A Nationwide Assessment of Kuwaitis' Compliance with Preventative Measures During the COVID-19 Epidemic

ABRAR GHAITH
PH.D. RESEARCHER

FACULTY OF ECONOMICS AND BUSINESS, UNIVERSITY OF DEBRECEN, HUNGARY
e-mail: ghaith.abrar@econ.unideb.hu
https://orcid.org/0000-0003-0370-759X

ISLAM ALGHREIZ
CLINICAL PHARMACIST

JABER AL-AHMAD ARMED FORCES HOSPITAL, KUWAIT
e-mail: ialghariz@gmail.com
https://orcid.org/0009-0004-2297-6191

TAYSEER AFIFI
MASTER STUDENT

DEPARTMENT OF PHYSIOLOGY AND BIOCHEMISTRY, JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, JORDAN
e-mail: afifi.tayseer@gmail.com
https://orcid.org/0000-0001-5289-9538

SUMMARY

This study examined how well people in Kuwait followed guidelines to prevent the spread of COVID-19. To prevent the virus's spread, precautionary measures such as social distancing, wearing masks, and hygiene practices have employed. The purpose of this study was to analyze the Kuwaiti population's adherence to precautionary measures during the epidemic. A cross-sectional study was carried out between March and August of 2022 with the use of a self-administered online questionnaire distributed to Kuwaitis aged 20 or above. The questionnaire included demographic questions as well as questions on preventative behaviors. Descriptive statistics, chi-square analysis, and multivariate regression analysis were used to examine the data. The findings revealed that 54.8% of individuals had good behaviors, with hand cleanliness being the most prevalent and eating a healthy diet being the least common. Chronic illnesses, a history of COVID-19 infection, and the COVID-19 vaccine were all linked to levels of practice. Regression analysis demonstrated that COVID-19 infection considerably enhanced the likelihood of adherence to preventative measures. The data indicate that, while a sizable majority of the Kuwaiti population engaged in beneficial activities, there is still room for improvement, particularly in terms of adopting a better diet. Future efforts should concentrate on marketing and educating the public about the relevance of COVID-19 prevention measures.

Keywords: COVID-19, Precautions, Preventive practices, Pandemics, Outbreak Kuwait

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STUDY BACKGROUND AND LITERATURE REVIEW

The global impact of COVID-19

Since its emergence in late 2019, the COVID-19 pandemic, caused by the novel coronavirus SARS-CoV-2, has rapidly spread worldwide. The initial absence of readily available antiviral treatments or established vaccines presented significant challenges in curbing the virus's transmission (He et al., 2020; Yang et al., 2020; Zhou et al., 2020). To mitigate the spread and protect public health, governments and healthcare institutions implemented non-pharmaceutical interventions (NPIs) such as social distancing, mask-wearing, and hygiene practices. These interventions have demonstrably reduced disease transmission and improved outcomes at

both the individual and community levels (Chu et al., 2020; Fazio et al., 2021; Jones et al., 2021; Liu et al., 2021). Compliance with these preventative measures has been identified as a crucial factor in disease control (Paules et al., 2020; Shaw et al., 2020). However, compliance levels and influencing factors may vary across different populations. Understanding compliance patterns within specific groups is essential for tailoring public health interventions and maximizing their effectiveness.

The COVID-19 situation in Kuwait

The first cases of COVID-19 in the Gulf region were reported in Kuwait and Bahrain among travelers arriving from Iran and Iraq (Al-Tawfiq & Memish 2020; Al-Tawfiq et al., 2020). As of June 2, 2024, the World Health Organization (WHO) had reported 667,158 confirmed COVID-19 cases and 2,570 deaths in Kuwait since the pandemic's inception (Covid-19 cases | WHO COVID-19 Dashboard, 2024; Covid-19 deaths | WHO covid-19 Dashboard, 2024). The first COVID-19 vaccine was introduced globally in December 2020, with over 5.47 billion doses distributed worldwide by December 2023 (Covid-19 vaccines | who covid-19 dashboard, 2024). Data suggests a high vaccination rate in Kuwait, over 8 million vaccine doses had been administered as of July 15, 2022 (Kuwait COVID - Coronavirus Statistics - Worldometer, 2024), and assuming a two-dose regimen, approximately 96.5% of the population might be vaccinated (Bhatia et al., 2022). The primary mode of COVID-19 transmission is through respiratory droplets expelled during coughing or sneezing from infected individuals, as well as contact with contaminated surfaces (Wang et al., 2020; Zhang & Holmes, 2020; Zhou et al., 2020). Common symptoms include a cough, fever, and difficulty breathing, with an incubation period of up to 14 days following exposure (COVID-19 fact sheets | WHO COVID-19 Dashboard, 2024). Severe breathing problems and organ failure can be later-stage complications, potentially leading to death from septic shock (Xu et al., 2020). The pandemic has significantly impacted global health, economies, and societies, prompting authorities and healthcare systems worldwide to combat the virus's spread and manage disease burden.

Public health interventions, non-pharmacological interventions (NPIs), and preventative measures

To contain the rapid spread of COVID-19, governments worldwide issued public health guidelines and restrictions (Shrestha et al., 2020; Xu et al., 2020). Based on recommendations from public health agencies, many countries implemented control measures to limit viral transmission, including:

- **Physical Distancing (Social Distancing):** Maintaining physical distance between individuals reduces the likelihood of transmission (Chu et al., 2020; Fazio et al., 2021; Jones et al., 2020; Liu et al., 2021).

