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Original Article

Use of the Capability, Opportunity, and Motivation Behaviour Model to Predict COVID-19 Vaccine Uptake in the Kurdistan Region, Iraq

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Abstract

Background and Objective: The Capability, Opportunity, and Motivation Behaviour (COM-B) model is widely used to explain behavior. In this survey, we examined how well the COM-B model could predict the likelihood of Iraqi Kurdish individuals getting vaccinated against COVID-19.

Materials and Methods: An online cross-sectional survey was developed to explain the COVID-19 vaccine uptake based on COM-B components. Non-probability sampling was used to collect data from 970 Kurdish people in Said Sadiq, Kurdistan Region, Iraq. Data were analyzed in SPSS software (version 16) using bivariate correlation and logistic regression statistical tests.

Results: The mean age of respondents was 32.68 years [95% CI: 31.95, 33.40], ranging from 18-72 years. Based on the results, 46.3% (420/907) of participants had received the COVID-19 vaccine at least once. Older age (OR: 1.021 and P=0.016), government job (OR: 1.691 and P<0.001), a positive family history of COVID-19 (OR: 1.764 and P=< 0.001), physical capability (OR: 1.877 and P<0.001), and automatic motivation (OR: 1.069 and P=0.016) had significant effects on COVID-19 vaccine uptake.

Conclusions: We have found evidence supporting the use of the COM-B model for developing programs aimed at increasing COVID-19 vaccination uptake. To develop effective interventions, it is important to prioritize activities that enhance physical capability and automatic motivation.

Keywords: Behavior Change, COVID-19, Vaccines

Background

The coronavirus disease 2019 (COVID-19) has caused a significant increase in global deaths since it was declared a pandemic by the World Health Organization (WHO), posing a major threat to public health [1]. According to the WHO report, as of May 10, 2023, there have been 765,903,278 confirmed cases of COVID-19 and 6,927,378 deaths [2]. Various behaviors are recommended by the WHO to prevent COVID-19, such as receiving the recommended doses of the COVID-19 vaccine, maintaining a safe distance from others, wearing a mask, washing hands, and covering the mouth when coughing [3]. broad-scale population immunity through vaccination is the most effective health approach to prevent and control the COVID-19 pandemic [4]. Vaccination programs are currently underway to help combat the coronavirus disease 2019 (COVID-19) pandemic and are a key strategy to mitigate the effects of COVID-19 [5]. In fact, vaccines have effectively reduced the spread of the pandemic [6].

In March 2021, the Ministry of Health in the Kurdistan Region of northern Iraq initiated a COVID-19 vaccination campaign using a website and app called KURDVAC. The goal of the campaign was to vaccinate all citizens, and they have assigned the population to three groups. The first group includes doctors, individuals over the age of 65, essential workers, overweight individuals, those with an obesity index greater than 40, and people with weakened immune systems. The second group consists of individuals over the age of 50 and those with chronic illnesses. Finally, the general public is the third and final target group for vaccination [7].

A key challenge is ensuring the population receives enough vaccine to reduce severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission, mortality, and morbidity from COVID-19. A thorough understanding of social

and demographic factors associated with vaccination coverage has significant implications for designing policies to maximize vaccination coverage [8]. The decision to become vaccinated has been at the forefront of medical discourse since the availability of COVID-19 vaccines, as numerous people have refused to receive them despite their significant benefits and modest risks [9]. In this regard, behavioral theories are a vital component of effective interventions in public health, and there is increasing evidence that theory-based interventions are more successful in health behavior change programs than interventions that lack a theoretical framework [10]. Behavior change theories and models are used to understand why people do or do not engage in health-promoting behaviors, identify information needed to design an effective intervention strategy, and help set priorities for educational and health-promoting interventions [11]. One of the models that is extensively used to identify what needs to change in order for a behavior change intervention to be effective is the COM-B. The COM-B model identifies three interlinked components, capability, opportunity, and motivation, which must exist to perform any health behavior [12]. The COM-B model offers a significant benefit by providing a thorough and organized understanding of the factors hindering or supporting a particular behavior. This model can be utilized by researchers to identify ways to encourage a desired behavior, serving as a foundation for designing effective interventions [13, 14].

Objectives

The present study aims to use the COM-B model as a theoretical framework, which is a comprehensive tool to guide the development of the intervention in order to identify the most important factors related to the COVID-19 vaccine uptake in the Kurdish population of Iraq.

Materials and Methods

Participants and recruitment procedure

This cross-sectional study was conducted on 907 adults over the age of 18 in Said Sadiq, Kurdistan Region, Iraq, in 2023. The research team used an online survey method with non-probability sampling. They reached out to infection control experts at Said Sadiq Hospital to distribute the survey through online social networks to the target population (adults over 18 living in Said Sadiq). The survey link was shared with the target group through social networks. Participants were informed about their right to participate, including the confidentiality and anonymity of their data, on the first page of the survey. All participants provided informed consent. The inclusion criteria for participants entailed proficiency in the Kurdish language, reading ability to answer the questions, residency in Said Sadiq City, and an age range of 18 years or older. The study protocol was approved by the Ethics Committee of Kermanshah University of Medical Sciences.

