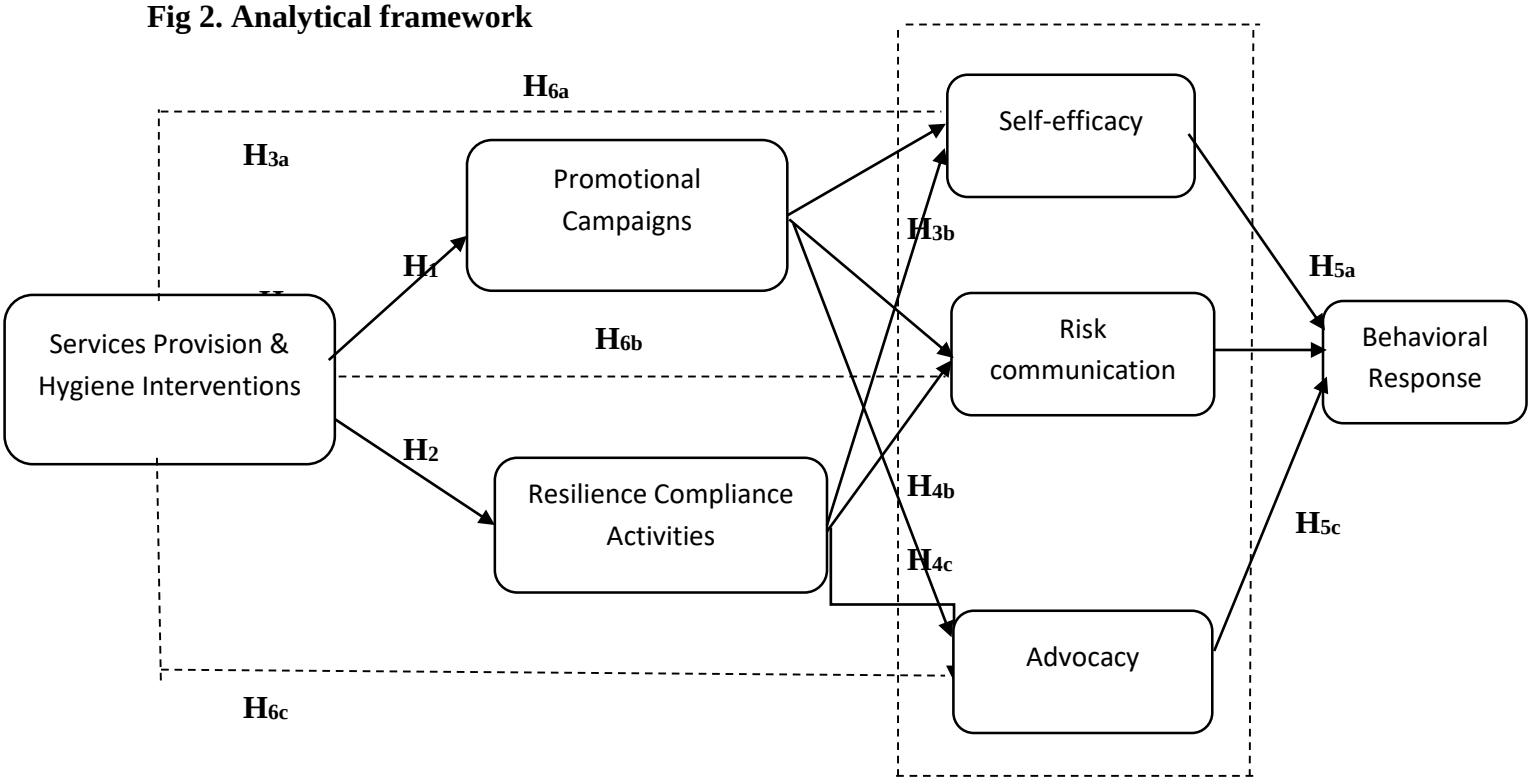
2. Theoretical framework and Hypothesis Development

There are several theories and approaches related to the impact of hygiene interventions and behavioral responses. These approaches are adoptable in changing hygiene behavior not only an effective practice but the provision of services and interventions reduces all severe acute respiratory syndrome (SARS) (WHO, 2020; Water Aid, 2020; UNICEF, 2020). Although the surge of COVID-19 calls for universal access to hygiene services, but how this should be achieved remains unclear. City governments and municipalities must regularize services and trace what extended hygiene consciousness in informal urban settlements (UN-Habitat, 2020; WHO,2020). Moreover, the techniques of hygiene interventions could be different, targeting handwashing behavior and everyday activities including persuasion of the communities to adopt hygiene behavior (Bavel at al., 2020. Analytical framework presented in figure 2, capture the effects of (1)

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

services provision and hygiene interventions on promotional campaigns and resilience compliance activities, and subsequently (2) hygiene promotional campaigns and resilience compliance activities impact on hygiene consciousness (self-efficacy, risk communication and advocacy) leading to examine the impact on behavioral response. Further, the mediating impact of promotional campaigns and resilience compliance activities are examined.

Fig 2. Analytical framework



Note*: Box covered by dash line is consisting of three hygiene consciousness aspects (self-efficacy, risk communication & advocacy).Arrows with dash lines indicate mediating relationships. SP & HI; Services Provision & Hygiene Interventions, PC: Promotional Campaigns, RCA: Resilience Compliance Activities, SE: Self Efficacy, RC: Risk Communication, ADV: Advocacy, BR: Behavioral Response.*

2.1. Impact of Services Provision and Hygiene Interventions on Promotional Campaigns

Governments are engaged in services provision and hygiene interventions through several forms such as creating hygiene consciousness, facilitating water, and hygiene facilities (Chen et al., 2020). During COVID-19 outbreak, there is an increase in government hygiene intervention for the public and mainly for vulnerable groups like informal urban settlements (UN Habitat, 2020; UNOCHA,2020a). Previously, city governments have given low priority to water and sanitation services in developing countries (WASH,2014; Curtis et al.,2009). The governments at all levels have become conscious and providing the necessary facilities for handwashing during COVID-19 (Chen et al., 2020; S. White et al., 2020).

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

Hygiene promotional campaigns has been implemented during the COVID-19 pandemic to promote hygiene consciousness, and to reduce the transmission of the virus within communities (Curtis et al.,2020; UNICEF,2020). Mobilizing local resources including the private sector leads to awareness of social distancing and promoting hygiene consciousness (WASH, 2020). Hygiene promotional campaigns have been used as an instrument to promote hygiene activities involving behavior response (Water Aid, 2020). Hence, there several forms of campaigns, such as ensuring hand washing with soaps and focusing on protective measurements, and knowledge improvement using various informative channels via social media and massaging (Tidwell et al., 2019; Bavel at al., 2020).

