



The positive impact of social media on health behavior towards the COVID-19 pandemic in Bangladesh: A web-based cross-sectional study

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ABSTRACT

Background: Health information has a profound impact on developing awareness and ultimately preventing the burden of coronavirus disease-2019 (COVID-19) pandemic, but study in Bangladesh is lacking.

Aims: Therefore, this study was conducted to investigate the impact of information from social media and television in developing health awareness among people amid the COVID-19 pandemic.

Methods: Data was collected during December 10, 2020 to February 10, 2021 from 1808 people. Data was collected by using questionnaire about information source and their impact on COVID-19 related health measures. Pearson's correlation analyses was conducted.

Results: Female (52%, 937 of 1808) was the most prevalent sex and the mean age was 24 ± 3.9 years. Most of the social media users were students (63%, 1131 of 1808). Social media (53%, 959 of 1808) and television (44%, 800 of 1808) were the most popular sources and Facebook (66.5%, 1203 of 1808) was the most common source of getting health information. About 87% people received health information on social media and television. Users of social media had about 3 times more likelihood to follow the health rules. About 80% participants who used social media followed the health measures after 0–28 days of getting the information. The strongest correlation was found between social distancing and the information on television ($r = 0.943$).

Conclusion: Strong correlation of health information was present among the participants in building awareness about taking preventive measures. This is the first study to describe the positive influence of information amid COVID-19 in Bangladesh.

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1. Introduction

The coronavirus disease-2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) [1]. The SARS-CoV-2 was first identified in Wuhan, China on November 17, 2019 and within few months, COVID-19 had transmitted in all over the world with increased morbidity and mortality which made a panic situation [1,2]. Due to global spread, the World Health Organization (WHO) has declared COVID-19 as pandemic on March 11, 2020 [3,4]. As of March 10, 2021, about 120 million cases and 2.7 million fatalities due to COVID-19 have been reported globally [3,4]. On March 08, 2020, the first case of COVID-19 was reported from Bangladesh and the cases have increased to 861,150 with 13,702 fatalities till June 23, 2021 [3–5]. Bangladesh is one of the top 35 countries by the case and

fatality number of COVID-19 [4]. Without delay the government imposed on a strict lockdown for impediment virus transmission during March to June 2020. Besides, government takes massive action against COVID-19 spread through closure of the educational institutions, government offices and public places and imposing restriction on local and international transportations [5].

Safe epidemic communication plays a crucial role to concern people about the latest tidings of COVID-19 [6]. Direct spread of important guidance on COVID-19 via government offices became impossible during the pandemic. Social media and television along with various websites played significant role in circulation of health messages and update on the pandemic [6,7]. Besides, e-medicine and telemedicine service in different countries were the primary way to provide medical services to COVID-19 patients [7,8]. Nowadays the whole world is connected together through the informatics shared by social media, television and print media. As measures of rapid responses amid the pandemic various governmental and private health agencies have created databases and websites containing various information on COVID-19

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Table 1
Socio-demographic characteristics of the study population.

| Variables | Male (Number, %) | Female (Number, %) | Total (Number, %) |
|---|------------------|--------------------|-------------------|
| Study Population | 871, 48.2% | 937, 51.8% | 1808, 100% |
| Age (in years) | | | |
| Below 10 | 15, 46.9% | 17, 53.1% | 32, 1.8% |
| 10–19 | 118, 29% | 289, 71% | 407, 22.5% |
| 20–29 | 459, 52.7% | 412, 47.3% | 871, 48.2% |
| 30–39 | 87, 50.6% | 85, 49.4% | 172, 9.5% |
| 40–49 | 87, 51.5% | 82, 48.5% | 169, 9.3% |
| 50–59 | 85, 73.9% | 30, 26.1% | 115, 6.4% |
| Above 60 | 21, 50% | 21, 50% | 42, 2.3% |
| Monthly Income (Thousands in taka) | | | |
| Less than 10 | 159, 54.5% | 133, 45.5% | 292, 16.2% |
| 10–29 | 151, 72.6% | 57, 27.4% | 208, 11.5% |
| 30–49 | 116, 78.9% | 31, 21.1% | 147, 8.1% |
| 50–79 | 62, 86.1% | 10, 13.9% | 72, 4% |
| More than 80 | 22, 73.3% | 8, 26.7% | 30, 1.7% |
| Not applicable | 361, 34.1% | 698, 65.9% | 1059, 58.6% |
| Occupation | | | |
| Physician | 23, 76.7% | 7, 23.3% | 30, 1.7% |
| Teacher | 73, 56.6% | 56, 43.4% | 129, 7.1% |
| Researcher | 10, 58.8% | 7, 41.2% | 17, 0.9% |
| Farmer | 17, 100% | 0, 0% | 17, 0.9% |
| Student | 486, 43% | 645, 57% | 1131, 62.6% |
| Police | 18, 90% | 2, 10% | 20, 1.1% |
| Businessman | 95, 93.1% | 7, 6.9% | 102, 5.6% |
| Others | 150, 41.4% | 212, 58.6% | 362, 20% |