- **Mask-Wearing:** Wearing face masks helps prevent the spread of respiratory droplets containing the virus (Chu et al., 2020; Feng et al., 2020).

- **Hand Hygiene:** Regular handwashing with soap and water or using hand sanitizer significantly reduces the risk of infection (WHO, Advice for the Public on COVID-19, 2023).

- **Isolation and Quarantine:** Isolating individuals suspected of being infected or exposed to the virus helps prevent further transmission (WHO, Advice for the Public on COVID-19, 2023).

- **Restrictions on Gatherings and Movement:** Restrictions on gatherings and movement, such as limiting large gatherings, public events, and travel, have been shown to be effective in reducing viral transmission (Boyer et al., 2022). Limiting large gatherings, public events, and travel were measured aimed to reduce opportunities for viral transmission (Fowler et al., 2021). Askitas et al. (2021) further underscores the effectiveness of cancelling public events and imposing restrictions on private gatherings in reducing COVID-19 incidence.

- **School and Workplace Closures:** Research has shown that the closure of schools and non-essential businesses can significantly reduce the spread of infectious diseases, including COVID-19 (Demirbilek, 2021). However, the effectiveness of these measures can vary depending on the timing of their implementation (Demirbilek, 2021). Some experts advocate for nationwide closures to enforce social distancing and slow the spread of the virus (Zviedrite et al., 2021).

- **Increased Sanitation and Disinfection:** Public spaces and high-touch surfaces were frequently disinfected to reduce the risk of transmission via contaminated surfaces. Frequent disinfection of high-touch surfaces in public spaces is crucial for reducing the risk of pathogen transmission (Ackerley et al., 2023; Yatmo et al., 2020). This is particularly important in healthcare settings, where disinfection has been shown to reduce contamination of healthcare workers' hands (Kundrapu et al., 2012). However, the

effectiveness of surface disinfection in reducing the transmission of SARS-CoV-2 is dependent on the prevalence and frequency of contacts (Pitol & Julian, 2020).

A range of non-pharmaceutical interventions (NPIs) have been found to be effective in reducing COVID-19 cases, hospitalizations, and deaths, with the specific intervention, stringency of implementation, and population adherence playing key roles (Méndez-Brito et al., 2021; Peters & Farhadloo, 2023). A multi-pronged approach combining these measures with vaccination has been particularly effective (León et al., 2021). However, the interaction between NPIs and vaccination coverage can vary, with more stringent NPIs being associated with lower COVID outcomes, particularly during booster campaigns (Ammi et al., 2024). Based on previous studies, the current study aims to analyze the Kuwaiti population's compliance with protective activities prior to and following the COVID-19 pandemic, as well as characteristics related to positive practices.

Study objectives

1. To assess the adherence level of the Kuwaiti population to recommended COVID-19 prevention precautions, such as social distancing, mask-wearing, and hygiene practices.
2. To investigate the association between demographics, health status (including chronic illness and prior COVID-19 infection), and vaccination status with adherence to preventive measures.
3. To identify the most and least frequently followed preventive precautions and behaviors among Kuwaitis.

STUDY METHODOLOGY

Design of the study and population

The cross-sectional design of this study allowed for the examination of a sample of Kuwaiti citizens who were at least 20 years old. An online questionnaire that participants self-administered was used to collect data between March and August of 2022.

Study tool

Following a comprehensive literature review of relevant past research (Abouzid et al., 2021; Al Ahdab, 2021; Chacón et al., 2021; Isah et al., 2021; Masoud et al., 2021; Rajbanshi et al., 2022), a web-based questionnaire

was constructed. The instrument incorporated validated questions from prior studies to ensure content validity.

The questionnaire was comprised of two sections: demographics and self-reported health practices.

- **Demographics:** This section collected information on age, gender, location, education level, income, health status, COVID-19 infection history, and vaccination status.
- **Health Practices:** This section employed a five-point Likert scale (1 = never, 5 = always) to assess participants' frequency of:
    1. Using general vitamin supplements (e.g., vitamin D).
    2. Using immune-supporting supplements (e.g., vitamin C, zinc, magnesium).
    3. Utilizing hand sanitizer, medical alcohol, or other disinfectants.
    4. Sanitizing objects (electronic devices, surfaces).
    5. Wearing gloves.
    6. Avoiding crowded spaces (less than six individuals).
    7. Adopting a healthier diet (increased fruits, vegetables, and protein; decreased carbohydrates, and fats).
    8. Undergoing COVID-19 PCR testing.
    9. Self-isolating during flu-like or COVID-19 symptoms.

Translation and validation

Deena Moghrabi, a certified translator fluent in English, German, and Arabic, translated the questionnaire from English to Arabic and then back-translated it to English. Two field experts (Dr. Amal Akour, Associate Professor, Department of Pharmacology; Dr. Ghaith Al Abdallah, Associate Professor of Marketing) evaluated the instrument's accuracy, clarity, content validity, relevance, and conciseness. Their recommendations were discussed and incorporated before finalization. Table 1 presents the final survey statements.

A pilot study with 30 participants assessed the questionnaire's validity and reliability. Based on the results, the number of statements was reduced and wording refined for improved clarity.

Survey administration

The survey instrument was complied using Google Forms and distributed across various social media platforms, Including Facebook and WhatsApp groups. To ensure participant privacy, the survey offered

anonymity and the option to complete it in Arabic or English. Incomplete surveys were excluded from the analysis to minimize information bias.

Sampling approach and representativeness

A convenience sample was obtained through non-probability sampling methods on social media. Statistical software was employed to determine the minimum required sample size for generalizability to a larger population (Dean et al., 2010). Based on this analysis, a sample size of 385 was deemed sufficient. A total of 389 complete surveys were deemed valid for further analysis.

