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RESEARCH ARTICLE

Assessing Sociodemographic Variances, COVID-19 Knowledge, and Health Practices in Intervention versus Non-Intervention Settings

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Abstract

Bangladesh's response to the WHO's declaration of COVID-19 as a global pandemic on March 11, 2020, exposed key gaps in public trust, coordination, and community engagement. To address these challenges and promote awareness and adoption of preventive behaviors, BRAC and the CDC Foundation launched a community-based intervention in Gazipur district. This quasi-experimental study employed a mixed-methods approach using a pre-test post-test control group design to evaluate the initiative's impact. Quantitative data were collected through baseline and endline surveys in intervention (Ward-26) and control (Ward-25) areas, with 611 participants surveyed at each site. Knowledge and practices regarding COVID-19 transmission, mask usage, hand hygiene, and social distancing were assessed. Descriptive statistics and the Difference-in-Differences (DiD) method were applied to examine changes over time. Findings revealed an increase in awareness within the intervention group–for example, knowledge of droplet transmission rose from 75% to 84%–while the control group showed declines. However, actual adherence to preventive practices declined over time, including mask-wearing (from 93% to 86%) and social distancing, particularly in crowded public areas. Qualitative findings from interviews and field observations highlighted contributing factors such as discomfort, financial pressures, reduced fear of COVID-19, and sociocultural norms. Although the intervention improved awareness and infrastructure, sustained behavior change was hindered by community fatigue, prolonged restrictions, and weak enforcement. In conclusion, the program enhanced public knowledge but failed to ensure lasting preventive behaviors. Future efforts should emphasize community engagement, consistent enforcement, and adaptive awareness strategies to strengthen pandemic preparedness.

Keywords: COVID-19, Infectious Diseases, Awareness Campaigns, Community Infection, Intervention, Bangladesh.

INTRODUCTION

The outbreak of SARS-CoV-2 in December 2019 from a wet market in Wuhan, China, rapidly escalated into a global health crisis (Lu et al., 2020). By March 11, 2020, the World Health Organization officially declared COVID-19 a global pandemic, as the virus had already spread to more than 110 countries with over 118,000 confirmed cases (WHO, 2020a). Bangladesh reported its first confirmed cases on March 8, 2020, and the first death was recorded on March 18, 2020 (Agusi et al., 2020; Siam et al., 2021). Despite implementing a range of public health interventions, the country struggled to mitigate the spread of the virus, facing a prolonged phase of community transmission without fulfilling the WHO's pandemic control benchmarks (WHO, 2020b). The situation was further exacerbated by public distrust in the government's response, which was criticized for being delayed, fragmented, and overly bureaucratic (Biswas et al., 2020; Shammi et al., 2021). This lack of public confidence led to poor adherence to preventive behaviors such as mask-wearing and social distancing, especially at the grassroots level (Alam et al., 2022). These challenges highlighted the critical need for community-driven, context-sensitive strategies to increase awareness, build trust, and sustain behavioral change (Cousins, 2020; Coroiu et al., 2020; Gilmore et al., 2020).

While previous studies have extensively examined national-level policies and international public health responses to the COVID-19 pandemic, there remains a significant gap in understanding the effectiveness of localized, community-driven interventions–particularly in low- and middle-income countries (LMICs) such as Bangladesh. Top-down directives often struggle to address

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the nuanced socio-cultural and economic realities of marginalized communities, where health infrastructure is limited, and public trust in authorities is fragile (Gilmore et al., 2020; Paul et al., 2020).

This study attempts to bridge that gap by evaluating the impact of a grassroots intervention implemented by BRAC–one of the world's largest NGOs with extensive experience in community mobilization–through a strategic partnership with the CDC Foundation, USA (Dey et al., 2021). Distinct from conventional public health campaigns, BRAC′s model utilized local community health workers and volunteers to conduct real-time surveillance, disseminate tailored Information, Education, and Communication (IEC) materials, and promote preventive practices such as mask-wearing, hand hygiene, and physical distancing at local hotspots including markets, mosques, and public transportation hubs.

This approach reflects growing evidence that bottom-up strategies, which prioritize community ownership, local knowledge, and participatory communication, tend to outperform centralized messaging in both reach and sustainability (Kaushik et al., 2021; Nguyen et al., 2020). Furthermore, trust in local actors–especially those embedded in the social fabric of communities–can significantly enhance compliance with health guidelines, particularly during crises characterized by fear, uncertainty, and information overload (Coroiu et al., 2020; Bierwiaczonek et al., 2020). By embedding behavioral nudges and culturally relevant content within familiar community structures, the BRAC-CDC initiative aimed not only to increase COVID-19 knowledge but also to foster long-term behavioral change through trust and empathy.

The selection of Gazipur district as the intervention site was strategically grounded in multiple evidence-based criteria. Gazipur is one of Bangladesh′s most densely populated industrial zones, home to a vast number of ready-made garment (RMG) factories and a highly mobile labor force, which increased its vulnerability to rapid COVID-19 transmission (Shammi et al., 2021). The district′s significant internal migration patterns, combined with congested living conditions and insufficient access to healthcare services, positioned it as a high-risk area for disease outbreaks. Moreover, earlier pandemic phases revealed substantial gaps in the reach and effectiveness of centralized government awareness campaigns in this region, especially among informal sector workers and low-income households (Biswas et al., 2020; Paul et al., 2020).

Recognizing these challenges, BRAC and the CDC Foundation deployed a targeted community engagement intervention in Gazipur with the goal of fostering sustainable public health behaviors. The initiative sought to assess whether locally driven strategies–emphasizing trust, participation, and contextual responsiveness–could enhance awareness and encourage adoption of preventive practices such as mask-wearing, hand hygiene, and physical distancing (Dey et al., 2021; Gilmore et al., 2020). The use of local volunteers familiar with the sociocultural fabric of the community was central to this approach, enabling a more culturally congruent and trusted form of outreach (Kaushik et al., 2021; Nguyen et al., 2020).