P value < .05 were statistically significant.

pandemic [7–9]. One group of databases and websites including Worldometer, Bing, WHO, CDC, John Hopkins University, GitHub are providing information on epidemiological aspects namely, cases, fatalities, age and gender distributions, test number, and overall situation of the pandemic in a country [5]. Besides, databases including Nextstrain, GISAID, and NCBI are providing the scientific community with the information on genomic data. Meanwhile, social media and television are circulating the core messages on both epidemiology and genomic information through different pages [7–9]. Among the most influencing social media platforms Facebook, YouTube, twitter, Instagram, messenger, WhatsApp, and WeChat are disseminating news and information to the mass people rapidly [8–17]. Besides, different journals and publishers are also sharing their information through the social media platform. Information shared via social media including general health precautionary measures, mask using, social distance maintaining, hand washing and lock down are having positive impact amid the pandemic [15–17]. Social networking sites are used by governments, as well as public health authorities to inform about tested location of COVID-19, more affected areas and take responsibilities strictly so that legal information are posted related to COVID-19 with the thoughts of legitimacy has deflected in the content of social media platforms [15–17]. Social media can transfer useful information about infectious diseases by identifying and tracking behavioral patterns of the users. Social media health campaigns related to pandemics can be effective to slow down the spread of the disease by conveying positive attitudes [7,18–30].

Information shared via social media and television needs rapid evaluation. Rumors and misinformation about the pandemic are also spreading fast through the social media and television [10,15–17]. It is becoming difficult for the common people to differentiate fake information from authentic. Besides, continuous sharing of negative and confusing news regarding the pandemic for long time having psychiatric effects on the users. However, strict evaluation of the information can reduce the spread of rumors regarding the pandemic [10,22]. The severity of the pandemic is still beyond control globally. Both the cases and fatalities are increasing every day [3,4]. In Bangladesh, the pandemic has been spreading throughout the country from March 2020 [5]. Both the incidence and the fatality associated with COVID-19 have increased in Bangladesh [3–5]. Several factors including preexisting health condi-

tions like hypertension and diabetes among the infected people have increased the severity and fatality [11,12]. Besides, environmental factors and population factors are also contributing in the pandemic [2,5,13,14].

As response against the pandemic the Government of Bangladesh has taken effective measures to reduce the spread. The information by the government along with the situation reports were rapidly made available to the mass people by social, and print media. Till January 3, 2020, about 66.44 million internet users were reported in Bangladesh, where the number of social media users were 36 million [31]. During the lockdown period both government and the health agencies in Bangladesh has disseminated important information and directions by websites, social media and television. In controlling the COVID-19 pandemic through information, social media and television became a major part [18–30]. However studies on the positive effects of the informatics shared by social media, television and print media amid the pandemic are insufficient [19]. Recently a study on the impact of social media in raising panic during the COVID-19 pandemic has been done in Iraq [10]. A significant research gap is present on the impact of informatics through websites and social media in building awareness during the COVID-19 pandemic.

The main aim of the study is to elucidate the significance of the information system to reduce the spread of the pandemic and ultimately health burden in Bangladesh. Another aim of this study is to determine the role of informatics available in websites and social media in building health awareness among people during COVID-19 and the frequency of the most used social media during the pandemic, age and gender distribution of the user, and ultimate effects of the information on the users amid the pandemic.

2. Materials and methods

2.1. Study area, design, and period

A web-based cross sectional study was conducted on 1808 people during December 10, 2020 to February 10, 2021, amid the second wave in Bangladesh. Data were collected using structured questionnaire developed in the mother tongue of local people (Bengali language) from all over the country. Sample size was determined based on the previously published works and our study sample size was large enough to power the statistical analysis. Categorical variables (yes vs no) were used to conduct the quantitative analyses. Socio-demographic variables included age, sex, profession and monthly income of the participants. Informed consent of the participants were taken before enrolling in the study. Appropriate ethical clearance was taken from Biosafety, Biosecurity & Ethical Committee at Jahangirnagar University under the clearance ref no. BBEC, JU/M 2021/COVID-19/(1)1.

2.2. Data collection tools and procedure

The data used in this study was collected by interviews over mobile phones and using Google forms. Data couldn't be collected by face-to-face interviews due to the COVID-19 pandemic. Data were collected by inviting the participants via the link of the questionnaire over Emails, Facebook, WhatsApp, YouTube and Instagram. Random sampling method was used to collect the data for this study. The responses of only the complete questionnaires were considered for the purpose of data analysis.