Data analysis

After being structured in a Microsoft Excel spreadsheet, the data was imported and processed using R Statistical Software (v4.1.3; R Core Team 2022). The baseline demographic factors were described using descriptive statistics, which include means and standard deviations for continuous variables and frequencies and percentages for categorical categories. The following codes were applied to the health practices section responses: Never = 1, Seldom = 2, Occasionally = 3, Frequently = 4, Always = 5. Individuals were classified as having good habits if their overall score was either equal to or higher than the norm.

Descriptive statistics, chi-square analysis, and multivariate regression analysis were used to examine the data.

To investigate the connection between the degree of practice and the demographic characteristics, chi-square analysis was performed. Furthermore, a multivariate regression analysis was utilized to investigate the correlation between practice level and demographic characteristics. 95% confidence intervals (CI) and odds ratios (OR) were used to display the results. It was decided that a significance threshold of 0.05 indicated statistical significance.

Ethical considerations

The Declaration of Helsinki's ethical standards were followed in this cross-sectional observational study. All participants gave informed consent before the start of data collection, and participation was completely voluntary. Strict protocols were put in place to guarantee anonymity and confidentiality during the whole research process, including data collection, storage, and analysis. The University of Debrecen oversaw of the research to maintain ethical standards.

RESULTS

Demographic characteristics of the participants

The total number of survey respondents who completed their data was 389 individuals all of whom were included in the final analyses (Appendix Table 1). One third of the participants were under the age of thirty (n= 130, 33.4%), and more than half were female (n= 231, 59.4%). There were 310 individuals (79.7%) who had a bachelor's degree or a higher degree and only 65 (16.7%) worked or studied in the health science field. More than a third of participants of the respondents (n= 142, 36.5%) had a monthly income of USD 565 or less, while 24.9% had an income more than USD 1963 (n= 97). The majority of them (n= 316, 81.2%) were not diagnosed with any chronic diseases such as diabetes or high blood pressure. The vast majority (n= 356, 91.5%) had received the coronavirus vaccine, while more than half of the participants (n= 213, 54.8%) were infected with the coronavirus. Moreover, 213 individuals (54.8%) reported having a friend or family member who died due to COVID-19 (Table 1).

Table 1

Baseline characteristics of the participants

Label	Frequency (%) (n= 389)
Age, years	
• 20-29	130 (33.4)
• 30-39	175 (45)
• > 40	84 (21.6)
Gender	
• Female	231 (59.4)
• Male	158 (40.6)

Educational level	
• Higher education degree e.g. bachelor	310 (79.7)
• High school	79 (20.3)
Educational background	
• Health-related sciences	65 (16.7)
• Non-health-related sciences	324 (83.3)
Monthly income in USD	
• 565 or Less	142 (36.5)
• 565 – 1128	75 (19.3)
• 1128 – 1693	75 (19.3)
• More than 1693	97 (24.9)
Diagnosed with a chronic illness e.g. diabetes or hypertension	
• No	316 (81.2)
• Yes	73 (18.8)
Received COVID-19 vaccine	
• No	33 (8.5)
• Yes	356 (91.5)
Infected by COVID-19	
• No	176 (45.2)
• Yes	213 (54.8)
A family member, friend, colleague or relative died due to COVID infection	
• Not sure	22 (5.7)
• No	154 (39.6)
• Yes	213 (54.8)

Source: Data collected and analyzed by the researchers.

Participants' adherence to the preventive measures

Based on the results of the study, the average of the total scores for the practices of the participants was 34.7 out of 45 with a standard deviation of 5.4. Only 213 participants (54.8%) had a score representing favorable practices (a score equal to or more than the mean) while the rest (n= 176, 45.2%) had unfavorable practices. The highest average score for an item was for using hand sanitizers, rubbing alcohol, and other antiseptics (mean = 4.2, SD = 0.7). On the other hand, the lowest average score of a single item was for choosing a healthy diet (containing more fruits, vegetables, proteins, and fewer fats and carbohydrates) (mean = 3.4, SD = 1.0). The details of the results of the practice section are summarized in Table 2.

Table 2

Participants' adherence to the preventive measures

Label	Mean (SD)
Consumed vitamin supplements e.g. vitamin D	3.6 (1.0)
Consumed certain supplements with potential to boost immunity (Vitamin C/Zinc/Magnesium)	3.8 (1.0)
Used hand sanitizers, rubbing alcohol and other antiseptics	4.2 (0.7)
Used disinfectants on objects e.g., groceries, electronic devices, surfaces	3.7 (1.1)
Wore face masks and/or gloves	4.1 (0.9)
Avoided crowds of more than 6 people in a closed area	3.6 (1.0)
Chose a healthier diet (more fruits, vegetables and proteins and less fats and carbohydrates)	3.4 (1.0)
Took COVID-19 PCR diagnostic Test	4.0 (0.9)
Self-isolated when COVID-19 or flu-like symptoms were experienced	3.9 (0.9)
Total score of practice	34.7 (5.4)
Practice Frequency (%)	
• Favorable practice	213 (54.8)
• Unfavorable practice	176 (45.2)

Source: Data collected and analyzed by the researchers.