Through a quasi-experimental design, this study evaluated the effectiveness of the intervention in improving knowledge and behaviors related to COVID-19. The results provide valuable insights into how community-centered models can complement state-level policies by reaching underserved populations, strengthening pandemic resilience, and informing scalable public health strategies for future health emergencies (Gilmore et al., 2020; WHO, 2020).

METHODS

Study Design

This study employed a quasi-experimental pre-test post-test control group design, integrating both quantitative and qualitative methods to assess the intervention's impact. A baseline survey was conducted from August to September 2020 across both study sites to gather initial data. A seven-week intervention followed, implementing activities numbered 2.1 through 4.1. Post-intervention data, both quantitative and qualitative, were collected from October to November 2020 to evaluate changes in COVID-19 safety knowledge, hygiene practices, and attitudes toward healthy behaviors. Additionally, phone interviews were conducted at surveillance sites to understand barriers to intervention participation.

Study Sites and Population

The intervention targeted COVID-19 transmission hotspots, including shopping malls, markets, mosques, barbershops, and public transport hubs, in Gazipur district. Locations were selected based on risk assessments conducted by BRAC HNPP, with input from local news reports, experts, CDC Bangladesh, and local authorities. Ward-26 in Gazipur was chosen as the intervention site, while Ward-25 served as the control. Ward-26 had a higher population density and previous engagement with health interventions, whereas Ward-25 was more remote and less populated. Due to COVID-19 restrictions, household surveys were replaced with on-the-spot surveys at five hotspots in each cluster. Health centers in ready-made garment (RMG) factories were separately surveyed, given their significant workforce representation in Gazipur.

Sampling Technique and Sample Size

A sample size of 611 per group (intervention and control) was determined using a 5% significance level, 80% power, and a 10% margin of error. The study area was divided into five strata (e.g., local markets, shopping malls, bus stops, mosques, and barbershops), ensuring equal data collection across each. Health centers in nine RMG factories were surveyed separately but were not stratified into intervention and control groups (Table 1).

Data Collection Tools and Process

Quantitative data were collected via face-to-face interviews using a semi-structured questionnaire. Additionally, an observation checklist and field notes were used. Data collection was carried out by six trained enumerators under the supervision of three field supervisors. Training sessions were conducted before both baseline and endline surveys. Data collection was managed through KoBo Toolbox, an Android-based online platform. Supervisors conducted daily reviews of the collected data, and a lead researcher monitored the entire process to ensure data accuracy and consistency.

To ensure the validity and reliability of measurement tools, a pilot study was conducted with a sample of 50 respondents before the baseline survey. The pilot test results were reviewed for consistency, and necessary

refinements were made to the questionnaire to enhance clarity and effectiveness. Cronbach's alpha was used to assess internal consistency, ensuring the reliability of the scales used.

Table 1. Detail of Data Collection

Data Collection Approach	Process	Intervention	Non-intervention	RMG
Quantitative	Interview	593 (Baseline), 651 (Endline)	593 (Baseline), 669 (Endline)	178 (Baseline), 192 (Endline)
	Checklist	59 (Baseline), 45 (Endline)	52 (Baseline), 55 (Endline)	9 (Baseline), 9 (Endline)
Qualitative	IDI	35 (Baseline), 35 (Endline)	15 (Baseline), 15 (Endline)	14 (Baseline), 6 (Endline)
	Field Note	59 (Baseline), 45 (Endline)	52 (Baseline), 55 (Endline)	9 (Baseline), 9 (Endline)

Data Analysis

Quantitative Data: Descriptive statistics, including frequency distributions and graphical representations, were used to present findings. Bivariate comparisons (proportion tests and chi-square tests) were applied to analyze differences between baseline and endline data in intervention and control areas. A difference-in-difference (DiD) estimator was employed to measure the intervention's impact, adjusting for initial area differences. Given the binary nature of outcomes, a logit model was used to estimate program effects. Statistical analyses were conducted using STATA 13.0 and Microsoft Excel.

Qualitative Data: A total of 84 in-depth interviews (IDIs) were conducted at baseline and 36 at endline, involving hotspot staff and users. Thematic analysis was employed to analyze qualitative data, identifying key themes related to social distancing, mask-wearing, and handwashing. Interview recordings were transcribed verbatim, and coding was performed using NVivo software. Field notes were reviewed and categorized to supplement interview findings.

Triangulation was conducted by cross-verifying qualitative data from multiple sources, including interviews, field notes, and observation checklists, to enhance data credibility. Two independent researchers coded and analyzed the qualitative data to ensure consistency, and discrepancies were resolved through discussion.

RESULTS

Respondent's profile

The baseline survey collected respondents' sociodemographic information, including age, sex, religion, education level, occupation, family size, and respondent category (Table 2). No significant differences were found between intervention and non-intervention areas in sex, marital status, religion, family size, or respondent category ($p > 0.05$). However, significant differences were observed in age, education, and occupation ($p < 0.05$). A higher percentage of service holders were found in the intervention area, while students were more prevalent in the non-intervention area ($p < 0.001$). The intervention area had a slightly older population (74% vs. 76% aged <35 years), and more respondents were engaged in business or service (37% vs. 24%), while the non-intervention area had more students and businesspersons (31% vs. 26%).

Table 2. Yield Calculation Results of Tammate Leaf Extract (Lannea coromandelica (Houtt.) Merr.)