A validated questionnaire was implemented to conduct the study [20,21]. The questionnaire was comprised of five sections. Section A included five questions on socio-demographic characteristics of the participants. Section B comprised of ten questions on the most used sources of information for using masks, hand sanitizers and maintaining social distance and duration of using the social media during the pandemic. Section C included 8 questions about the source and influence of infor-

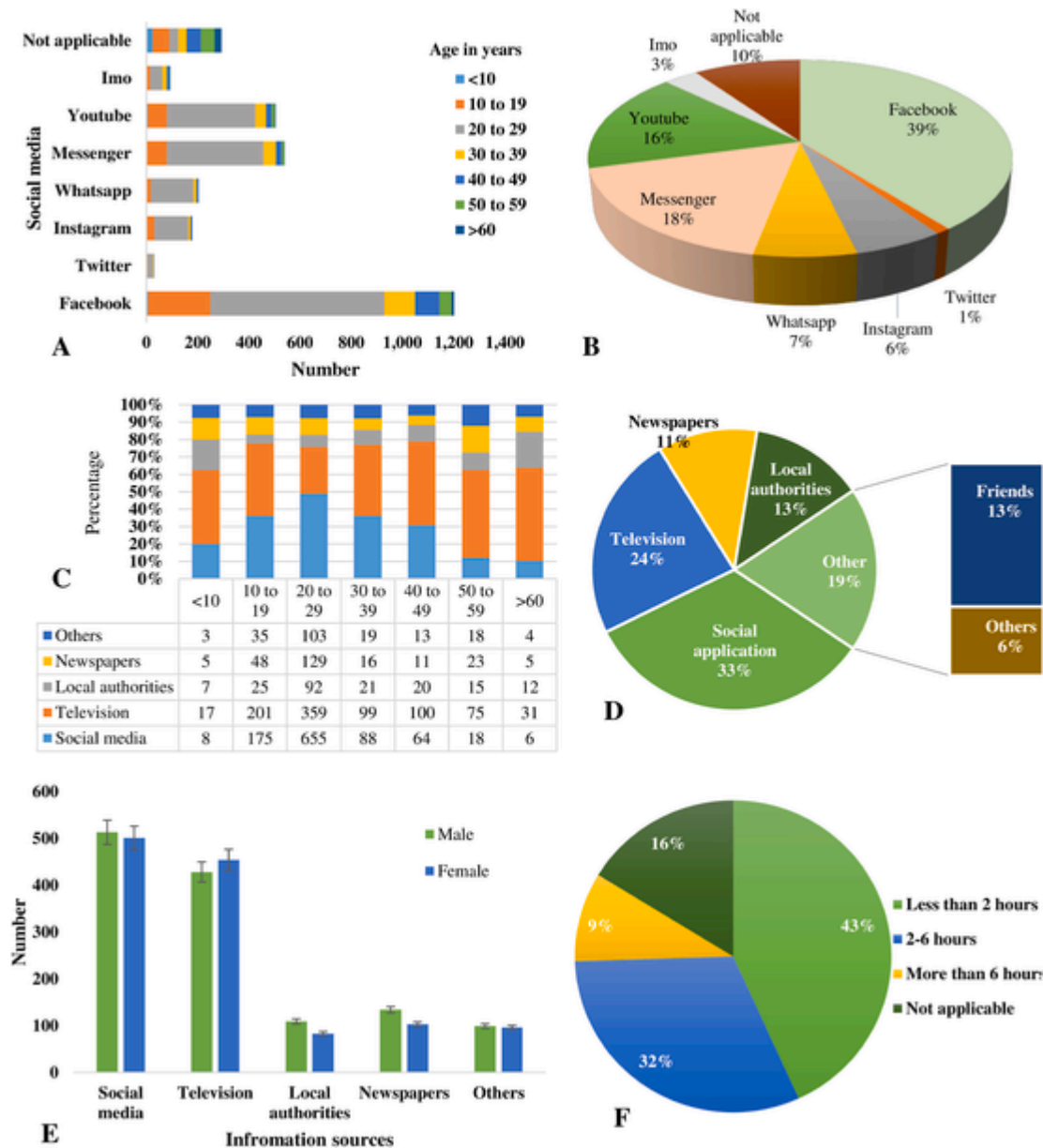


Fig. 1. Distribution of the frequency of participants using different A-B. Social media for getting information about mask using, hand sanitizer using and maintaining social distances, C-D. Frequency distribution of sources of information about COVID-19 associated death and cases in different age groups in Bangladesh, E. Sex distribution of the population to use different sources to obtain information on COVID-19, F. Frequency distribution of the duration of using social media during COVID-19 pandemic.

mation about case and fatality report of COVID-19. Section D and E included 15 questions to measure the influence of different information sources to build awareness about the pandemic. The scoring of the questionnaire was done for each question depending on the responses of the participants by following 'NHS Patient Survey Programme: Scoring of Questionnaires' guidelines.