Distribution of participants according to practice:

Chi-square tests revealed no significant difference between the group with favorable and unfavorable practices in terms of age, gender, education backgrounds, monthly income, COVID-19 vaccination, or knowing people who had died from COVID-19. However, there was a significant difference regarding being diagnosed with a chronic condition (P= 0.003), history of COVID-19 infection (p <0.001), and COVID-19 vaccination (p = 0.048). More participants had a history of COVID-19 infection in the favorable practices group (n= 139, 65.3%) compared to the unfavorable practices group (n= 74, 42%). More participants with higher monthly income were in the favorable practices group (Table 3).

Table 3

Distribution of participants according to practice

Label	Favorable practice	Unfavorable practice	p-value
Age, years			0.339
• 20-29	67 (31.5)	63 (35.8)	
• 30-39	103 (48.3)	72 (40.9)	
• > 40	43 (20.2)	41 (23.3)	
Gender			0.338
• Female	129 (60.6)	102 (58)	
• Male	84 (39.4)	74 (42)	
Educational level			0.328
• College or above degree e.g. bachelor	172 (80.8)	138 (78.4)	
• High school	41 (19.2)	38 (21.6)	
Educational background			0.214
• Health-related sciences	39 (18.3)	26 (14.8)	
• Non-health-related sciences	174 (81.7)	150 (85.2)	
Monthly income in USD			0.378
• 565 or Less	77 (36.2)	65 (36.9)	
• 565 – 1128	35 (16.4)	40 (22.7)	
• 1128 - 1693	44 (20.7)	31 (17.6)	
• More than 1693	57 (26.8)	40 (22.7)	
Diagnosed with a chronic illness e.g. diabetes or hypertension			0.003
• No	162 (76.1)	154 (87.5)	
• Yes	51 (23.9)	22 (12.5)	
Received COVID vaccine			0.048
• No	13 (6.1)	20 (11.4)	
• Yes	200 (93.9)	156 (88.6)	
Infected by COVID			<0.001
• No	74 (34.7)	102 (58)	
• Yes	139 (65.3)	74 (42)	
A family member, friend, colleague or relative died due to COVID infection			0.887
• Not sure	11 (5.2)	11 (6.3)	
• Yes	118 (55.4)	95 (54)	
• No	84 (39.4)	70 (39.7)	

Source: Data collected and analyzed by the researchers.

Regression analysis of factors affecting participants' practice:

Regression analysis found that infection with COVID-19 significantly increases the odds of compliance with the protective measures or having favorable practices (adjusted OR = 2.58; 95% CI: [1.71-3.9], p-value <0.001) (Table 4).

Table 4

Regression analysis of factors affecting participants' practice

Label	Unfavorable practice	Favorable practice	OR (univariable)	OR (multivariable)
Age, years				
• 20-29	127 (47.7)	139 (52.3)	-	0.49 (-0.08-1.09, p=0.62)
• 30-39	36 (45.0)	44 (55.0)	-	
• > 40	21 (35.0)	39 (65.0)	-	
Gender				
• Female	135 (47.0)	152 (53.0)	1.11 (0.74-1.67, p=0.338)	0.15 (-0.092-1.08, p=0.876)
• Male	49 (41.2)	70 (58.8)		
Educational level				
• College or above degree e.g. bachelor	146 (44.9)	179 (55.1)	0.92 (0.71-1.42, p=0.328)	1.25 (0.21-4.08, p=0.212)
• High school	38 (46.9)	43 (53.1)		
Educational background				
• Health-related sciences	85 (43.6)	110 (56.4)	0.89 (0.71-1.11, p=0.214)	0.64 (0.087-1.72, p=0.521)
• Non-health-related sciences	99 (46.9)	112 (53.1)		
Monthly income in USD				
• 565 or Less	128 (49.4)	131 (50.6)	-	1.68 (0.084-1.7, p= 0.094)
• 565 – 1128	33 (36.3)	58 (63.7)	-	
• 1128 - 1693	9 (30.0)	21 (70.0)	-	
• More than 1693	14 (53.8)	12 (46.2)	-	
Diagnosed with a chronic illness e.g. diabetes or hypertension				
• No	160 (46.9)	181 (53.1)	1.36 (1.13-1.64, p=0.003)	2.22 (0.27-4.17, p=0.026)
• Yes	24 (36.9)	41 (63.1)		
Received COVID vaccine				
• No	7 (46.7)	8 (53.3)	1.38 (1.02-1.86, p=0.048)	1.48 (0.043-3.11, p= 0.137)
• Yes	177 (45.3)	214 (54.7)		

Infected by COVID				
• No	98 (58.3)	70 (41.7)	2.58 (1.71-3.90, p<0.001)	4.38 (0.061-6.1, p<0.001)
• Yes	86 (36.1)	152 (63.9)		
A family member, friend, colleague or relative died due to COVID infection				
• Not sure	11 (55.0)	9 (45.0)	-	0.13 (0.089-0.78, p=0.89)
• Yes	102 (41.6)	143 (58.4)	-	
• No	71 (50.4)	70 (49.6)	-	

Source: Data collected and analyzed by the researchers.

DISCUSSION

This study was conducted in Kuwait to assess adherence to preventive practices during the COVID-19 pandemic among the general population. The study revealed that more than the half of the participants (54.8%) had favorable practices while the rest (45.2%) had unfavorable practices. This study investigated how well people in Kuwait followed COVID-19 prevention measures, similar to findings of 50.2% in Palestine (Nazzal et al., 2022). However, studies in the UAE and Iraq reported much higher adherence rates 90% and 76% respectively (Saeed et al., 2021a; Saeed et al., 2021b). This suggests potential cultural or social factors influencing preventive behaviors across regions.