Characteristics	Intervention (%)	Non-intervention (%)	p value
Age			
Less than 25	32.5	41.8	0.012
25-34	41.5	35.8	
35-44	13.0	11.3	
45 and above	13.0	11.1	
Sex			
Female	5.9	7.4	0.295
Male	94.1	92.6	
Marital status			
Married	54.3	49.1	0.072
Unmarried	45.7	50.9	
Religion			
Islam	95.6	95.4	0.846
Hinduism and others	4.4	4.5	
Education			
No education	4.0	6.4	0.021
Primary complete	11.6	12.1	
Secondary complete	29.5	24.8	
Higher secondary	29.2	34.2	
Graduate and above	19.6	19.2	
Religious education	6.1	3.2	
Occupation			
Service	37.4	24.1	<0.001
Business	24.1	26.1	
Student	19.1	31.2	
Unemployed/ Retired	8.8	6.6	
Driver/Helper	6.6	6.6	
Day labor	2.2	3.2	
Home maker	1.9	2.2	
Family size			
Lived alone	4.0	5.9	0.214
2 to 5 members	75.7	72.0	
More than 5 members	20.2	22.1	
Respondent category			
Service provider*	26.1	28.2	0.433
Service user	73.9	71.8	
Total (N)	593	593	

COVID 19 related knowledge and practices

Knowledge of COVID-19 transmission and prevention was assessed (Figures 1 and 2). Awareness of droplet transmission increased from 75% to 84% in the intervention area but declined in the non-intervention area (78% to 66%). Knowledge of transmission through fomites, proximity, and direct contact improved in the intervention area, whereas only fomite-related knowledge slightly increased in the non-intervention area (32% to 34%). Awareness of social distancing and avoiding direct contact declined significantly in the non-intervention area (44% to 35% and 55% to 40%, respectively).

Preventive measure awareness was higher than transmission knowledge. Mask-wearing awareness remained high (85%+), followed by social distancing and hand hygiene. Awareness of specific preventive measures, such as avoiding handshakes and touching the face, significantly improved in the intervention area but remained low in the non-intervention area. Audio-visual media remained the primary information source (80%+), while reliance on social media and newspapers declined. Notably, 15% of respondents in the intervention area cited BRAC staff/community volunteers as their primary COVID-19 information source.

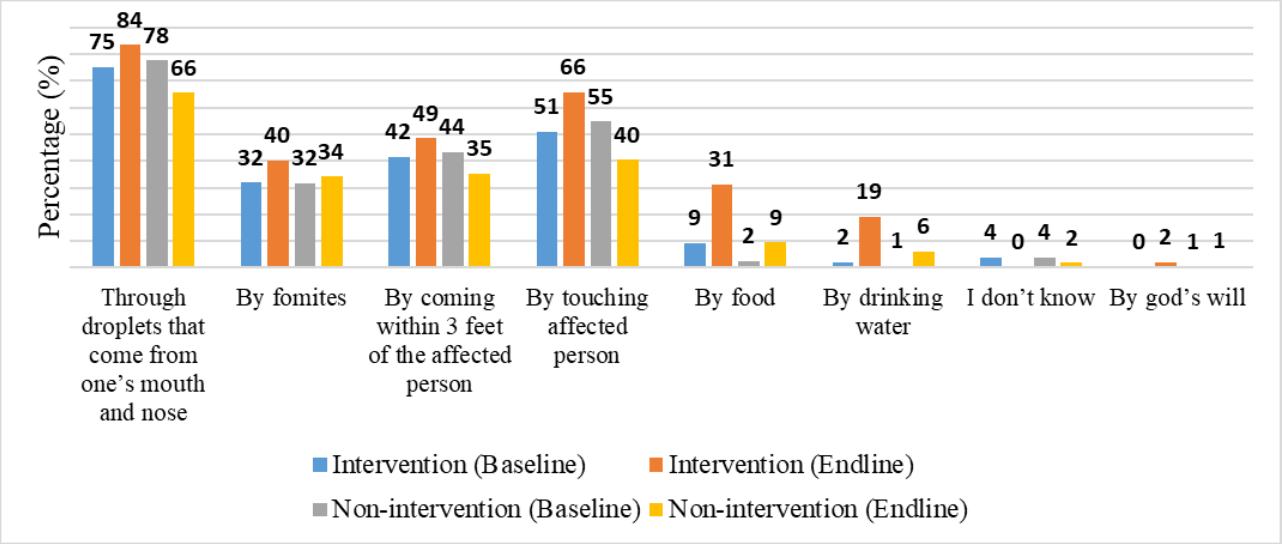

Figure 1. Transmission of COVID 19 (Multiple response).
*Fomites – Objects or materials which are likely to carry infection, such as clothes, utensils, and furniture.

The respondents were found to be more aware about the preventive measures than the mode of transmission (Figure 2). Wearing masks was known almost universally (85%+) followed by maintaining a distance of at least 3ft from one another and washing hands with soap and water. During the baseline preventive measures such as avoiding handshake, touching face, covering face etc.) was found to be poor (6 – 10%) in both areas. However, substantial improvement can be seen in the knowledge about these measures in the intervention area.

Audio-visual media was found to be the dominant source of COVID related information (80%+) in both intervention and non-intervention areas (figure 2). However, dependency on social media and newspapers decreased in both intervention and non-intervention areas from baseline to endline. Noticeably, 15% of the respondents reported BRAC staff/Community volunteer as the main source of COVID-19 related information in the intervention area.