2.3. Statistical analysis

Correlation analysis was conducted to determine the association of variables with the primary and secondary outcome among the study population. Percentage was used for presenting categorical variables and mean/median was used for continuous variables. Inferential statistics (*p*-value) was applied for the analysis. Statistical analysis was performed by using International Business Machines (IBM) Statistical Package for the Social Sciences (SPSS) version 26.0 (Chicago, IL, USA) and Microsoft Excel 2019.

3. Results

3.1. Socio-demographic analyses of the study population

During the study period 1808 participants responded in the study questionnaire. Female (52%, 937 of 1808) was the prevalent sex group. The mean age of the study population was 24 ± 3.9 years. In the categorical analysis, study participants were divided into seven age groups including below 10 years to above 60 years (Table 1). About 52.7% (459 of 871) of the population were from age group 20–29 years followed by age group 10–19 years (29%, 208 of 1808). Students (63%, 1131 of 1808) were the most common occupation of the population with no monthly (59%, 1059 of 1808) income followed by teacher (7%, 129 of 1808) (Table 1).

Table 2

Correlation among sources of information and likelihood of the participants to follow the health guidance.

| Variables | Mask using | | Hand washing/hand sanitizer using | | PPE/Hand gloves using | | Social distance maintaining | |
|-------------|------------|----------|-----------------------------------|----------|-----------------------|----------|-----------------------------|----------|
| | <i>r</i> | <i>p</i> | <i>r</i> | <i>P</i> | <i>r</i> | <i>p</i> | <i>r</i> | <i>p</i> |
| Sources | | | | | | | | |
| Facebook | .861 | .001 | .927 | .004 | -.014 | .001 | .834 | .197 |
| Messenger | .671 | .066 | .422 | .005 | -.034 | .005 | .649 | .004 |
| YouTube | .624 | .007 | .747 | .016 | -.142 | .022 | .871 | .019 |
| WhatsApp | .519 | .051 | .296 | .064 | -.008 | .047 | .197 | .005 |
| Instagram | .437 | .001 | .511 | .001 | -.043 | .341 | .614 | .167 |
| Television | .637 | .0001 | .897 | .006 | -.435 | .001 | .943 | .001 |
| Newspaper | .439 | .004 | .734 | .041 | -.243 | .066 | .494 | .046 |
| From others | .488 | .053 | .368 | .092 | -.113 | .723 | .637 | .031 |

P value < .05 were statistically significant.

3.2. Source of information towards the COVID-19 pandemic

About 84% (1514 of 1808) of the study population used social media amid the pandemic and female was the predominant users (50.4%, 763 of 1808) (Fig. 1). Among the social media platforms, Facebook (66.5%, 1203 of 1808) was most commonly used social media platform followed by Messenger (30%, 540 of 1808), YouTube (28%, 504 of 1808) and WhatsApp (11.3%, 204 of 1808), respectively. Most of the social media users (74%, 1347 of 1808) spent 0–6 h with mean 4.6 ± 2.1 h per day in browsing social media websites. Direct questions about the source of precautionary health measures information was incorporated in the study. Trend of getting information on cases, fatalities, transmission rate and daily epidemiological data of the participants was also measured. About 58% (1054 of 1808) of the population used social media for getting the information about the situation during the COVID-19 pandemic. Among the sources of information, participant used social media (53%, 959 of 1808) and television (44%, 800 of 1808) most frequently. Further, we analyzed the source of information of using masks, hand gloves, cleaning hands and maintaining social distance in this study. About 56% (1014 of 1808) participants got information on taking precautionary safety measures on social media followed by television (49%, 882 of 1808) and print media (13%, 237 of 1808). In cases of getting COVID-19 related information of local areas, participants also used social media (46%, 828 of 1808) most frequently, followed by television (32%, 588 of 1808), relatives (18%, 324 of 1808) and friends (17.6%, 318 of 1808), respectively (Fig. 1).

3.3. Role of social media on health behavior towards the COVID-19 pandemic

Direct questions about health practices of COVID-19 were used to measure the influence of the information available on social media and television. Among the participants 43.5% (787 of 1808) are sharing COVID-19 related health information on various social media platforms and majority of them are male 55.5% (437 of 787). Information on the patients with COVID-19 are also available in social media and television. Television 51.2% (926 of 1808) is the most common source of information followed by social media 48.2% (872 of 1808) on the recovering patients with COVID-19. Further, about 64.4% (1165 of 1808) of the participants are getting direct access to communicate with individuals recovering from COVID-19. Besides, rapid spread of information about COVID-19 is occurring inside the family members. About 74.3% (1343 of 1808) people are sharing the information with the family members who do not use social media. Information on safe practice of precautionary health measures have been made available through social media. About 96.8% (1750 of 1808) people were encouraged to wear mask by following informatics campaign on social media and television (Fig. 1). Further, information on social media and television has

also raised concern to avoid the use of hand gloves and PPE for mass people and increase the use among health care workers and doctors. About 98.3% (1777 of 1808), 84.3% (1524 of 1808) and 80.5% (1456 of 1808) people developed awareness about hand washing, hand sanitizers using and social distance maintaining through the information shared on various social media and television.