Service provision and hygiene interventions during the COVID-19 pandemic, the transmission of infectious can be prevented through improvement in regular services among marginalized communities (Jordan et al., 2020; World Bank, 2020; Washem, 2020). The prior research has identified the effectiveness of promotional campaigns for reducing the risk of respiratory diseases along with water provision (Bavel at al., 2020; Chen et al., 2020). It is thus proposed that services provision and hygiene interventions is positively related to promotional activities. This leads to

H_1:The more regular water services provision and hygiene interventions during COVID-19, the stronger the communities acknowledge the hygiene promotional activities raised by city government.

2.2. Impact of Services Provision and Hygiene Interventions on Resilience Compliance activities

Resilience compliance referes to adaptability of changing environment (Linkov, 2014; Nas, 2012). In the context of services provision and hygiene interventions, it indicates the way that government adopts in critical situations like the global outbreak of COVID-19. To implement and create a response for vulnerable people who live in informal urban settlements and to reduce the spread of the disease globally is necessary (Clark et al., 2020; WHO, 2020). Governments manage this crisis and emerge as the hubs to provide utility information and obligations to comply with safety that makes themsuch vibrant and appealing places for many to live (Russell et al.,2020; UNDP, 2020). Various governments responded differently, some of the countries managed an adequate and affordable supply of face masks, free sensitizers, and increased the health care facilities (Chen et al., 2020;UNOCHA, 2020a)

Evolving consequences of COVID-19 and promoting resilience compliance is having a positive impact on hygeine response, and this contribute to the further enrichment of integrated governance processes (UNOCHA,2020a). Governments response to COVID-19 in different ways is yet one of the main strategy which have been adopted by the various countries to manage resilience compliance (Angela, 2020; Shaw et al., 2020). Some countries made successful control of COVID-19 by doing early response and preparation of the crisis(Cheng et al., 2020). Providing technical coordination and utilities information on hygiene resilience compliance activities (Li et al., 2020).

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

For instance, city governments in Pakistan enhanced its response in alignment with water services and coordination among various services departments. It thus leads to propose:

***H*$_{2}$**:The more regular services provision and hygiene interventions during COVID-19, the stronger the communities recognize the resilience compliance activities enacted by the City Government.

2.3. Promotional Campaigns and Hygiene Consciousness

Self-efficacy is more related to knowledge as well as it describes hygiene awareness and transmission associated with poor hygiene (Khan et al. 2020; Rabbani et al.,2020). Self-efficacy refers to maintaining hygiene knowledge to achieve hygiene conscious (Al-Rifaai et al., 2018;WHO, 2020). Furthermore, building risk communication prevents and controls the spread of communicable diseases through social engagement and by selecting appropriate hygiene messages. Studies showed that risk communication and constant hygiene massaging related to infectious diseases and COVID-19 increases peoples understanding of hygiene consciousness and community engagement (Rabbani etal., 2020; WHO, 2020). Likewise, hygiene advocacy normally purposes to influence public policy, public opinion, and resource mobilization (UNICEF, 2020). Advocacy for hygiene includes hygiene facilities, hygiene promotional activities, and measuring people's access to handwashing facilities (WASH,2020).

Provisions for promotional campaigns and hygene facilities include providing community awareness and mobilize private-publicactors to endorse the promotion of hygiene messages (World Bank, 2020; Li et al., 2020). Awareness messages for handwashing campaigns change and promote hygiene consciousness, by using mass media campaigns for efficient community awareness during outbreaks (WHO, 2020; Tidwell et al., 2019;UNICEF,2020). Promotional campaigns increase the level of community knowledge regards to infectious diseases and it teaches how communities can prevent the spread of COVID-19 outbreak (Kucharski et al., 2020; WHO, 2020). Sanitation awareness among the community is the most important step towards maintaining a positive hygiene consciousness (Thanishka et al., 2020). Formally, it is hypothesized:

H$_{3a}$The effective promotional campaigns enacted by the government are linked with awareness of self-efficacy in hygiene consciousness among communities.
H$_{3b}$ The efficient promotional campaigns enacted by the government are linked with understanding risk communication in hygiene consciousness among communities.
H$_{3c}$ The effective promotional campaigns enacted by the government are linked with advocacy for hygiene consciousness among communities.

2.4. Resilience Compliance Activities and Hygiene Consciousness

Providing and managing hygiene facilities are required for the effective capacity of building resilience against pandemic(Tidwell et al., 2019) and to establish multi-sector, institutions, and proposals for policy improvement and the coordination of preventive policies against

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

communicable diseases like COVID-19(Clark et al., 2020). Policy tools offer specific prospects for governments to accelerate behavior change by providing efficient resilience compliance(Anser et al., 2020). After the outbreak of COVID-19 nations implement different policies and adopted a decisive campaign against COVID-19 by implementing immediate complete lock-down (Shaw et al., 2020; WHO, 2020). While in Pakistan government implement awareness campaigns by sending messages to the communities to increase the hygiene perception of the communities. Increasing community understanding, public awareness, and advocating effective hygiene policies can all enhance the level of community consciousness of COVID-19 (Zhang et al., 2020; WHO, 2020) Therefore, this research proposed:

H_{4a} The stronger resilience compliance activities backed by the government is linked with awareness of self-efficacy in hygiene consciousness among communities.
H_{4b} The stronger resilience compliance activities backed by the government are linked with awareness of risk communication in hygiene consciousness among communities
H_{4c} The stronger resilience compliance activities backed by the government are linked with awareness of advocacy in hygiene consciousness among communities

2.5. Impact of Hygiene Consciousness on Behavior Response

Behavioral response from the communities can be modified through government interventionsof water and sanitation facilitates (Jordan et al., 2020; Jamie, 2020; S. White, et al., 2020). Successful behavioral responses in informal urban settlements after hygiene consciousness can result in better hygiene practice (Water Aid, 2020; UNICEF, 2020; WASH, 2020). Established positive behavior response can enhance the frequency and develop a good practice of essential positive hygiene behaviors (Wilson et al., 2011). Mobilization of private, public, and civil society actors to act in response to COVID-19 outbreaks has taken place in several states (Jordan et al., 2020: UN-Habitat, 2020; Lunn et al., 2020; Anser et al. 2020; CAWST, 2020;WASH, 2020). Behavior response refers to a systemic approach of interacting and encouraging the widespread of safe hygiene practice during COVID-19 and communicable diseases(WHO,2020; Samuel et al., 2019; Martilda et al. 2016) Self-efficacy, risk-community, and advocacy actives can change the short-term hygiene behavior of the informal urban settlements. Therefore, this research proposed:

H_{5a} The higher awareness of self-efficacy has a positiveimpact on hygeine behavior response
H_{5b} The influential of risk communication has a positive effect on behavioral response
H_{5c} The stronger advocacy has positive positive behavioral response

2.6. Mediating effects of Promotional Campaigns and Resilience Compliance Activities on Hygiene Consciousness

Promotional campaigns influences services provision and hygiene interventions (Curtis et al.,2020; Chen et al., 2020). Self-efficacy at crucial times could be a requirement for behavior

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

change, although knowing alone does not necessarily change behavior. Knowledge means more explicitly, constant handwashing, and to prevent the spread of COVID-19 hand washing is one of the most important activities that can reduce the risk of this virus (Khan et al. 2020; Prem et al., 2020).Equally, risk communication campaigns have been made in urban informal settlements in several developing countries(Rabbani et al., 2020). Governments initiate a new policy to respond to the outbreak of COVID-19(Clark et al., 2020). Hence, in Pakistan people who live in informal urban settlements experience the same challenges for that reason. this proposes the following:

H_{6a} Service provision and hygiene interventions' efefct on awareness of self-efficacy is mediated by promotional campaigns and resilience compliance activities.
H_{6b} The relationship between service provision of hygiene intervention and influence of risk communication is mediated by promotional activities and resilience compliance.
H_{6c} The relationship between service provision of hygiene intervention and advocacy is mediated by promotional activities and resilience compliance.

3 Study Area

Informal settlements or katchiabbadis are a turn into unplanned sprawl of urbanization around the periphery areas of Islamabad the capital territory of Pakistan. Due to the localized nature of inequality in housing, as per Capital Development Authority (CDA) around 52 katchiabadis are in Islamabad and the inhabitants living in informal settlements exceeds more then 100,000 (Anwar, 2016). Most residents are laborers, domestic, sanitary workers, and daily wagers flocked form various parts of the country for earning in the city. The poor basic services and density are the crucial components in fighting against COVID-19. Hygiene interventions set by city governments are challenged in response to COVID-19 among these communities to sustain handwashing or sanitizer practice behavior. Handwashing or sanitizer practice is not the sole solution but behavioral change in response to hand hygiene activities is also needed to avoid from the spread of pandemic. Currently, there are 52 informal urban settlements in Islamabad where only ten of them are recognized by capital development authority (CDA)(Chen et al., 2020).The majority of informal urban settlements some of them are working as domistic workers while other are sanitory workers and subordinary staff for the goverment (Shahzada, 2015; Malik, 2020).

3.1Sampling and data collection

The analytical framework presented in figure 2 indicates the hypothesized relationships, first how services provision and hygiene interventions influence promotional campaigns and resilience compliance activities provided by city government leading towards hygiene consciousness. Second, it refers to examine the mediating role of promotional campaigns and resilience compliance activities on hygiene consciousness during COVID-19. Data is collected from households of informal urban settlements across 10 locations in Islamabad capital territory of Pakistan. The survey has been translated intothe local language for ease of households. The study is conducted in the10 recognized informal urban settlements/Katchiabbadi by city development authority (CDA) Islamabad. Before collecting the data, pre-test of responses was collected from 30 households andwith the help of community members, the survey questions were interpreted to

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

achieve clarity. After refining survey, the participants were informed in detail the purpose and assured the voluntary willingness. Random data collection took four months after semi-lockdown to complete opening June-September 2020 and final sample of 490households were retained for responses.

3.2 Measurement instrument

The study followed existing measurement scales from previous studies and items interpretation is modified according to the pre-test responses to fit in the current context. The profile of the households includesinformation about location, gender, and religion, and education status, occupation of the family head, housing capacity and water sources. The study measured services provision and hygiene interventions (SP&HI- five items), promotional campaigns (PC-five items) and resilience compliance activities (RCA- three items) using concepts that were taken from(Curtis, 2019; Tidwell et al., 2020). For hygiene consciousness,all three constructs (self-efficacy, risk communication & advocacy), were measured assuming ideasfrom(Zengana et al., 2020), with 12 items used to measure the constructs – self-efficacy (SE- four items), risk communication (RC-three items) and advocacy (ADV-five items). Behavioral response (BR) was measured with four items from (Zengana et al., 2020; UNICEF, 2020; UN-Habitat, 2020). The scales of all lebaled items with 1= strongly disagree and 7 = strongly agree.

3.3. Common method bias (CMB)

Instrument is also checked for common method baies (CBM) as respondents are from informal urban settlements but the locations are different (Podsakoff, 2012). A number of steps are taken to implement procedural remedies taking inspiration from Podsakoff (2003). Firstly, the survey was distributed and collected the data in various phases during pandemic from extreme intervals to very low; this gave chance to the respondents to eliminate agreement consistency bias. Secondly, the ideas of constructs and items are adopted from related studies studies of UN-Habitat, WASH, WHO, WSP (2020) etcduring pandemic. Thirdly, from post-hoc technique Harman single-factor test is applied to compare chi-square difference between single factor model and multifactor model that is measurement model of the study (Homberg et al., 2011). The result indicates single factor model (chi-square 3320.287, df = 403)is much poorer fit with all latent variables. It gives evidence that thepotential for common method bias is low.

4. Results

The household'ssample is relatively young 65.2% between the age of 20 and 40 years and 55% of the sample was females. About 48% of the sample is working in informal sector and rests were doing low scale jobs in public and private organizations. In terms of religion segregation, 53% of the respondent'sstate Christianity as religion.For the education status, 25% of the respondents attained secondary school education, 50% received primary education and rests were uneducated. Most of the respondents were from urban informal settlements situated in hub of the city and having houses consisting of two small rooms with little open space. All of the houses are having access to public supply water system being the recognized settlements from CDA.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

3.4.1. Partial least squares structural equation modeling (PLS-SEM)

For analyzesPLS-SEMis used. Using partial least squaresstructural equation modelling which is used to assess hypothesized relationships in analytical framework. PLS-SEM estimated parameters in complicated multivariate model (Joseph et al., 2014). SEM is applied through two approaches; covariance-based SEM and variance-based (Haier et al., 2014). The variance-based SEM is nonparametric technique that accommodate the complex modeland mediation test and this approach is not restricted to normality assumptions of data (Vinzi et al., 2010). PLS-SEM is more appropriate for this study. The study measures all scales and is applied to test the relations.