Personal safety and hygiene related practices

Respondents were asked questions related to mask wearing and hand washing during the survey (table 3). In the intervention area 93% respondents said that they wear masks while going outside during baseline survey which significantly decreased to 86% during the endline survey ($p < 0.001$). Similar to this, in the non-intervention area self-reported mask wearing significantly decreased from 81% to 73% ($p = 0.001$). In both areas, uneasiness in breathing and unaffordability were reported as major reasons for not using mask by the respondents. During the baseline survey, 39 individuals reported that they didn't wear masks and 72% of them stated that the reason for doing so was because they didn't feel comfortable, 26% said they didn't think it was necessary and only 3% said they didn't have any masks with them. But during the endline survey, 91 individuals said that they didn't wear mask and surprisingly 70% of them reported that, they didn't have mask and 45% said they didn't feel comfortable using the mask.

Similarly, in the non-intervention area, during baseline survey153 individuals reported that, they didn't use masks while go outside from home and 180 individuals reported of doing so during endline. Major reason of not using mask were comfortability followed by didn't have any mask and not considering it necessary. Respondents were also asked about their hand washing knowledge and practice during the survey. Most of the respondents said that they wash their hands after returning home and before/after defecation. However, the percentage of person who said they wash their hand after returning home decreased significantly ($p < 0.001$) in both intervention and non-intervention areas from baseline to endline. Percentages of person who should wash their hand with soap after touching anything, before touching their mouth, nose increased significantly in the intervention area but decreased in the non-intervention area.

Apart from asking about wearing mask and hand hygiene related information, respondents were also

observed by the data collectors to see whether they are practicing standard mask wearing protocol, social distancing and hand hygiene or not and the responses were collected by a checklist.

Wearing Mask properly

Self-reported mask use declined significantly in both areas. In the intervention area, usage dropped from 93% to 86% ($p < 0.001$), while in the non-intervention area, it declined from 81% to 73% ($p = 0.001$). Discomfort and cost were the main barriers. Notably, the proportion of respondents citing a lack of mask availability as a reason for non-use increased from 3% to 70% at endline.

Observational data confirmed declining proper mask use (Figure 2). The intervention area saw a 14% decline, whereas the non-intervention area experienced a sharper 33% drop. Disaggregated analysis revealed that barbershop respondents in the intervention area initially had the highest proper mask use (60%), shifting to bus stops at endline (56%). In the non-intervention area, shopping mall respondents consistently had the highest mask adherence (31% to 26%).

Washing/Sanitizing hand before entering the premise

Handwashing practice decreased significantly in both areas ($p < 0.001$). Most respondents continued to wash hands after returning home and after defecation. However, fewer reported washing hands after touching objects or before eating in the non-intervention area, while this knowledge improved in the intervention area.

Observational data indicated a decline in handwashing before entering premises (Figure 2). In the intervention area, the highest adherence was initially at mosques (33%) but later shifted to shopping malls (37%). In the non-intervention area, mosque adherence dropped from 34% to 16%.