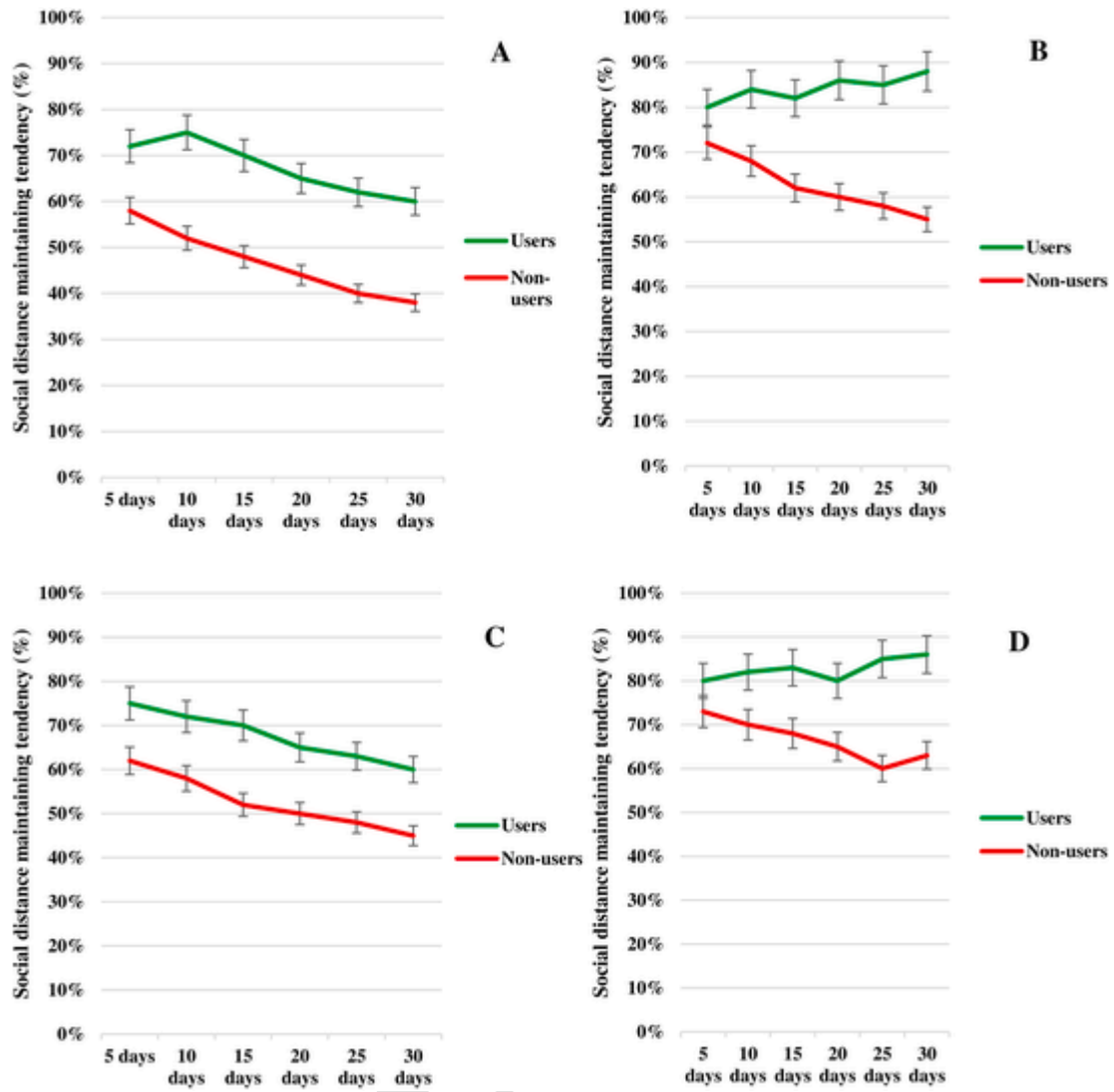
3.4. Correlation between health behavior and social media

Pearson's correlation analysis was conducted for the variables. The correlation was determined between source of information and tendency of the participants to follow the precautionary health measures. The most significant correlation was detected between mask using tendency and the information shared on Facebook ($r = 0.861$), followed by messenger ($r = 0.671$) and television ($r = 0.637$), respectively. Information shared on Facebook has also encouraged hand washing/hand sanitization most strongly ($r = 0.927$). Usage of hand gloves and PPE by the participants was negatively influenced by the informatics on the social media and television (Table 2). Further, strongest correlation was present between the social distance maintaining attitude and the information shared on the television ($r = 0.943$) and YouTube ($r = 0.871$) (Table 2).