Measures

The study used a questionnaire that consisted of two parts. The first part assessed participants' background information, while the second part evaluated different aspects of the COM-B model. The survey was conducted in Kurdish language.

Background variables

Background variables included age (years), gender (female, male), marital status (single, married), education level (primary school, secondary school, high school, diploma, and academic), job (student, self-employed job, and employed), family size (1-2, 3-4, 5-6, more than 6), economic status (very bad, bad, good, and very good), positive family history of COVID-19 (no, yes), positive history of COVID-19 among friends (no, yes), history of death due to COVID-19 in relatives and acquaintances (no, yes), if you have been tested for COVID-19 (I have not tested, positive, negative), and COVID-19 vaccine uptake (no, yes-one dose, yes-two dose, yes-three dose).

COM-B components

COM-B components scale was designed based on a standard questionnaire [12-16] and included 31 items. The physical capability was assessed using one item ("I can "walk, drive or use other means of transportation to get to and from the vaccination center") rate" on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). A higher score indicates a greater physical capability of uptaking COVID-19 vaccination. In our study, psychological capability in the COM-B model included three constructs (knowledge, perceived risk, and self-efficacy). Knowledge was measured by three items (e.g., "I know"how to get the vaccine (where to go and when to go"). Perceived risk was measured by three items (e.g., "I believe that the complications of the Coronavirus will be severe for me if I do not receive the COVID-19 vaccine in time."). Two items were designed to measure self-efficacy (e.g., "I can overcome my impatience about long queues to get the Coronavirus vaccine"). The"psychological capability constructs items were measured by a 5-point Likert scale from 1 (very little) to 5 (very much). The items had very good internal reliability (0.87). A higher score indicates a

higher level of psychological capability.

Environmental opportunity was assessed using three items (e.g., "Do you have the time to go and get vaccinated?") rated" on a five-point scale from 1 (very little) to 5 (very much). The items had good internal reliability (0.73). A higher score was suggestive of a greater environmental opportunity for COVID-19 vaccination uptake. The social opportunity was assessed using nine items (e.g., "Most people in my community are planning on taking the COVID-19 vaccine") rate" on a five-point scale from 1 (very little) to 5 (very much). The items had very good internal reliability (0.86). A higher score demonstrates a greater social opportunity for COVID-19 vaccination uptake.

Reflective motivation was assessed using seven items (e.g., "I have been hoping for the future since I found out the COVID-19 vaccine was made") rate" on a five-point scale from 1 (very little) to 5 (very much). The items had very good internal reliability (0.94), with higher scores signifying a more reflective motivation for receiving the COVID-19 vaccine. The automatic motivation was assessed using three items (e.g., "I do not trust the government in the Coronavirus vaccine program") rated" on a five-point scale from 1 (strongly agree) to 5 (strongly disagree). The items had very good internal reliability (0.80). A higher score is indicative of a more automatic motivation for receiving the COVID-19 vaccine.

Data analysis

The data was analyzed using SPSS software (version 16). Descriptive statistics were used to summarize and organize the data. Bivariate correlation was used to determine the correlation between COM-B components. Univariate and multivariate analyses using logistic regression were conducted to identify the factors associated with COVID-19 vaccine uptake. In the univariate regression, variables with $P<0.3$ were included in the multivariate analysis, and variables with $P>0.05$ were retained in the final multivariate model.

Results

The mean age of respondents was 32.68 years [95% CI: 31.95, 33.40], ranging from 18-72 years. More details of the demographic characteristics of participants are presented in Table 1.

Table 1. Distribution of the demographic characteristics among the participants

Variables	Number	Percent
Gender		
Female	371	40.9
Male	536	59.1
Marital Status		
Single	366	40.4
Married	541	59.6
Education level		
Primary school	125	13.8
Secondary school	96	10.6
High school	148	16.3
Diploma	229	25.2
Academic	309	34.1
Job		
Student	310	34.2
Self-employed job	284	31.3
Employed	313	34.5
Family Size		
1-2	120	13.2
3-4	306	33.7
5-6	346	38.1
More than 6	135	14.9
Economic Status		
Very bad	132	14.6
Bad	162	17.9
Good	569	62.7
Very good	44	4.9
Positive family history of COVID-19		
No	361	39.8
Yes	546	60.2
Positive history of COVID-19 among friends		
No	195	21.5
Yes	712	78.5
History of death due to corona in relatives and acquaintances		
No	514	56.7
Yes	393	43.3
If you have been tested for COVID-19		
I have not tested	521	57.4
Positive	179	19.7

Table 1 Continue		
Negative	207	22.8
COVID-19 vaccine uptake		
No	487	53.7
Yes (one dose)	104	11.5
Yes (two doses)	293	32.3
Yes (three doses)	23	2.5

Our findings indicated that 46.3% (420/907) of participants had received COVID-19 vaccine.