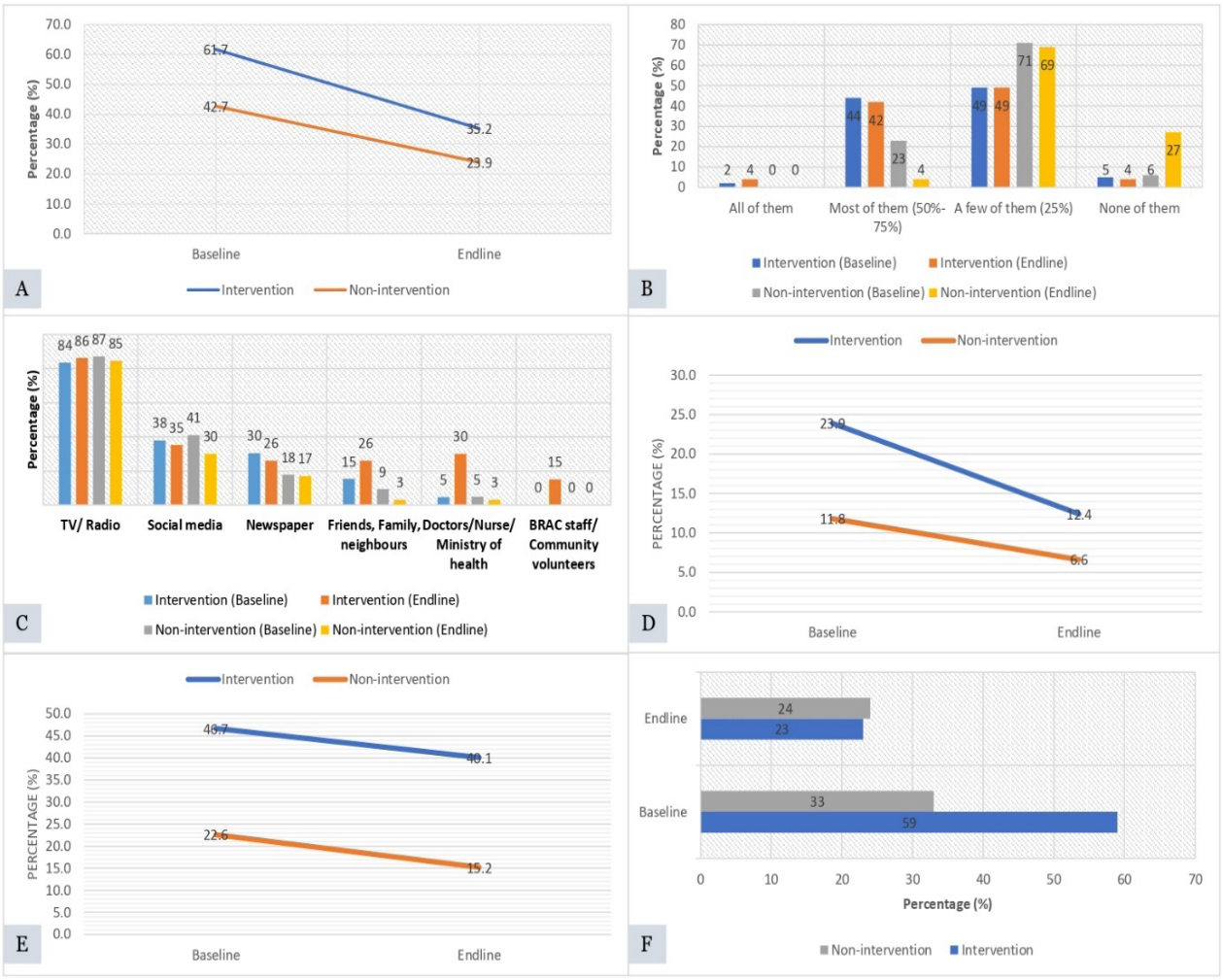

Figure 2: Conditions of personal safety and hygiene related practices. (A) Percentage of respondents maintain social distancing inside the premise; (B) Percentage of service providers wearing mask in the facilities; (C) Main sources of COVID 19 related information (Multiple response); (D) Percentage of respondents washing their hand before entering the premise; (E) Percentage of respondents wearing mask properly; (F) Percentage of respondents maintain social distance outside the premise.

Table 3. COVID 19 related safety measures/practices.

Characteristics	Intervention			Non-intervention		
	Baseline (%)	Endline (%)	P- value	Baseline (%)	Endline (%)	P- value
Wear mask while go outside from home						
Yes	93.4	86.0	<0.001	80.8	73.1	0.001
No	6.6	14.0		19.2	26.9	
If yes, then duration of wearing the mask						
All the time	36.8	20.2	<0.001	29.9	11.9	<0.001
Most of the time	49.5	65.5		50.3	58.1	
Sometime	13.7	14.3		19.8	30.1	
If no, then the reason for not using mask (Multiple response)						
I don't feel comfortable	71.8	45.1	0.005	69.3	50.0	<0.001
I don't have mask	2.6	70.3	<0.001	38.6	41.7	0.565
I don't think it's necessary	25.6	13.2	0.084	21.1	30.6	0.050
I can't afford it	2.6	3.3	0.832	1.8	1.1	0.591
Need to wash hand with soap/sanitizer (Multiple response)						
After return home	83.5	62.4	<0.001	75.5	64.1	<0.001
Before eating/ After defecation	65.1	65.3	0.941	52.8	48.0	0.089
After touching anything where a person cough/ sneeze	41.8	47.8	0.034	35.4	22.7	<0.001
Before touching our mouth, eyes and nose	21.6	31.5	<0.001	24.6	19.0	0.016
After a handshake	12.8	20.1	<0.001	7.6	16.0	<0.001
Washes hands with						
Soap and water	72.8	59.9	<0.001	58.7	59.0	<0.001
Liquid hand wash	18.7	34.9		29.0	31.1	
Alcohol based hand sanitizers	7.3	4.5		10.3	3.3	
Only water	1.2	0.8		2.0	6.6	

Social distancing outside the premise

Social distancing adherence declined in both areas. Observational data showed that at baseline, local markets in the intervention area had the highest compliance (86%), which dropped to 15% at endline. Shopping malls had the highest compliance at endline (64%). In the non-intervention area, shopping mall respondents had the highest compliance throughout (82% to 47%). Inside premises, social distancing adherence also declined. In the intervention area, local market compliance dropped from 92% to 63%, while shopping malls had the highest compliance at endline (68%). In the non-intervention area, local market compliance fell from 74% to 42%.

A hotspot analysis revealed significant variations across facilities. Mosques had the highest initial adherence to handwashing and mask use but saw a sharp decline as religious gatherings resumed. Shopping malls consistently maintained relatively higher adherence levels. Markets showed the steepest decline in social distancing, likely due to crowding and the inability to enforce measures effectively.

Findings from the facility checklist

Along with the respondent's interview and observation checklist, data collectors also assess facilities in the selected spots (Table 5). In the intervention area, in total 59 facilities were assessed during the baseline survey and 45 were assessed during the endline survey. In the non-intervention area, 52 and 55 facilities were assessed during the two waves of surveys.

In the facility checklist, the presence of different precautionary measures taken by the facilities during the pandemic days focusing on hand washing, social distancing, awareness raising, disinfecting was observed by the data collectors (Table 4). In the intervention area, handwashing related amenities, awareness related posters were increased significantly from baseline to endline. On the contrary, in the non-intervention area, these indicators either decreased significantly or stalled from baseline to endline. Social distancing related practices (spot marked for social distancing, maintaining social distancing) were decreased from baseline to endline in the intervention area. However, in the non-intervention area, these indicators also decreased but not significantly. Situation of other precautionary measures, such as disinfecting, waste disposals were also worsened in both areas from baseline to endline.