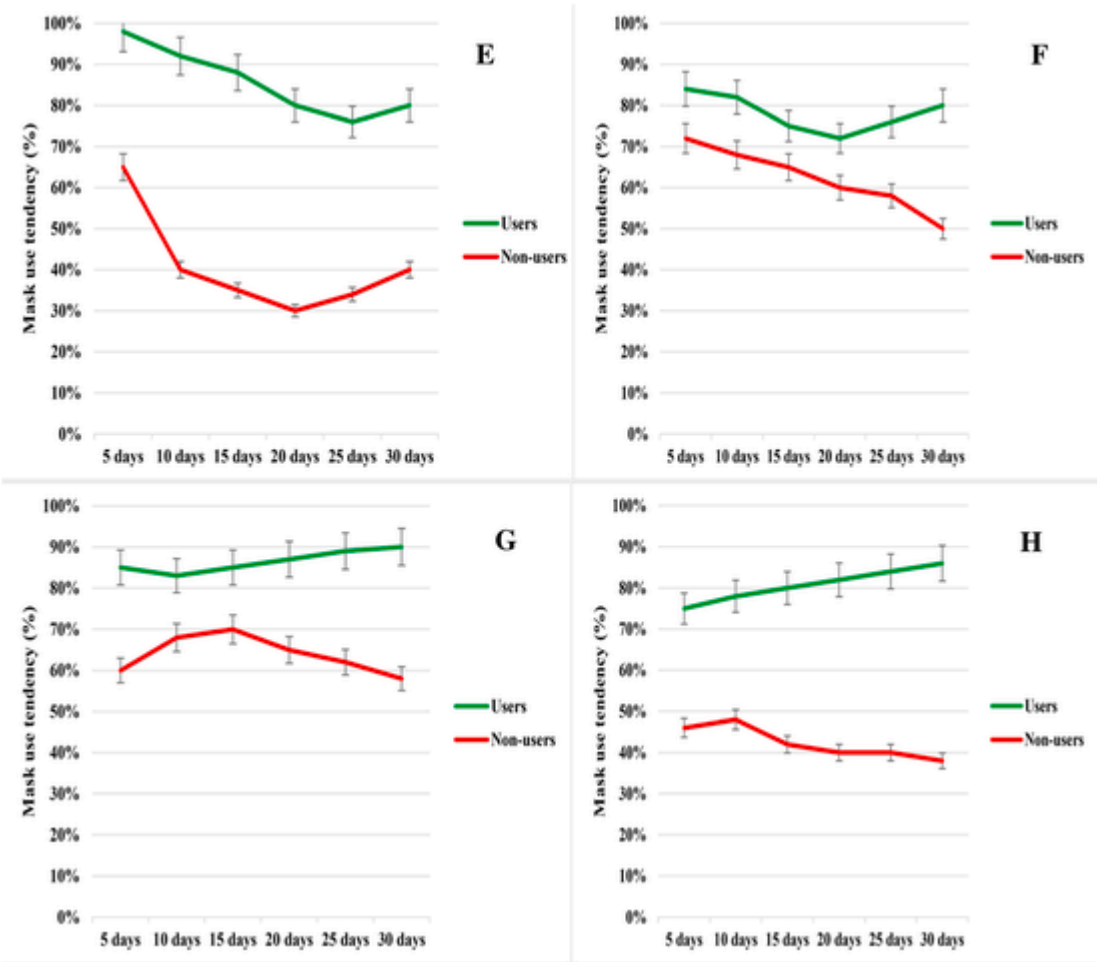
Sex-wise tendency of following the health precautionary measures of social media and television users versus non-users was also evaluated. Female participants using social media and television had the highest likelihood of following the social distance guidance (Fig. 2A–D). The tendency of following social distance increased from 80% on day 1–90% on day 28 of getting information among female. However, in male of both the users and non-users of the social media, the tendency of following social distance declined with increasing days from when they first got the information. About 100%–80% of the male who used social media followed the rules of using masks while outside but only 60%–40% of the male who didn't get information via social media followed the rules of using masks while outside (Fig. 2E–H). Further, hand washing aptitude was more common in male and female getting the information by social media and television than non-users of social media and television (Fig. 2I–L).

4. Discussion

Information and news on the social media, television and print media have profound influences on our daily activities [7]. During the ongoing COVID-19 pandemic various information have been made available to the people so that they can take proper health measures to avoid infection and transmission [7,9,18,19]. In this study we determined the impact and correlation of informatics on the COVID-19 pandemic. This study was conducted on 1808 participants. The ratio of male to female was 1:1.08 and the mean age was 24 ± 3.9 years. Students (63%, 1131 of 1808) were the most common occupation. Gender distribution, mean age and occupation of the people using information on social media and television published on recent articles were reflected by the findings in our study [32]. In this study, we found significant correlation between the likelihood of people to follow the health precautionary measures and the circulating health information on different platforms. We detected significant correlation between the social distance maintaining attitude and the information shared on the television ($r = 0.943$), mask using, and information on Facebook ($r = 0.861$), hand washing/hand sanitization and health message on Facebook ($r = 0.927$). Information shared on social media was the most popular and trusted sources of awareness building against COVID-19 followed by television and newspapers. To the best of our knowledge, this is the first study that comprehensively investigates the positive impact of social media, television and print media on building awareness among people about the COVID-19 pandemic in Bangladesh. These findings are similar with recently published works [7]. Social media have also played significant roles on