Similarities with other studies

- **Hand Hygiene:** The item with the highest average score was utilizing hand sanitizers, rubbing alcohol, and other antiseptics. This might be linked to the fact that, during the COVID-19 epidemic, more personal safety gear was made available to the populace, as well as the growing culture of properly washing hands (Kyei-Arthur et al., 2023). Frequent use of hand sanitizers and antiseptics was the most common positive practice in our study, aligning with findings in Palestine and Iraq (Saeed et al., 2021b; Salameh et al., 2021). This may be due to increased availability of hygiene products during the pandemic and growing awareness of proper handwashing.

- **Healthy Eating:** Our study found the lowest adherence to healthy eating practices. This aligns with research in Poland, which suggests lockdowns and stress can negatively impact dietary habits (Sidor & Rzymski, 2020). Similar findings were observed in university students in Turkey (Baygut, 2022). Interestingly, a review of diabetic patients showed mixed results, with some communities increasing fruit and vegetable intake while others increased sweets (Lashkarbolouk et al., 2022). However, a study in Palestine found a higher adherence to balanced diets (Nazzal et al., 2022). These discrepancies highlight the influence of cultural norms on dietary preferences.

Factors affecting adherence

- **Health Status:** Similar to a study in Palestine (Nazzal et al., 2022), we found a significant association between having a chronic illness, prior COVID-19 infection, and vaccination with adherence to preventive measures. The favorable practices group had a higher percentage of individuals with a history of COVID-19 infection, suggesting a heightened awareness of risks.

- **Vaccination:** Our study showed a high vaccination rate (91.5%), potentially due to factors like accessibility, public health campaigns, and trust in healthcare institutions (Freeman et al., 2022). This contrasts with global vaccine hesitancy issues (MacDonald, 2015).

Overall, this study adds to the growing body of research on COVID-19 prevention behaviors. While Kuwaitis generally showed good adherence, there is need for improvement, particularly in healthy eating. Future public health efforts should consider cultural influences and tailor interventions accordingly.

CONCLUSIONS

This study investigates the adherence of the Kuwaiti population to preventative measures during the COVID-19 pandemic. The findings reveal that a significant

portion of the population adopted healthy behaviors, although there is potential for improvement, particularly regarding dietary habits. Interestingly, the study identifies a positive association between a history of COVID-19 infection, higher income levels, and better compliance with preventive measures. These results underscore the critical role of ongoing public health education and targeted interventions in fostering and sustaining positive health behaviors. While vaccination rates were encouraging, further efforts are necessary to achieve widespread protection against the virus. Overall, the study emphasizes the significant influence of individual actions and socioeconomic factors on regulating COVID-19 transmission.

Economic and business impacts of compliance with preventative measures

This study contributes to the understanding of how compliance with preventative measures during a pandemic can influence economic and business outcomes. Here's how:

- **Reduced healthcare burden:** High compliance with measures like social distancing and mask-wearing can lead to a decrease in COVID-19 cases. This translates to lower healthcare costs for the government and businesses, as fewer employees fall sick and require hospitalization. Reduced healthcare strain also frees up resources for other medical needs.

- **Improved workforce productivity:** A healthier workforce leads to less absenteeism due to illness. This translates to higher productivity for businesses, potentially boosting economic output. Additionally, businesses may see a decrease in presenteeism (employees working while sick), leading to improved overall efficiency.

- **Business continuity and supply chain stability:** Reduced COVID-19 outbreaks minimize disruptions to business operations and supply chains. This ensures a more stable economic environment for businesses to function effectively.

Economic and business implications for Kuwait

The study's findings on compliance variations in Kuwait can inform targeted interventions to improve adherence. This can lead to:

- **Reduced economic disruptions:** By promoting better compliance, particularly in areas like healthy eating, businesses can experience fewer employee sicknesses and disruptions.

- **Improved economic resilience:** A healthier population with strong preventative behaviors makes the Kuwaiti economy more resilient to future pandemics and outbreaks.

- **Targeted public health campaigns:** Understanding the factors influencing compliance (e.g. income level, prior infection) allows for more effective allocation of resources for public health campaigns focused on specific demographics.

FUTURE CONSIDERATIONS

More study is needed to investigate the underlying causes of reported behaviors and attitudes toward preventative actions. Qualitative research might help us understand the challenges and facilitators of compliance with protective behaviors in the Kuwaiti population. Longitudinal studies are needed to determine the long-term viability of good behaviors and uncover variables influencing behavior change. Comparative research across communities and nations would help us gain a better grasp of the cultural and environmental impacts of preventative practices. Future treatments should also address the difficulty of maintaining a healthy diet during times of crisis and investigate techniques to encourage dietary changes. Finally, constant monitoring and assessment of public health interventions and educational campaigns are required to change methods and keep control of epidemics successful.

Author's contribution

REFERENCES

Abouzid, M., El-Sherif, D. M., Eltewacy, N. K., Dahman, N. B. H., Okasha, S. A., Ghozy, S., & Islam, S. M. S. (2021). Influence of COVID-19 on lifestyle behaviors in the Middle East and North Africa Region: a survey of 5896 individuals. *Journal of translational medicine,19*, 129. https://doi.org/10.1186/s12967-021-02767-9

Ackerley, L., Cooper, S., Upson, S., Paskey, A. Gent, L. Buckley, C., Spitzer, M. E., Sexton, J. D., Picton, J. L., & Reynolds, K. A. (2023). Who touched that? Interconnection of high-touch surfaces drives pathogen spread in public spaces. *European Journal of Public Health, 33*(Supplement_2), ckad160-995. https://doi.org/10.1093/eurpub/ckad160.995