Table 4. Distribution of the facilities visited during the survey

Spot	Intervention		Non-intervention	
	Baseline	Endline	Baseline	Endline
Local market	8	6	7	9
Shopping mall	8	7	7	9
Bus stop	16	14	16	18
Mosque	12	11	10	10
Barber shop	15	7	12	9
Total	59	45	52	55

Table 5. COVID 19 related safety measures/practices

Characteristics	Intervention			Non intervention		
	Baseline (%)	Endline (%)	p value	Baseline (%)	Endline (%)	p value
Presence of handwashing station at the entrance	44.1	57.8	0.166	30.8	5.5	<0.001
Running water supply in the handwashing station	28.8	55.6	0.006	28.8	3.6	<0.001
Presence Soap/ hand sanitizer at the station	22.0	51.1	0.002	5.8	1.8	0.276
Presence of proper drainage system in the hand washing station	32.2	55.6	0.017	28.8	3.6	<0.001
Posters/ guidelines for awareness on best practices at the entrance/ point of entry	18.6	71.1	<0.001	11.5	12.7	0.849
Presence of infrared thermometer at the entrance	1.7	2.2	0.853	0.0	0.0	-
Functional thermometer	1.7	0.0	0.380	0.0	0.0	-
Spots marked to maintain social distancing in the facility	18.6	4.4	0.030	7.7	5.5	0.646
Maintenance of social distancing in the premise	44.1	17.8	0.005	9.6	3.6	0.209
Frequently touched surfaces being disinfected	35.6	13.3	0.010	21.2	1.8	0.002
Covered and marked container for disposing tissue/masks etc.	28.8	20.0	0.305	9.6	20.0	0.132
Total (N)	59	45		52	55	

*In terms of binary responses, to avoid the duplication in reporting only the positive responses are presented

In the surveyed facilities, percentages of service providers wearing face masks were observed. Findings suggests that percentage of service providers wearing mask in the facilities were stalled in the intervention area and decreased substantially in the non-intervention area. For the mosques, some additional COVID-19 focused hygiene practices were also observed during the facility assessment. In the treatment area, in 91% of the facilities only a few of the devotees brought their own prayer mat during the prayer time which was 42% at the baseline ($p = 0.013$). In the non-intervention area, this indicator also decreased insignificantly (40% vs 10%, $p=0.121$). Percentage of facilities where the praying area was disinfected before the prayers were decreased in both intervention and non-intervention area from baseline to endline (67% vs. 27% and 90% vs. 70% respectively). In the intervention area, only 8% of the completely maintained social distancing during Jaamat at baseline but none of the mosque maintained this at the endline. On the other hand, in the non-intervention area, only 20% of the mosques followed social distancing completely during baseline which decreased to 10% during endline of the survey ($p=0.531$).

Qualitative Findings

In the qualitative phase, In-Depth Interviews (IDIs) were conducted to understand how people viewed COVID-19 health measures like mask-wearing, handwashing, and social distancing. Observational field notes were also taken at each location, focusing on people's adherence to these guidelines.

Mask-Wearing

Field observations noted that approximately 50% of individuals wore masks in public at baseline. Despite BRAC's mask distribution efforts, reluctance persisted at endline. IDIs revealed various misconceptions–some believed maintaining a one-foot distance was sufficient if masked. Others viewed mask-wearing as socially or religiously unnecessary, particularly during prayers. Masculinity perceptions discouraged usage, and myths about COVID-19 being an "act of God" contributed to declining adherence.

Handwashing

Baseline observations showed limited access to handwashing facilities. Intervention areas had improved infrastructure at endline, yet usage remained inconsistent. IDIs revealed that perceived inconvenience, soap shortages, and fading fear of COVID-19 contributed to declining hand hygiene.

Social Distancing

Observations confirmed a steep decline in social distancing adherence. In intervention areas, strict distancing was initially observed in local markets but drastically declined. Shopping malls emerged as the most compliant locations. IDIs revealed that early fear-driven compliance weakened over time, particularly in non-intervention areas where limited reinforcement contributed to lax adherence. Economic constraints and daily livelihood pressures also led to decreased compliance, particularly among vendors and small business owners.

DISCUSSION

This study contributes significantly to the growing body of literature on community-based responses to pandemics by demonstrating that grassroots interventions can meaningfully improve awareness and certain preventive behaviors–albeit with limitations–in resource-constrained, high-density environments like Gazipur, Bangladesh. As the COVID-19 pandemic has revealed, technical solutions such

as vaccines or lockdowns must be complemented by socially embedded strategies that resonate with local realities (Gilmore et al., 2020; Paul et al., 2020).

The results of our quasi-experimental intervention in Gazipur show that while awareness of COVID-19 transmission and prevention increased in the intervention area–evidenced by the rise in knowledge about droplet transmission from 75% to 84%–sustaining behavioral adherence proved more difficult. Mask usage, although initially high (93%), declined to 86%, while handwashing frequency also dropped. These results mirror trends observed globally, where initial fear-based compliance gave way to fatigue, complacency, and socioeconomic obstacles over time (Bierwiaczonek et al., 2020; Wang et al., 2020).

Our findings reinforce the importance of trust and community involvement in driving health behavior change. As BRAC community volunteers became trusted messengers–cited by 15% of respondents as their primary information source–they succeeded in penetrating information deserts, particularly among populations less reached by mainstream media. This aligns with findings from Nigeria and India, where local volunteers facilitated greater adherence to preventive practices compared to centrally broadcasted campaigns (Agusi et al., 2020; Kaushik et al., 2021).

However, behavioral change was not uniform across demographics. A clear pattern emerged showing that sociodemographic factors, such as age, education, and occupation, influenced the uptake of preventive behaviors. Respondents in the formal employment sector (service and business) demonstrated higher adherence, likely due to better access to health infrastructure, organizational policies enforcing safety measures, and greater perceived health risks in professional environments. In contrast, students and daily laborers, especially in the informal economy, faced barriers including misinformation, limited PPE access, and economic necessity that discouraged compliance (Shammi et al., 2021). These disparities underscore the need for tailored messaging and resource allocation that consider context-specific constraints.

Interpreting these findings through the Health Belief Model (HBM) reveals critical insights. The model posits that an individual's decision to adopt a health behavior is shaped by their perceived susceptibility to illness, perceived severity, perceived benefits of action, perceived barriers, cues to action, and self-efficacy (Rosenstock, 1974). In our study, perceived susceptibility was a key driver: those who believed they were at higher risk were more likely to wear masks and maintain hygiene. However, barriers such as discomfort from prolonged mask usage, economic inability to purchase replacements, and skepticism toward the virus's seriousness reduced adherence over time–consistent with other HBM-based studies (Dey et al., 2021; Matusiak et al., 2020).