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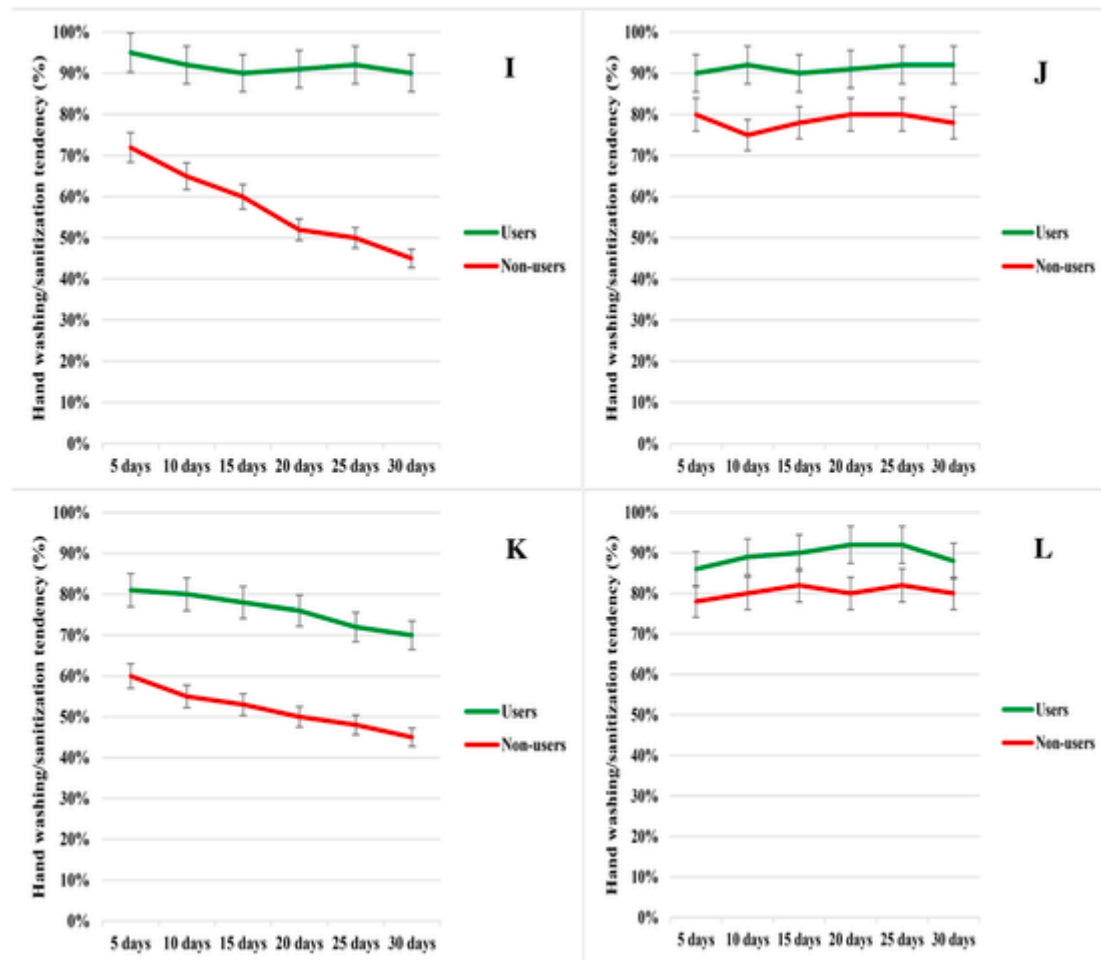


Fig. 2. A-D Frequency of the tendency to follow the information of maintaining social distance by A. Male users and non-users of social media, B. Female users and non-users of social media, C. Male users and non-users of television, D. Female users and non-users of television.