3.4.2. Model Measurement

Initially,assessments of the main constructs are assessed on construct validity and measurement reliability. Reliability is assessing thoroughly on the basis of composite reliability, internal reliability and factor loading (Haier et al., 2016) (Table 1). The items indicate that loading is 0.796 to 0.956, composite reliability is 0.924 to 0.973and internal consistency is 0.90 to 0.96 which are greater than the minimum requirement as proposed by Hair et al., (2014). The convergent validity is evaluated by average variance extracted (AVE) which is exceeded then the minimum t average variance extracted arehieger than 0.5. To establish the discriminant validity, the analysis is done comparing the squared root of AVE with correlation among constructs. It indicates AVE of the constructs higher than the squared coefficient confirming the discriminant validity (Henseler et al., 2015).

Table1
Measurement model (Factor loading, reliability, and validity Scale)

Constructive Items	**Composit relaibility**	**Avrage**	**Cronbach α**	**average variance extracted >Corrilation 2**	**Loadings**	**means**	**standard deviation**	**t-value**
Services Provision & Hygiene Interventions	0.958	0.835	0.950	0.835>0.622				
The city government has provided adequate water					0.925	0.925	0.010	90.324
Provision of water supply in my home is enough for my family supplied by the city government					0.919	0.919	0.010	77.003
Government make it the availability of soaps, hand sanitizers and face masks at affordable cost					0.891	0.890	0.013	50.243
City government make hygiene facilities at an affordable cost					0.892	0.8931	0.011	69.526
Handwashing facilities are adequate for my family because the city government					0.937	0.937	0.006	121.833
Promotional Activities	0.973	0.889	0.966	0.889>0.717				
I receive hygiene messages in the local language from the government					0.956	0.956	0.003	170.468

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

I receive constant hygiene messages on my mobile from the city government.					0.935	0.933	0.010	94.590
I buy hand sanitizers in local shops after the local government-supplied					0.934	0.933	0.007	101.905
The city government teaches us how to wash hands with soap and underwater for at least 20 seconds.					0.940	0.940	0.006	112.894
We receive encouraging hygiene awareness from the city government					0.943	0.943	0.005	129.885
Resilience compliance Activities	0.924	0.857	0.916	0.856?0.615				
I have been fined by the city government after I go out without a facemask					0.929	0.929	0.08	92.868
The government has ensuring wearing facemasks in public places					0.922	0.921	0.08	89.926
Whenever I am in public places government people check my temperature					0.925	0.922	0.011	85.921
Self-efficacy	0.959	0.831	0.949	0.831>0.613				
I know not to be caught in a public place and to cover my mouth during coughing by my hand or tissue.					0.918	0.918	0.011	71.177
I tell people to not touch their mouth, nose, and eyes, that would increase disease transmission					0.909	0.909	0.014	58.050
I know not to sneeze in a public place and to cover my mouth during coughing by my hand.					0.903	0.903	0.012	63.555
I advocate better hygiene in my area					0.895	0.895	0.015	53.445
I learn that poor hygiene leads to diseases a					0.928	0.928	0.08	97.768
Risk Communication	0.926	0.769	0.902	0.769>0.659				
I know the riskiness of COVID-19 for my health					0.921	0.921	0.009	97.424
I inform my neighbors of the dangerousness of COVID-19					0.906	0.904	0.010	76.304
I know the transmission methods of COVID-19					0.814	0.813	0.034	22.810
Advocacy	0.924	0.719	0.902	0.719>.0613				
I advocate better hygiene facilities					0.874	0.873	0.020	39.770
I have seen new water facilities provided by the government					0.881	0.880	0.016	49.522
We are receiving that CODIV-19 is a risk for health					0.796	0.793	0.036	20.938
I have met people who were advocating the hygiene of informal settlement					0.848	0.849	0.016	46.030
I endorse hygiene promotional campaigns					0.832	0.832	0.021	36.833
Behavior response	0.952	0.835	0.933	0.835?0.602				
I wash hand before eating food with my hands					0.922	0.922	0.010	94.153

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

I washed my hands when I come back from the shopping					0.916	0.915	0.013	62.148
I develop a new habit of wearing a mask whenever I am going out					0.930	0.929	0.009	81.770
I make it a habit to wash my hand in twenty seconds					0.883	0.883	0.020	39.814

Based on seven-point likert scale

3.4.3.Structural model

Predictive Accurancy and Relevence

Predictive accurancy is used in the model is measured by coefficient of determination (R^2) which indicates the amount of variance of the endogenous constructs in the structured model (Table 2). With regard to predictive accuracy, estimated $R^2$is classified into weak (0.5), moderate (0.50) or substantial (0.75). The estimate R^2shows that predictive accuracies of endogenous constrcuts are between moderate and substantial categories. The R^2 of promotional compaings (0.622), resilience complaince activities (0.518), self efficacy (0.524), risk communication (0.715), advocacy (0.358) and behavioral response (0.615) shows the predictive accuracies. Q^2 measures the predictive relelvance for endogenous constrcuts and Q^2 values establish the path model predictive relevance if it is larger than zero. The Q^2values for promotional compaings (0.241), resilience compliance activities (0.511), self efficacy (0.553), risk communication (0.444) and advocacy (0.546) show model predictivity for those dependent variables.

Path coeffeicints

The inner or structural model assess the estimated path coefficients to check the correlationamong exogenous and endogenous variables. On 95% interval confidence through bootstrapping with 5000 samples (Aguirre-Urreta & Ronkko, 2017). Results reveal that services provision and hygiene interventions has significant impact on promotional compains ($\beta = 0.788$) and on resilience compliance activities ($\beta = 0.719$) respectively. The results indicate that the effect of promotional compaings on hygiene consciousness are significant. Particulary, the effect of promotional compiangs on SE: ($\beta = 0.262$, $p < 0.05$), RC:($\beta = 0.392$, $p < 0.05$) and ADV: ($\beta = 0.256$, $p < 0.05$) are significant. The hypothesized relationships show that *H1, H2, H3$_a$, H3$_b$,* and *H3$_c$* are all supported.