For example, discomfort was the most frequently cited reason for not wearing masks, a finding supported by Matusiak et al. (2020), who noted that physiological discomfort and social embarrassment can significantly hinder compliance, particularly in hot and humid climates. Additionally, 70% of non-mask users in the intervention area at endline reported not owning a mask–highlighting the material dimension of perceived barriers, and pointing to a structural, not just behavioral, challenge.

In parallel, self-efficacy and cues to action were instrumental but underleveraged. Although posters, handwashing stations, and other visual cues were improved in the intervention area, their impact waned over time, likely due to message fatigue or inconsistent reinforcement. Social learning theory suggests that behavior change is more likely to be sustained when individuals observe role models consistently demonstrating the desired behaviors (Bandura, 1986). Therefore, a decline in visible adherence–particularly by service providers in public facilities–may have demotivated others, creating a cascading effect of non-compliance.

This finding reflects the limitations of short-term interventions and points to the need for continuity and institutionalization. As the WHO (2020) emphasizes, community engagement must be embedded within broader health systems to ensure long-term resilience. Governments and NGOs must co-create mechanisms to sustain behavior change through periodic reinforcement, social norm campaigns, and integrated service delivery.

From a policy perspective, the implications are profound. Firstly, the demonstrated success of the BRAC-CDC intervention in enhancing awareness validates the potential of NGO-government partnerships in pandemic response. These collaborations can help reach populations that public systems alone struggle to engage, especially in peri-urban and slum contexts. Secondly, ensuring equitable access to hygiene commodities such as masks, soap, and sanitizers is critical. Public subsidies or community-based distribution channels could reduce economic barriers and improve behavioral consistency.

Third, there is a pressing need to invest in digital health communication infrastructure. Our study found audiovisual media to be a major information source, but reliance on social media declined over time–possibly due to misinformation fatigue. This points to the opportunity to develop curated, culturally sensitive digital content through mobile messaging apps, IVR systems, and social media influencers that can sustain public engagement over time (Nguyen et al., 2020). Additionally, integrating theory-driven approaches such as the Theory of Planned Behavior (Ajzen, 1991) and Social Cognitive Theory (Bandura, 1986) can enhance message design by accounting for attitude, normative beliefs, and perceived behavioral control.

Moreover, behavioral fatigue observed in this study highlights the necessity of dynamic, phase-based communication strategies. Initial messages may focus on risk perception, but over time, the emphasis should shift to social solidarity, benefit framing, and normalizing desired behaviors. As seen in observational data from marketplaces and mosques, adherence varied by setting and over time, suggesting that interventions must be responsive to behavioral ecology–where context, timing, and group dynamics influence uptake.

Finally, this study underscores the value of mixed-methods evaluation. While quantitative data showed trends in knowledge and behavior, qualitative interviews and field notes revealed the motivations, misconceptions, and socio-cultural influences behind them. For instance, the belief that COVID-19 was "an act of God" or that it did not require precautions during prayers significantly affected behavior. These insights are critical for designing culturally competent interventions and should inform training modules for community volunteers and religious leaders.

While this community-based intervention succeeded in raising awareness and temporarily improving behavior, its limitations point to the complexities of public health behavior change. Community mobilization, while essential, must be systematically supported by policy, resources, and adaptive communication to maintain its effects. The COVID-19 experience in Gazipur provides a template not only for Bangladesh but also for other LMICs grappling with similar structural and cultural challenges.

CONCLUSION

This study demonstrates that community-based interventions can effectively enhance awareness and adherence to preventive behaviors in resource-limited settings. By integrating findings with behavioral theories and international literature, we provide valuable recommendations for policymakers and public health practitioners seeking to optimize intervention strategies. Ensuring long-term sustainability of such initiatives requires policy support, community engagement, and the integration of innovative health communication methods.

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DECLARATIONS

Ethics approval and consent to participate

Prior to the interview, the purpose of the study was described to the participants and verbal consents were obtained from the participants. They were assured that they can withdraw at any point of the interview. All respondents were ensured of the confidentiality of the information provided.

Competing/Conflict of interests Statement

The author declares no conflict of interest

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Authors' contributions

Mithun Gupta: Data Collection Process with Collaborators and Checked Writing, Web-Survey Design, Manuscript Editing and Supervised All Steps, Researched Literature, Wrote the First Draft of The Manuscript, Interpret Data, Paper Revision, Final Editing.

Availability Of Data And Materials

The article and supplementary materials contain the original contributions discussed in the study. Original datasets are available upon reasonable request from the corresponding author.

ABBREVIATIONS

BCC: Behavior Change Communication
BRAC-JPGSPH: BRAC James P. Grant School of Public Health
CDC : Center for Disease control
COVID/COVID 19: Corona Virus Disease/ Disease caused by SARS-CoV 2
DiD : Difference in Difference
EPI : Expanded Program on Immunization
HNPP : Health, Nutrition and Population Program
IDI : In-depth Interview
IEC : Information Education Communication
IPC : Infection Prevention and Control
KAP : Knowledge, Attitude and Practice
LMIC : Low and Middle income country
NGO : Non-Government organization
ORT : Oral Rehydration Therapy
RMG : Ready-made Garments Factory
WHO : World Health Organization

REFERENCES

Agusi, E. R., Ijoma, S. I., Nnochin, C. S., Njoku-Achu, N. O., Nwosuh, C. I., & Meseko, C. A. (2020). The COVID-19 pandemic and social distancing in Nigeria: Ignorance or defiance. *The Pan African Medical Journal*, *35*(Suppl 2), 52. https://doi.org/10.11604/pamj.supp.2020.35.2.23649