Fig. 2E-H Frequency of the tendency to follow the information of using masks by E. Male users and non-users of social media, F. Female users and non-users of social media, G. Male users and non-users of print media and television, H. Female users and non-users of print media and television. Fig. 2I-L Frequency of the tendency to follow the information of cleaning hands by I. Male users and non-users of social media, J. Female users and non-users of social media, K. Male users and non-users of print media and television, L. Female users and non-users of print media and television.

dispersing the information about the infected patients. This study found that information on recovering patients were most available on the television 51.2% (926 of 1808) followed by social media 48.2% (872 of 1808). Due to the use of social media, 64.4% (1165 of 1808) of people can directly communicate with individuals already recovered from COVID-19. This communication has also benefited in reducing community transmission. About 98.3% (1777 of 1808), 96.8% (1750 of 1808), 84.3% (1524 of 1808) and 80.5% (1456 of 1808) people developed awareness about hand washing, wearing masks, hand sanitizers using and social distance maintaining, respectively by following the information available on social media and television. Findings in this study are in good agreement with recently published work [7,9,19,23]. The acceptability of information shared on Facebook, Messenger, YouTube, television and newspapers as sources of knowledge during the current outbreak echoed past infectious outbreaks including severe acute respiratory syndrome (SARS) [31], H1N1 pandemic [34,35], seasonal flu, and Middle-East respiratory syndrome (MERS) in 2003, 2009 and 2012, respectively [36]. Previous studies on impact of communication have found that electronic and print media were used by the common people as the main source of information on outbreaks [37], relating the findings of our study. Further, previously published works reported that the government websites, doctors, health officials and television were the most used and trusted sources of outbreak related information [7,33], while another study on Ebola outbreak found internet and the govern-

ment to be the most used information sources [37]. Along with various websites, social media has become a major part of communication in recent years. In similar with previous studies, this study also detected that electronic and print media have great impact on dissemination of knowledge regarding COVID-19 pandemic, but social media has the most significant role in Bangladesh [7,9,17,34–37].

Precautionary health practices are regarded as the most suitable preventive measures to stop the transmission of COVID-19. Though vaccination program has been started, both the vaccinated and unvaccinated people are advised to follow the preventive measures [38,39]. Social media, television and print media have made people aware about the preventive measures by continuous sharing of the information during the pandemic [7,17,38,39]. In this study, we found that the users of social media and television continuously got the information and built the habit of wearing masks, cleaning hands and maintaining social distances, while non-users of social media or television had less likelihood of following the health measures. These findings were in good agreement with previous studies [7,17,38,39]. Attitude of using different mainstream media and social media among people during the pandemic changed. During lockdown, the frequency of usage of various websites and social media platform significantly increased. Different pages on Facebook and channels on YouTube were more available to people than the printed newspaper during the lockdown. The government and health agencies took various steps to promote health informa-

tion via both social media and television as well as through different websites. Our study found that the strategies of the government and health agencies were up to the mark to satisfy the demand of the people amid the pandemic. Younger generation were the most common users of social media and they actively inform other members of the family about the health measures of the pandemic. However, spread of misinformation leading to panic situation among people were inconsistently found during the pandemic. On the contrary, the government and other mainstream media reacted rapidly against the spread of misinformation and tried to keep the trust of the people on the original information regarding the pandemic.

Number of limitations were present in this study. First, the study was conducted on the data of self-reported population. Second, the internal diversity of pages on social media have significantly influenced the trends of information extraction of people during the pandemic. So, in future research work should focus on define web pages on social media platform and add specific stratified sources of information. Knowledge, attitude and belief about the crisis of the pandemic are frequently changing among the people, so the questions used in this study may become irrelevant in future situations of the pandemic. However, the main strength of the study is the large size of the population and stratified analysis of social media platform by age and gender of the people. This structured analysis can be adapted and re-executed in the future studies focusing the changing pattern of the pandemic.

5. Conclusions

To the best of our knowledge, this is the first study revealing the attitude of the people to use various information sources including social media, television and print media and the impact of these information on the users about the COVID-19 pandemic. The demand of quick communication of authentic and original information about the pandemic is constantly present and the findings of this study will provide significant insights to the government, policy makers and health agencies to acknowledge the impact of these information on developing awareness and knowledge about the pandemic. In addition, the socio-demographic profiling of the users and non-users of information will help the public health agencies to identify the community and implement altered program to communicate the messages more effectively. In future, researches should include larger sample to highlight the actual discrepancy in dissemination of information regarding COVID-19 in Bangladesh and other countries.

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Author contributions

Nadim Sharif: Conceptualization (lead); Data curation (lead); Formal analysis (lead); Investigation (equal); Methodology (lead); Project administration (lead); Software (lead); Validation (lead); Writing-original draft (lead); Writing-review & editing (lead). **Rubayet Rayhan Opu:** Data curation (equal); Investigation (equal). **Khalid J Alzahrani:** Data curation (equal); Investigation (equal). **Shamsun Nahar Ahmed:** Data curation (equal); Methodology (equal). **Suchana Islam:** Data curation (equal). **Shika Sohoda Mim:** Data curation (equal). **Fariha Bushra Khan:** Data curation (equal). **Fariha Zaman:** Data curation (equal). **Shuvra Kanti Dey:** Conceptualization (lead); Data curation (lead); Formal analysis (lead); Investigation (equal); Methodology (lead); Project administration (lead); Software (lead); Validation (lead); Writing-original draft (lead); Writing-review & editing (lead).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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