Regarding the relationships between resilience compliance activities and hygiene consciousness, the results show resilience compliance activities effect on self-efficcacy ($\beta = 0.310$, $p < 0.05$), risk communication ($\beta = 0.428$, $p < 0.05$) and advocacy ($\beta = 0.265$, $p < 0.01$) are significant. It supports $H4_a$, $H4_b$ and$H4_c$. The direct relationship effect of hygiene consciousness componenets on behavioural response, the effect of self-efficacy and risk communication are significant ($\beta = 0.211$, $p < 0.05$ and $\beta = 0.658$, $p < 0.05$). Thus, $H5_a$ and$H5_b$ are supported. Whereas, the effect of advocacy is not significant ($\beta = -0.068$, $p > 0.05$), so H_{5c} is not supported.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

Table 2. Path coefficients

Hypotheses	Relationships	Path Coefficients	Mean	Standard Deviation	tvalues	pvalue	Testing
Hypothesis 1	SP&HI - > PC	0.788	0.788	0.022	32.829	0.000	(supported)
Hypothesis 2	SP&HI - > RCA	0.719	0.720	0.028	22.362	0.000	(supported)
Hypothesis 3a	PC - > SE	0.262	0.253	0.104	2.453	0.012	(supported)
Hypothesis 3b	PC - > RC	0.392	0.390	0.074	5.204	0.000	(supported)
Hypothesis 3c	PC - > ADV	0.256	0.251	0.105	2.405	0.016	(supported)
Hypothesis 4a	RCA - > SE	0.310	0.315	0.091	3.514	0.000	(supported)
Hypothesis 4b	RCA - > RC	0.428	0.429	0.069	6.091	0.000	(supported)
Hypothesis 4c	RCA - > ADV	0.265	0.271	0.093	2.807	0.003	(supported)
Hypothesis 5a	SE - > BR	0.211	0.214	0.087	2.397	0.014	(supported)
Hypothesis 5b	RC - > BR	0.658	0.657	0.059	10.848	0.000	(supported)
Hypothesis 5c	ADV - > BR	−0.068	−0.067	0.062	1.095	0.271	not supported

3.4.4. Mediation Testing

The structural model further is tested to know the mediation effects of promotional compaings and resilience complaince activities on hygiene consciousness (self-efficacy, risk communication & advocacy) in relation to services provision and hygiene interventions provided by city government. Multiple mediator model is applied to examine the mediation effects (Harrington et al., 2011). The two indirect effects show connection between services provision and hygiene interventions on hygiene consciousness through promotional compaigns and resilience compliance activities indicated in table 3-5.

(SP&HI → PC → SE) and (SP&HI → RCA → SE)

In analysisshown in part 1, first indirect effect is the indirect effect of services provision and hygiene interventionson self-efficacy throughpromotional compaigns labled as indirect effect 1(SP&HI →PC→ SE). This indirect effect is 0.568 which shows positive significance (indicated as a_1 b_1). The second mediation effect of services provision and hygiene interventions on self efficacy via resilience complaince activities islabeled as indirect effect 2 (SP&HI → RCA → SE). This indirect effect is not significant 0.079(indicated as a_2b_2). The total indirect effect is 0.647 the sum of all indirect effects (a_1 b_1 + a_2b_2). Without mediation, the direct effect (indicated c) of services provision and hygiene interventions on self-efficacy is 0.511. The direct effect is 0.207 when promotional campaigns and resilience compliance activities are included as mediators. It is obvious that the effect is reduced but still it is significant which puts PC and resilience compliance activities as complimentary mediators in relationship between SP&HI and self-efficacy. So hypothesis 6_a is supported.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

Table 3.
Part 1: RCA & PC mediate the impact of SP&HI on SE

					95% Confidence interval(Bootstrap)	
	paths	**effect**	**standard deviation**	**T value**	**low**	**high**
without moderators						
estimate	c	0.511	0.041	11.928	0.427	0.595
with moderators						
Indirect effect one	a1b1	0.568	0.082	6.781	0.403	0.732
Indirec effect two	a2b2	0.079	0.066	1.183	−0.051	0.213
total direct effect	c'	0.207	0.084	2.437	0.039	0.375
total indirect effect	a1b1 + a2b2	0.647	0.064	9.790	0.518	0.779
total effect	c'+a1b1 + a2b2	0.854	0.038	21.485	0.779	0.936
mediation (complementary)						

(SP&HI → PC → RC) and (SP&HI → RCA → RC)

In table 4, the same procedure is done for (SP&HI → PC → RC) and (SP&HI → RCA → RC) for mediation effects. It is significant which puts PC and resilience compliance activities as idrect mediators in relatinship between SP&HI and risk communication. So hypothesis 6_b is supported.

Table 4.
Part 2: PC and RCA mediate the impact of SP&HI on RC

					95% Confidence interval(Bootstrap)	
	paths	**effect**	**standard deviation**	**T value**	**low**	**high**
without moderators						
estimate	c	0.511	0.041	11.928	0.427	0.595
with moderators						
Indirect effect one	a1b1	0.737	0.042	16.712	0.650	0.824
Indirec effect two	a2b2	0.167	0.049	3.308	0.067	0.268
total direct effect	c'	0.066	0.056	1.165	−0.044	0.180
total indirect effect	a1b1 + a2b2	0.904	0.042	16.712	0.650	0.824
total effect	c'+a1b1 + a2b2	0.970	0.032	24.079	0.739	0.871
mediation (indirect only)						

(SP&HI → PC → ADV) and (SP&HI → RCA → ADV)

In table 5, the same procedure is done for (SP&HI → PC →ADV) and (SP&HI → RCA → ADV) for mediation effects. It is significant which puts PC and resilience compliance activities as indrect mediators in relatinship between SP&HI and hypothesis. So hypothesis 6c is supported.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

Table 5.
Part 3: PC and RCA mediate the impact of SP&HI on ADV

					95% Confidence interval(Bootstrap)	
	paths	**effect**	**standard deviation**	**T value**	**low**	**high**
without moderators						
estimate	c	0.511	0.041	11.928	0.427	0.595
with moderators						
Indirect effect one	a1b1	0.568	0.083	6.695	0.401	0.734
Indirec effect two	a2b2	0.067	0.068	0.982	−0.067	0.204
total direct effect	c'	0.114	0.076	1.486	−0.035	0.267
total indirect effect	a1b1 + a2b2	0.635	0.056	11.074	0.523	0.749
total effect	c'+a1b1 + a2b2	0.749	0.041	17.727	0.696	0.836
mediation (indirect only)						

5. Discussion

The results of this study show that water services provision and hygiene interventions from the city government have a strong connection with promotional campaigns and resilience compliance activities which increase the hygiene consciousness resulting in positive behavioral responses. This research used PLS-SEM regression to test the hypothesis. Nevertheless, findings are similar to (UNICEF, 2020; WHO,2020; Bavel et al., 2020) results. Yet, this study discovers that services independently cannot bring behavior response without hygiene promotional campaigns. Promotional campaigns were the target in informal urban settlements during the outbreak of COVID-19 to promote and improve hygiene practices to make behavior change. The services provision and hygiene interventions support hygiene promotional campaigns to be effective. Though in informal urban settlements, it is difficult to outreach all communities who live there. As for compliance activities, the services increased to cope with pandemic emergencies. The prior research has indicated that regular water and sanitation services enhance compliance practicality (WASH, 2020; World Bank, 2020; Wolf et al.,2018; Dreibelbis et al., 2013). Moreover, it explains how increased city government interventions with promotional campaigns can result in positive behavioral responces in terms of hygiene.