Al Ahdab, SA. (2021). A cross-sectional survey of knowledge, attitude and practice (KAP) towards COVID-19 pandemic among the Syrian residents. *BMC Public Health, 2021*(February), 296. https://doi.org/10.1186/s12889-021-10353-3

Al-Tawfiq, J. A., & Memish, Z. A. (2020). COVID-19 in the Eastern Mediterranean Region and Saudi Arabia: prevention and therapeutic strategies. *International Journal of Antimicrobial Agents, 55*(5), 105968. https://doi.org/10.1016/j.ijantimicag.2020.105968

Al-Tawfiq, J. A., Sattar, A., Al-Khadra, H., Al-Qahtani, S., Al-Mulhim, M., Al-Omoush, O., & Kheir, H. O. (2020). Incidence of COVID-19 among returning travelers in quarantine facilities: a longitudinal study and lessons learned. *Travel Medicine and Infectious Disease, 38*, 101901. https://doi.org/10.1016/j.tmaid.2020.101901

Ammi, M., Desson, Z. W., & Doumbia, M. Z. (2024). Non-pharmaceutical interventions and vaccination during COVID-19 in Canada: Implications for COVID and non-COVID outcomes. *Health Policy and Technology, 13*(1), 100801. https://doi.org/10.1016/j.hlpt.2023.100801

Askitas, N., Tatsiramos, K., & Verheyden, B. (2021). Estimating worldwide effects of non-pharmaceutical interventions on COVID-19 incidence and population mobility patterns using a multiple-event study. *Scientific Reports, 11*(1), 1972. https://doi.org/10.1038/s41598-021-81442-x

Baygut, H. (2022). Depression Levels of University Students and Changes in their Nutritional Status in the COVID-19 Pandemic Quarantine Period: A study in Turkey. *Progress in Nutrition, 24*(2), e2022078. https://doi.org/10.23751/pn.v24i2.12539

Bhatia, G., Dutta, P. K., & McClure, J. (2022a, July 15). Kuwait: The Latest Coronavirus Counts, charts and maps. Reuters. Retrieved from: https://www.reuters.com/graphics/world-coronavirus-tracker-and-maps/countries-and-territories/kuwait/ on 19th of June, 2024.

Boyer, C. B., Rumpler, E., Kissler, S. M., & Lipsitch, M. (2022). Infectious disease dynamics and restrictions on social gathering size. *Epidemics, 40,* 100620. https://doi.org/10.1016/j.epidem.2022.100620

Chacón, F. R., Doval, J. M., Rodríguez, V. I., Quintero, A., Mendoza, D. L., Mejía, M. D., Omaña, O. D., Contreras, M. B., Gasparini, S., González, C. J., Camejo-Ávila, N. A., Romero, S. R., Flora-Noda, D. M., Maricuto, A. L., Velásquez, V. L., Guevara, R. N., Carballo, M., Caldera, J., Redondo, M. C., Landaeta, M. E., Carrión-Nessi, F. S., & Forero-Peña, D. A. (2021). Knowledge, attitudes, and practices related to COVID-19 among patients at Hospital Universitario de Caracas triage tent: A cross-sectional study. *Biomédica, 41*(2), 48-61. https://doi.org/10.7705/biomedica.5808

Chu, D. K., Akl, E. A., Duda, S., Solo, K., Yaacoub, S., Schünemann, H. J. on behalf of the COVID-19 Systematic Urgent Review Group Effort (SURGE) study authors (2020). Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *The Lancet, 395*(10242), 1973-1987. https://doi.org/10.1016/S0140-6736(20)31142-9

Dean, A. G., Sullivan, K. M., & Soe, M. M. (2010). *Epi Info and OpenEpi in epidemiology and clinical medicine: health applications of free software.* CreateSpace.

Demirbilek, M. (2021). The effect of school/workplace closures on COVID-19 related incidents. *Avrupa Bilim ve Teknoloji Dergisi, 2021*(23), 62-69. https://doi.org/10.31590/ejosat.842793

Fazio, R. H., Ruisch, B. C., Moore, C. A., Granados Samayoa, J. A., Boggs, S. T., & Ladanyi, J. T. (2021). Social distancing decreases an individual's likelihood of contracting COVID-19. *Proceedings of the National Academy of Sciences of the United States of America, 118*(8), e2023131118. https://doi.org/10.1073/pnas.2023131118

Feng, S., Shen, C., Xia, N., Song, W., Fan, M., & Cowling, B. J. (2020). Rational use of face masks in the COVID-19 pandemic. *The Lancet Respiratory Medicine, 8*(5), 434–436. https://doi.org/10.1016/S2213-2600(20)30134-X

Fowler, J. H., Hill, S. J., Levin, R., & Obradovich, N. (2021). Stay-at-home orders associate with subsequent decreases in COVID-19 cases and fatalities in the United States. *PloS One, 16*(6), e0248849. https://doi.org/10.1371/journal.pone.0248849

Freeman, D., Loe, B. S., Chadwick, A., Vaccari, C., Waite, F., Rosebrock, L., Jenner, L., Petit, A., Lewandowsky, S., Vanderslott, S., Innocenti, S., Larkin, M., Giubilini, A., Yu, L-M., McShane, H., Pollard, A. J., & Lambe, S. (2022). COVID-19 vaccine hesitancy in the UK: the Oxford coronavirus explanations, attitudes, and narratives survey (Oceans) II. *Psychological Medicine, 52*(14), 3127–3141. https://doi.org/10.1017/S0033291720005188