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Alam, E., Rahman, K. A., & Hridoy, A. E. (2022). Public confidence in COVID-19 prevention and response in Bangladesh. *Frontiers in Public Health*, *9*, 783726. https://doi.org/10.3389/fpubh.2021.783726

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bierwiaczonek, K., Kunst, J. R., & Pich, O. (2020). Belief in COVID-19 conspiracy theories reduces social distancing over time. *Applied Psychology: Health and Well-Being*, *12*(4), 1270–1285. https://doi.org/10.1111/aphw.12223

Biswas, R. K., Huq, S., Afiaz, A., & Khan, H. T. A. (2020). A systematic assessment on COVID-19 preparedness and transition strategy in Bangladesh. *Journal of Evaluation in Clinical Practice*, *26*(6), 1599–1611. https://doi.org/10.1111/jep.13467

BRAC. (2021). Creating opportunities for people to realise potential.

Coroiu, A., Moran, C., Campbell, T., & Geller, A. C. (2020). Barriers and facilitators of adherence to social distancing recommendations during COVID-19 among a large international sample of adults. *PloS One*, *15*(10), e0239795. https://doi.org/10.1371/journal.pone.0239795

Cousins, S. (2020). Bangladesh's COVID-19 testing criticised. *The Lancet*, *396*(10251), 591. https://doi.org/10.1016/S0140-6736(20)31819-5

Dey, D., Ema, T. I., Biswas, P., Aktar, S., Islam, S., Rinik, U. R., ... & Badal, M. N. U. (2021). Antiviral effects of bacteriocin against animal-to-human transmittable mutated SARS-cov-2: A systematic review. *Frontiers of Agricultural Science and Engineering*, *8*(4), 603–614. https://doi.org/10.15302/j-fase-2021397

Gilmore, B., Ndejjo, R., Tchetchia, A., de Claro, V., Mago, E., Diallo, A. A., ... & Bhattacharyya, S. (2020). Community engagement for COVID-19 prevention and control: A rapid evidence synthesis. *BMJ Global Health*, *5*(10), e003188. https://doi.org/10.1136/bmjgh-2020-003188

Kaushik, M., Agarwal, D., & Gupta, A. K. (2021). Cross-sectional study on the role of public awareness in preventing the spread of COVID-19 outbreak in India. *Postgraduate Medical Journal*, *97*(1154), 777–781. https://doi.org/10.1136/postgradmedj-2020-138349

Lu, H., Stratton, C. W., & Tang, Y. W. (2020). Outbreak of pneumonia of unknown etiology in Wuhan, China: The mystery and the miracle. *Journal of Medical Virology*, *92*(4), 401–402. https://doi.org/10.1002/jmv.25678

Matusiak, Ł., Szepietowska, M., Krajewski, P., Białynicki-Birula, R., & Szepietowski, J. C. (2020). Inconveniences due to the use of face masks during the COVID-19 pandemic: A survey study of 876 young people. *Dermatologic Therapy*, *33*(4), e13567. https://doi.org/10.1111/dth.13567

Nguyen, N. P. T., Hoang, T. D., Tran, V. T., Vu, C. T., Siewe Fodjo, J. N., Colebunders, R., ... & Van Vo, T. (2020). Preventive behavior of Vietnamese people in response to the COVID-19 pandemic. *PloS ONE*, *15*(9), e0238830. https://doi.org/10.1371/journal.pone.0238830

Paul, A., Sikdar, D., Hossain, M. M., Amin, M. R., Deeba, F., Mahanta, J., ... & Nath, T. K. (2020). Knowledge, attitudes, and practices toward the novel coronavirus among Bangladeshis: Implications for mitigation measures. *PloS ONE*, *15*(9), e0238492. https://doi.org/10.1371/journal.pone.0238492

Rosenstock, I. M. (1974). The health belief model and preventive health behavior. *Health Education Monographs*, *2*(4), 354–386. https://doi.org/10.1177/109019817400200405

Shammi, M., Bodrud-Doza, M., Islam, A. R. M. T., & Rahman, M. M. (2021). Strategic assessment of COVID-19 pandemic in Bangladesh: Comparative lockdown scenario analysis, public perception, and management for sustainability. *Environment, Development and Sustainability*, *23*(4), 6148–6191. https://doi.org/10.1007/s10668-020-00867-y

Siam, M. H. B., Hasan, M. M., Tashrif, S. M., Rahaman Khan, M. H., Raheem, E., & Hossain, M. S. (2021). Insights into the first seven months of COVID-19 pandemic in Bangladesh: Lessons learned from a high-risk country. *Heliyon*, *7*(6), e07385. https://doi.org/10.1016/j.heliyon.2021.e07385

Wang, C., Chudzicka-Czupała, A., Grabowski, D., Pan, R., Adamus, K., Wan, X., & Ho, C. (2020). The association between physical and mental health and face mask use during the COVID-19 pandemic: A comparison of two countries with different views and practices. *Frontiers in Psychiatry*, *11*, 569981. https://doi.org/10.3389/fpsyt.2020.569981

World Health Organization (WHO). (2020a). *Advice on the use of masks in the context of COVID-19: Interim guidance, 5 June 2020*. https://apps.who.int/iris/handle/10665/332293

World Health Organization (WHO). (2020b). *Considerations for implementing and adjusting public health and social measures in the context of COVID-19: Interim guidance*. https://www.who.int/publications/i/item/considerations-in-adjusting-public-health-and-social-measures-in-the-context-of-covid-19-interim-guidance