5.1. Policy Implications and Conclusion

To conclude with the main finding of this research. Water services and provisional and hygiene interventions from the city government with moderating role promotional campaigns and resilience compliance activities lead to a positive behavioral response. The data is collected from ten informal urban settlements in Islamabad which are registered by Islamabad Capital Territory(ICT). The study was used PLS-SEM regression to test the hypotheses. Since there is no direct relations ship between the SP&HI with consciousness(self-efficacy, risk communication,

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

and advocacy)the roles of mediators are very important, and only with promotional campaigns and resilience compliance, a positive hygiene behavioral response would be achieved.

Hence, there is a wide scope within existing literature that recommends several policy implications. Yet in this study, all developing and under-developing nations need to provide effective water services in informal urban settlements (F.R. Ashik, et al., 2020). According to UN-habitat (2020) over 1 billion population are living in these areas and urbanization in developing countries has involved the growth of informal settlements. Communities who live in informal urban settlements are living in a place which are overcrowded, undesigned, lack of infrastructure, unhygienic, and most of these communities are under the poverty line. Water is one of the most essential to reach a clean environment. This research recommends policy implications designate that city government water services provision and hygiene interventions are important factors of hygiene consciousness during this pandemic. Water, sanitation, and hygiene (WASH) will be crucial integrated components in the future. This research study proposes:-

- City governmentspecially in developing countries have to anticipate an effective policy of distributing hygiene tools like handwashing facilities, water in the slum areas, and the city government has to provide accessible and affordable cleaning materials.
- Local government or municipalities should plan a budget to build better infrastructure for water, roads, hygiene, housing, and to decrease the overcrowded of the slum area.
- During the outbreaks like COVID-19, the city government should make rapid response through promotional complaining, increasing people's awareness, and targeting households in the Informal Urban Settlements. As a part of the preparation from the city, governments are an effective response and promoting the local production of hand sanitizers to fight against the COVID-19 pandemic.
- The city government should establish deeper and trusted partnerships within communities to receive a positive behavioral response by building public-private partnerships among the municipalities and the civil society organizations involved in the sanitation sector. To subsidize sectors like rubbish collectors, production hand sanitizers, face masks, hand gloves.
- Hiringcommunities who live in the informal urban settlements in these industries would lead to economic development and, that could change their lifestyle as most of these communities living less than $1.9 per day according to WHO (2020).
- Promoting hygiene messages and training the community to know the importance of handwashing behavior during the outbreaks by using community-based approaches, social marketing, direct messages from the government officials(local people might not trust the international organization but they do trust their governments), and all media platforms with the local languages that the people could understand. Along with providing clarity during hygiene promotional awareness increases self-efficacy and risk communication will result in uncemented community engagement.
- Educating people who live in an urban informal settlement, by providing free scholarships, and in long terms when the community becomes more educated then eventually that leads to a clean environment because they learn the risk of poor hygiene (S. Shekhar, 2020).

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

- To give special consideration and budget of hygiene promotion campaign as an aspect of broader risk communication and community engagement and to engage with local governments and colleagues on behavior change interventions in the context of this new virus and to prevent future outbreaks.
- To empower and protect vulnerable communities like informal urban settlements would result in environmental and hygiene security.

Reference

Aguirre-Urreta, M., Hu, J., &Rönkkö, M. (2017). Polynomial Regression and Measurement Error: Implications for IS Research.

Al-Rifaai, J. M., Al Haddad, A. M., &Qasem, J. A. (2018). Personal hygiene among college students in Kuwait: A Health promotion perspective. Journal of education and health promotion, 7, 92.https://doi.org/10.4103/jehp.jehp_158_17

Angela Velasquez (2020). Archroma's Pakistan Facility Starts Hand Sanitizer Production. https://sourcingjournal.com/denim/denim-innovations/archroma-hand-sanitizer-production-pakistan-coronavirus-220716/

Annie Wilkinson (2020). Key considerations: COVID-19 in informal urban settlements. Social Science in Humanitarian Action Platform. Published 30 Mar 2020. https://www.socialscienceinaction.org/resources/key-considerations-covid-19-informal_urban-settlements-march-2020/

Anser, M. K., Yousaf, Z., Khan, M. A., Nassani, A. A., Moinuddin, M., Abro, Q., Vo, X. H., &Zaman, K. (2020). Social and administrative issues related to the COVID-19 pandemic in Pakistan: better late than never. 474(February), 34567–34573.

Aunger R, Greenland K, Ploubidis G, Schmidt W, Oxford J, and Curtis V (2016). The Determinants of Reported Personal and Household Hygiene Behaviour: A Multi-Country Study. PLoS ONE 11(8): e0159551. doi: 10.1371/journal.pone.0159551

Bavel JJV, Baicker K, Boggio PS, Capraro V, Cichocka A, Cikara M et al, using social and behavioral science to support COVID-19 pandemic response. Nat Hum Behave, 2020; https://doi.org/10.1038/s41562-020-0884-z

CAWST. (2020). Handwashing in schools and households in La Mosquitia , Honduras. April.

Chen Dongxiao. (2020). China's Fight Against COVID-19 Epidemic: A Decisive Campaign

Chen, X., Ran, L., Liu, Q., Hu, Q., Du, X., & Tan, X. (2020). Hand hygiene, mask-wearing behaviors, and its associated factors during the COVID-19 epidemic: A cross-sectional study among primary school students in Wuhan, China. International Journal of Environmental Research and Public Health, 17(8).https://doi.org/10.3390/ijerph17082893

Clark, C., Davila, A., Regis, M., & Kraus, S. (2020). Predictors of COVID-19 voluntary compliance behaviors: An international investigation. Global transitions, 2, 76–82.https://doi.org/10.1016/j.glt.2020.06.003

Curtis, V. A., Danquah, L. O., &Aunger, R. V. (2009). Planned, motivated and habitual hygiene behaviour: An eleven-country review. Health Education Research, 24(4), 655–673. https://doi.org/10.1093/her/cyp002

Curtis, V. A., Robert Dreibelbis and Myriam S., et al., (2020). How to set up government-led national hygiene communication campaigns to combat COVID-19: a strategic blueprint.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

Dreibelbis, R., Winch, P. J., Leontsini, E., Hulland, K. R., Ram, P. K., Unicomb, L., &Luby, S. P. (2013). The integrated behavioural model for water, sanitation, and hygiene: a systematic review of behavioural models and a framework for designing and evaluating behaviour change interventions in infrastructure-restricted settings. BMC public health, 13(1), 1015.