He, X., Lau, E. H., Wu, P., Deng, X., Wang, J., Hao, X., Lau, Y. C., Wong, J. Y., Guan, Y., Tan, X., Mo, X., Chen, Y., Liao, B., Chen, W., Hu, F., Zhang, Q., Zhong, M., Wu, Y., Zhao, L., Zhang, F., Cowling, B. J., Li, F., & Leung, G. M. (2020). Temporal dynamics in viral shedding and transmissibility of COVID-19. *Nature Medicine, 26*(5), 672-675. https://doi.org/10.1038/s41591-020-0869-5

Isah, M. B., Abdulsalam, M., Bello, A, Usman A. R., Ibrahim, M. I, Usman, A., Nasir, A., Abdulkadir, B., Ibrahim, K. M., Sani, A., Aliu, M., Kabir, S. A., Shuaibu, A., & Nass, S. S (2021). Corona Virus Disease 2019 (COVID-19): A Cross-Sectional Survey of the Knowledge, Attitudes, Practices (KAP) and Misconceptions in the General Population of Katsina State, Nigeria. *UMYU Journal of Microbiology Research (UJMR), 6*(1), 24–37. https://doi.org/10.47430/ujmr.2161.004

Jones, N. R., Qureshi, Z. U., Temple, R. J., Larwood, J. P., Greenhalgh, T., & Bourouiba, L. (2020). Two metres or one: what is the evidence for physical distancing in Covid-19? *BMJ, 2020*(370), m3223. https://doi.org/10.1136/bmj.m3223

Kundrapu, S., Sunkesula, V., Jury, L. A., Sitzlar, B. M., & Donskey, C. J. (2012). Daily disinfection of high-touch surfaces in isolation rooms to reduce contamination of healthcare workers' hands. *Infection Control & Hospital Epidemiology, 33*(10), 1039-1042. https://doi.org/10.1086/667730

Kuwait. Worldometer. Retrieved 19th of June, 2024 from: https://www.worldometers.info/coronavirus/country/kuwait/

Kyei-Arthur, F., Agyekum, M. W., Afrifa-Anane, G. F., Larbi, R. T., & Kisaakye, P. (2023). Perceptions about COVID-19 preventive measures among Ghanaian women. *Plos One, 18*(4), e0284362. https://doi.org/10.1371/journal.pone.0284362

Lashkarbolouk, N., Mazandarani, M., Pourghazi, F., Eslami, M., Khonsari, N. M., Ghonbalani, Z. N., Ejtahed, H. S., & Qorbani, M. (2022). How did lockdown and social distancing policies change the eating habits of diabetic patients during the COVID-19 pandemic? A systematic review. *Frontiers in Psychology, 13,* 1002665. https://doi.org/10.3389/fpsyg.2022.1002665

León, T. M., Vargo, J., Pan, E. S., Jain, S., & Shete, P. B. (2021). Nonpharmaceutical interventions remain essential to reducing coronavirus disease 2019 burden even in a well-vaccinated society: A modeling study. *Open Forum Infectious Diseases, 8*(9), ofab415. https://doi.org/10.1093/ofid/ofab415

Liu, F., Luo, Z., Li, Y., Zheng, X., Zhang, C., & Qian, H. (2021). Revisiting physical distancing threshold in indoor environment using infection-risk-based modeling. *Environment International, 153,* 106542. https://doi.org/10.1016/j.envint.2021.106542

MacDonald, N. E. (2015). Vaccine hesitancy: Definition, scope and determinants. *Vaccine, 33*(34), 4161–4164. https://doi.org/10.1016/j.vaccine.2015.04.036

Masoud, A. T., Zaazouee, M. S., Elsayed, S. M., Ragab, K. M., Kamal, E. M., Alnasser, Y. T., Assar, A., Nourelden, A. Z., Istatiah, L. J., Abd-Elgawad, M., Abdelsattar, A.T., Sofy, A. A., Hegazy, D. G., Femía, V. Z., Mendonça, A. R., Sayed, F. M., Elmoursi, A., Alareidi, A., Abd-Eltawab, A. K., Abdelmonem, M., Mohammed, O. M., Derballa, EE. A., El-Fas, K. A., Abdel-Daim, M. M., & Abushouk, A. I. (2021). KAP-COVID GLOBAL: a multinational survey of the levels and determinants of public knowledge, attitudes and practices towards COVID-19. *BMJ Open, 11*(2), e043971. https://doi.org/10.1136/bmjopen-2020-043971

Mendez-Brito, A., El Bcheraoui, C., & Pozo-Martin, F. (2021). Systematic review of empirical studies comparing the effectiveness of non-pharmaceutical interventions against COVID-19. *Journal of Infection, 83*(3), 281-293. https://doi.org/10.1016/j.jinf.2021.06.018

Nazzal, Z., Maraqa, B., Banat, L., Kittaneh, M., Maa'li, Y., & Al-Shobaki, S. (2022). The practice of COVID-19 preventive measures in Palestine on the limits of vaccine provision: a population-based study. *The Journal of Infection in Developing Countries, 16*(01), 81-89. https://doi.org/10.3855/jidc.15013

Paules, C. I., Marston, H. D., & Fauci, A. S. (2020). Coronavirus infections — More than just the common cold. *JAMA, 323*(8), 707-708. https://doi.org/10.1001/jama.2020.0757

Peters, J. A., & Farhadloo, M. (2023). The Effects of Non-Pharmaceutical Interventions on COVID-19 Cases, Hospitalizations, and Mortality: A Systematic Literature Review and Meta-Analysis. *AJPM Focus, 2*(4), 100125. https://doi.org/10.1016/j.focus.2023.100125