Edkarl, Galing and Alexandra Conroy (2020). Papua New Guinea, hand washing can be a challenge in some communities. Asian Development Blog.https://blogs.adb.org/in-papua-new-guinea-hand-washing-can-be-a-challenge-in-some-communities

F.R. Ashik, SadiaAlamMim and MeherNigarNeema (2020). Towards vertical spatial equity of urban facilities: An integration of spatial and aspatial accessibility. Journal of Urban Management 9 (2020) 77–92.

Hair, J. F., Hult, G. T. M., Ringle, C., &Sarstedt, M. (2016). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM) (2nd Editio). New York: SAGE Publications.

Hair, Jr, J., Sarstedt, M., Hopkins, L., & G. Kuppelwieser, V. (2014). Partial least squares structural equation modelling (PLS-SEM). European Business Review, 26(2), 106-121. http://doi.org/10.1108/EBR-10-2013-0128.

Heijnen, M. and Greenland, K. (2015). Level of behavior change achievable by handwashingwith soap interventions: a rapid review. Evidence on Demand, UK (2015) v + 30 pp.DOI: 10.12774/eod_hd.april2015.heijnenmetal.

Jamie Myers (2020). 'Covid-19 in low-income countries – we need rapid learning about effective handwashing initiatives. Opinion published on Published on 8 April 2020. Institute of Development Studies.https://www.ids.ac.uk/opinions/covid-19-in-low-income-countries-we-need-rapid-learning-about-effective-handwashing-initiatives/.

Jones, H. Clench, B. & Harris, D. (2014b). The governance of urban service delivery in developing countries: Literature review. Discussion Paper, Overseas Development Institute 3 Blackfriars Road London.

Jones, H. Cummings, C. & Nixon, H. (2014a). Services in the city: Governance and political economy in urban service delivery. Discussion Paper, Overseas Development Institute 3 Blackfriars Road London.

Jordan, J., Yoeli, E., & Rand, D. (2020). Do not get it or do not spread it? Comparing self-interested versus prosaically framed COVID-19 prevention messaging. https://www.nature.com/articles/s41562-020-0884-z.

Joseph F. Hair, J., Hult, G. T. M., Ringle, C. M., &Sarstedt, M. (2014). A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). Los Angeles. London. New Delphi. Singapore. Washington DC: SAGE Publications, Inc.

Jovanović1, 2 · P. Klimek3 · O. Renn4 · R. Schneider5 · K. Øien6 · J. Brown7 · M. DiGennaro Y. Liu · V. Pfau1 · M. Jelić2 · T. Rosen2 · B. Caillard1 · S. Chakravarty · P. Chhantyal. (2020). Assessing resilience of healthcare infrastructure exposed to COVID-19: emerging risks, resilience indicators, interdependencies, and international standards (p. 176).

Khan, Y. H., Mallhi, T. H., Alotaibi, N. H., Alzarea, A. I., Alanazi, A. S., Tanveer, N., &Hashmi, F. K. (2020). Perspective Piece Threat of COVID-19 Vaccine Hesitancy in Pakistan: The Need for Measures to Neutralize Misleading Narratives. 103(2), 603–604. https://doi.org/10.4269/ajtmh.20-0654

Kucharski, A. J., Russell, T. W., Diamond, C., Liu, Y., Edmunds, J., Funk, S., ... & Davies, N. (2020). Early dynamics of transmission and control of COVID-19: a mathematical modelling study. The lancet infectious diseases.

Larson, E.L., (2007). Warned, but not well armed: preventing viral upper respiratory infections in households. Publ. Health Nurs. 24, 48–59

Li, Q., Guan, X., Wu, P., Wang, X., Zhou, L., Tong, Y., ...& Xing, X. (2020). Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. New England Journal of Medicine.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

Linkov I, Bridges T, Creutzig F, Decker J, Fox-lent C, Kro¨ger W, Thiel-Clemen T (2014) Changing the resilience paradigm. Nature Publishing Group 4(6):407–409. doi:10.1038/nclimate 2227

Lunn P, Belton C, Lavin C, McGowan F, Timmons S and Robertson D, Using BehaviouralScience to Help Fight the Coronavirus. Journal of Behavioral Public Administration, 2020; Vol. 3 No. 1 Available from: https://journal-bpa.org/index.php/jbpa/article/view/147

Malik, A., & Malik, I. (2020). COVID-19 and community pharmacy services in Pakistan: Challenges, barriers, and solution for progress. Journal of Pharmaceutical Policy and Practice, 13(1), 1–4. https://doi.org/10.1186/s40545-020-00240-4

Matilda Jerneck, Carolien van der Voorden, Clara Rudholm(2016). SANITATION AND HYGIENE BEHAVIOUR CHANGE AT SCALE: UNDERSTANDING SLIPPAGE. Primarily based on experiences from the Global Sanitation Fund-supported programme in Madagasca

National Academy of Sciences (NAS) (2012) Disaster resilience: a national imperative. The National Academies Press, Washington, DC. Retrieved from www.nap.edu/catalog.php?record_id=13457

Paul Jones (2020). Too many left behind: the failing of COVID-19 prevention measures in informal settlements and slums. The Conversation.Published on 4 May, 2020. https://theconversation.com/too-many-left-behind-the-failing-of-covid-19-prevention-measures-in-informal-settlements-and-slums-137288

Podsakoff S. B. MacKenzie and P. M., Common method bias in marketing: Causes, mechanisms, and procedural remedies, Journal of Retailing, vol. 88, no. 4, pp. 542-555, 2012.

Podsakoff, S. B. MacKenzie, J.-Y. Lee, and N. P. Podsakoff, Common method biases in behavioral research: A critical review of the literature and recommended remedies, Journal of Applied Psychology, vol. 88, no. 5, pp. 879-903, 2003

Prem, K., Liu, Y., Russell, T. W., Kucharski, A. J., Eggo, R. M., Davies, N., ...& Abbott, S. (2020). The effect of control strategies to reduce social mixing on outcomes of the COVID-19 epidemic in Wuhan, China: a modelling study. The Lancet Public Health.

Prüss-Ustün, A., Jennyfer, Wolf., Jamie, Bartram., Thomas, Clasen., Oliver, Cumming., Matthew, C. Freeman., Bruce, Gordon., Paul R. Hunter., Kate, Medlicott., and Richard, Johnston. (2019). Burden of disease from inadequate water, sanitation, and hygiene for selected adverse health outcomes: An updated analysis with a focus on low and middle-income countries. International Journal of Hygiene and Environmental Health 222 (2019) 765–777. https://doi.org/10.1016/j.ijheh.2019.05.004

Rabbani, M. G., Akter, O., Hasan, M. Z., Samad, N., Mahmood, S. S., &Joarder, T. (2020). Knowledge, Attitude and Practice towards COVID-19 among people in Bangladesh during the pandemic: a cross-sectional study. medRxiv.

Russell M Viner, Simon J Russell, Helen Croker, Jessica Packer, Joseph Ward, Claire Stansfield, Oliver Mytton, Chris Bonell, Robert Booy. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review (2020)

S. Shekhar, (2020). Effective management of slums- Case study of Kalaburagi city, Karnataka, India. Journal of Urban Management 9 (2020) 35–53.

S. White, Astrid HasundThorseth, Robert Dreibelbis, and Val Curtis (2020). The determinants of handwashingbehaviour in domestic settings: An integrative systematic review. International Journal of Hygiene and Environmental Health.227 (2020) 113512.

Samuel Ginja, Stephen Gallagher & Mickey Keenan (2019): Water, sanitation, and hygiene (WASH) behaviour change research: why an analysis of contingencies of reinforcement is needed, International Journal of Environmental Health Research, DOI: 10.1080/09603123.2019.1682127

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

Shahzada Irfan Ahmed (2015). A questionable existence: 52 katchiabadis of Islamabad. https://www.thenews.com.pk/tns/detail/559167-a-questionable-existence-of-katchi-abadi-in-islamabad

Shaw, R., Kim, Y., &Hua, J. (2020). Governance, technology, and citizen behavior in pandemic: Lessons from COVID-19 in East Asia. Progress in Disaster Science, 6, 100090.https://doi.org/10.1016/j.pdisas.2020.100090

Thanishka et al. "Impact of COVID-19 outbreak on the health consciousness and hygiene levels in the people of Hyderabad, India: A questionnaire-based community study". AIJR Preprints, 106, version 1, 2020. https://preprints.aijr.org/index.php/ap/preprint/view/106. Impact of COVID-19 outbreak on the health consciousness and hygiene levels in the people of Hyderabad, India: A questionnaire-based community study.

Tidwell, J.B., Chipungu, J., Bosomprah, S., Aunger, R., Curtis, V., Chilengi, R., 2019. Effect of a behaviour change intervention on the quality of peri-urban sanitation in Lusaka, Zambia: a randomised controlled trial. The Lancet Planetary Health 3 (4), e187–e196.

UNDP. (2020). Policy Brief: COVID-19 in an Urban World. United Nations, July 1–30.https://www.un.org/sites/un2.un.org/files/sg_policy_brief_covid_urban_world_july_2020.pdf

UN-Habitat.(2020). Informal settlements and COVID-19.UN-Habitat.Published March, 2020.https://unhabitat.org/sites/default/files/2020/05/130520_-_un-habitat_informal_settlements_and_covid-19_key_messages.pdf

UNICEF & WHO.(2015) Water, sanitation and hygiene in health care facilities – urgent needs and actions https://www.who.int/water_sanitation_health/facilities/wash-in-hcf-geneva.pdf?ua=1

UNICEF (2020).WASH Programme contribution to coronavirus disease (COVID-19) prevention and response.Published March 2020.Technical Note. Link: https://www.unicef.org/documents/wash-programme-contributioncoronavirus-disease- covid-19-prevention-and-response

UNICEF,& WHO. (2020). Water, sanitation, hygiene, and waste management for the COVID-19 virus. World Health Organization, March 1–9.

United Nations, (2015). The Millennium Development Goals Report 2015. United Nations, New York

UNOCHA (2020a).Pakistan Humanitarian Response Plan for Covid-19 Pandemic.United Nations Office for the Coordination of Humanitarian Affairs.

Vinzi, V. E., Trinchera, L., & Amato, S. (2010). PLS path modeling: from foundations to recent developments and open issues for model assessment and improvement. In *Handbook of partial least squares* (pp. 47-82). Springer, Berlin, Heidelberg.

Washem (2020).How to design handwashing facilities that change behavior. Link: https://s3.eu-west-2.amazonaws.com/washem-assets prod/documents/washem_quicktip_handwashingdesign.pdf

Water Aid (2020). A system strengthening approach to improve hygiene behaviors

WEDC (2014). Managing hygiene promotion in WASH programmes, Managing hygiene promotion in WASH programmes

WHO (2020)Interim recommendations on obligatory hand hygiene against transmission of COVID-19. Published on 1 April 2020. Link: https://www.who.int/who-documents-detail/interim-recommendations-on-obligatory-handhygiene-against-transmission-of- covid-19

Will Kenton (2020). "What Is the International Poverty Line?" https://www.investopedia.com/terms/i/international-poverty-line.asp Updated Apr 1, 2020.

Wilson, S., Jacob, C. J., & Powell, D. (2011). Behavior-change interventions to improve hand-hygiene practice: a review of alternatives to education. Critical Public Health, 21(1), 119-127.

Tianjin Daxue Xuebao (Ziran Kexue yu Gongcheng Jishu Ban)/
Journal of Tianjin University Science and Technology
ISSN (Online): 0493-2137
E-Publication: Online Open Access
Vol:55 Issue:03:2022
DOI 10.17605/OSF.IO/7F5ZS

World Bank (2020).WASH (Water, Sanitation & Hygiene) and COVID-19. Brief published on 6 April 2020. Retrieved from https://www.worldbank.org/en/topic/water/brief/wash-water-sanitation-hygiene-and-covid-19

Zangana, A., Shabila, N., Heath, T., & White, S. (2020). The determinants of handwashingbehaviour among internally displaced women in two camps in the Kurdistan Region of Iraq. *PloS one*, *15*(5), e0231694.

Zhang, J., Litvinova, M., Wang, W., Wang, Y., Deng, X., Chen, X., ...& Wu, Q. (2020). Evolving epidemiology and transmission dynamics of coronavirus disease 2019 outside Hubei province, China: a descriptive and modelling study. The Lancet Infectious Diseases.