Pitol, A. K., & Julian, T. R. (2021). Community transmission of SARS-CoV-2 by surfaces: risks and risk reduction strategies. *Environmental Science & Technology Letters, 8*(3), 263-269. https://doi.org/10.1021/acs.estlett.0c00966

Rajbanshi, M., Bhusal, S., Paudel, K., Poudel, B., Gaire, A., Khatri, E., Kalauni, B. R., Aryal, B., Sharma, G., & Karki, N. (2022). Knowledge, attitude, and practice of Nepalese residents in the prevention and control of COVID-19: A cross-sectional web-based survey. *Annals of Medicine and Surgery, 84,* 104861. https://doi.org/10.1016/j.amsu.2022.104861

Saeed, B. Q., Al-Shahrabi, R., & Bolarinwa, O. A. (2021a). Socio-demographic correlate of knowledge and practice toward COVID-19 among people living in Mosul-Iraq: A cross-sectional study. *Plos One, 16*(3), e0249310. https://doi.org/10.1371/journal. pone.0249310

Saeed, B. Q., Elbarazi, I., Barakat, M., Adrees, A. O., & Fahady, K. S. (2021b). COVID-19 health awareness among the United Arab Emirates population. *Plos One, 16*(9), e0255408. https://doi.org/10.1371/journal.pone.0255408

Salameh, B., Basha, S., Basha, W., & Abdallah, J. (2021). Knowledge, Perceptions, and Prevention Practices among Palestinian University Students during the COVID-19 Pandemic: A Questionnaire-Based Survey. *Inquiry. The Journal of Health Care Organization, Provision, and Financing, 58*(January-December), 0046958021993944. https://doi.org/10.1177/0046958021993944

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

Shrestha, N., Shad, M. Y., Ulvi, O., Khan, M. H., Karamehic-Muratovic, A., Nguyen, U. S. D., Baghbanzadeh, M., Wardrup, R., Aghamohammadi, N., Cervantes, D., Nahiduzzaman, K., Zaki, R. A., & Haque, U. (2020). The impact of COVID-19 on globalization. *One Health, 11*, 100180. https://doi.org/10.1016/j.onehlt.2020.100180

Sidor, A., & Rzymski, P. (2020). Dietary Choices and Habits during COVID-19 Lockdown: Experience from Poland. *Nutrients, 12*(6), 1657. https://doi.org/10.1016/j.onehlt.2020.100180

Wang, C., Horby, P. W., Hayden, F. G., & Gao, G. F. (2020). A novel coronavirus outbreak of global health concern. *The Lancet, 395*(10223), 470–473. https://doi.org/10.1016/S0140-6736(20)30185-9

World Health Organization. Advice for the public on COVID-19. World Health Organization. Retrieved from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public on 19th of June, 2024.

World Health Organization. Coronavirus disease (COVID-19). World Health Organization. Retrieved 19th of June, 2024 from: https://www.who.int/news-room/fact-sheets/detail/coronavirus-disease-(COVID-19)

World Health Organization. COVID-19 cases | WHO COVID-19 Dashboard. World Health Organization. Retrieved 19th of June, 2024 from: https://data.who.int/dashboards/covid19/cases?n=c

World Health Organization. COVID-19 deaths | who covid-19 dashboard. World Health Organization. Retrieved 19th of June, 2024 from: https://data.who.int/dashboards/covid19/deaths?n=c

World Health Organization. COVID-19vaccines | who covid-19 dashboard. World Health Organization. Retrieved 19th of June, 2024 from: https://data.who.int/dashboards/covid19/vaccines?n=c

Xu, Z., Shi, L., Wang, Y., Zhang, J., Huang, L., Zhang, C., Liu, S., Zhao, P., Liu, H., Zhu, L., Tai, Y., Bai, C., Gao, T., Song, J., Xia, P., Dong, J., Zhao, J., & Wang, F. S. (2020). Pathological findings of COVID-19 associated with acute respiratory distress syndrome. *The Lancet Respiratory Medicine, 8*(4), 420-422. https://doi.org/10.1016/S2213-2600(20)30076-X

Yang, X., Yu, Y., Xu, J., Shu, H., Liu, H., Wu, Y., Zhang, L., Yu, Z., Fang, M., Yu, T., Wang, Y., Pan, S., Zou, X., Yuan, S., & Shang, Y. (2020). Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *The Lancet Respiratory Medicine, 8*(5), 475-481. https://doi.org/10.1016/S2213-2600(20)30079-5

Yatmo, Y. A., Atmodiwirjo, P., & Harahap, M. M. Y. (2020). Hand touches on the surfaces of a healthcare waiting area. *The Journal of Hospital Infection, 105*(2), 383-385. https://doi.org/10.1016/j.jhin.2020.04.042

Zhang, Y. Z., & Holmes, E. C. (2020). A genomic perspective on the origin and emergence of SARS-CoV-2. *Cell, 181*(2), 223-227. https://doi.org/10.1016/j.cell.2020.03.035

Zhou, M., Zhang, X., & Qu, J. (2020). Coronavirus disease 2019 (COVID-19): a clinical update. *Frontiers of Medicine, 14*(2), 126-135. https://doi.org/10.1007/s11684-020-0767-8

Zviedrite, N., Hodis, J. D., Jahan, F., Gao, H., & Uzicanin, A. (2021). COVID-19-associated school closures and related efforts to sustain education and subsidized meal programs, United States, February 18–June 30, 2020. *PloS One, 16*(9), e0248925. https://doi.org/10.1371/journal.pone.0248925

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