Table 2 displays the details of correlation, mean, and range of COM-B components scores.

Finally, the associated variables for COVID-19 vaccine uptake are illustrated in Table 3. Initially, univariate analysis was performed using logistic regression, and non-significant variables (education level, economic status, and family size) were removed from the model. The findings of the multivariate analysis are also presented in Table 3. As displayed in Table 3, the age (OR: 1.021 and P: 0.016), job (OR: 1.691 and P: < 0.001), positive family history of COVID-19 (OR: 1.764 and P: < 0.001), physical capability (OR: 1.877 and P: < 0.001), and automatic motivation (OR: 1.069 and P: 0.016) had significant effects on COVID-19 vaccine uptake among participants.

Table 2. Correlation, mean, and standard deviation of COM-B components

COM-B components	X1	X2	X3	X4	X5	Mean (SD)
X1. Physical Capability	1					2.96 (1.30)
X2. Psychological Capability	0.786**	1				25.48 (7.50)
X3. Physical Opportunity	0.151**	0.198**	1			8.10 (2.43)
X4. Social Opportunity	0.425**	0.439**	0.550**	1		21.24 (7.18)
X5. Reflective Motivation	0.700**	0.767**	0.140**	0.420**	1	20.26 (7.83)
X6. Automatic Motivation	0.406**	0.332**	0.139**	0.102**	0.510**	8.16 (3.52)

**Correlation is significant at the 0.01 level (2-tailed)

Table 3. Predictors of COVID-19 vaccine uptake

Variables	Model 1 (Crude)		Model 2 (Adjusted)	
	Crude OR (95% CI)	P	Adjusted OR (95% CI)	P
Age	1.042 (1.029-1.055)	< 0.001	1.021 (1.004-1.039)	0.016
Gender	2.023 (1.542-2.654)	< 0.001	1.198 (0.856-1.677)	0.293
Marital status	1.576 (1.204-2.062)	0.001	0.996 (0.686-1.445)	0.982
Job	1.866 (1.582-2.202)	< 0.001	1.691 (1.363-2.099)	< 0.001
Education level	0.981 (0.843-1.141)	0.804	-	-
Economic status	0.978 (0.830-1.153)	0.795	-	-
Family Size	0.928 (0.802-1.073)	0.312	-	-
Positive family history of Covid-19	2.707 (2.049-3.577)	< 0.001	1.764 (1.243-2.504)	0.001
Positive history of COVID-19 among friends	1.933 (1.388-2.691)	< 0.001	0.955 (0.617-1.477)	0.835
History of death due to corona in relatives and acquaintances	1.924 (1.474-2.511)	< 0.001	1.369 (0.988-1.896)	0.059
X1. Physical capability	2.255 (1.986-2.559)	< 0.001	1.877 (1.530-2.301)	< 0.001
X2. Psychological capability	1.119 (1.096-1.143)	< 0.001	0.994 (0.956-1.034)	0.783
X3. Environmental Opportunity	1.087 (1.029-1.148)	0.003	1.066 (0.983-1.156)	0.120
X4. Social opportunity	1.055 (1.035-1.075)	< 0.001	0.987 (0.958-1.017)	0.391
X5. Reflective motivation	1.108 (1.086-1.130)	< 0.001	1.021 (0.986-1.058)	0.238
X6. Automatic motivation	1.157 (1.112-1.204)	< 0.001	1.069 (1.013-1.128)	0.016

Discussion

As evidenced by the obtained results, 46.3% of participants received at least one COVID-19 vaccine, while only 34.8% of participants received two or three doses of the vaccine. Our findings are broadly consistent with the results of other studies conducted in Iraq. For instance, Alatrany et al., in their study on 7,778 adults in Iraq, reported that 32.4% of participants received COVID-19 vaccine [17]. Merza et al. carried out research on students and staff at Duhok University in Kurdistan in northern Iraq and indicated that 53.16% and 89.16% of students and staff received the COVID-19 vaccine, respectively [18]. Nonetheless, in a study by Alhlew et al. on people over 18 in Basmaia (a small city in Baghdad) from June to October 2022, the rate of COVID-19 vaccine uptake was reported as 70.4% (higher than that in our study) [19]. It should be noted that before the start of the vaccine campaign in Iraq, a cross-sectional study that was conducted to assess people's attitudes toward the COVID-19 vaccine demonstrated that only 56.2% of participants intended to uptake the vaccine [19]. Considering the insufficient rate of COVID-19 vaccine uptake in the studied population, it seems necessary to develop interventions to promote the COVID-19 vaccine uptake.

Our findings pointed out that among the background variables of older age, a positive family history of COVID-19 and involvement in a

government job were predictors of COVID-19 vaccine uptake. In line with the findings of the present study, several studies, such as a study by Murphy et al. in Ireland and the United Kingdom [20], Smith et al. study in the United Kingdom [21], and similar studies conducted in Iraq [17-19], reported that older age is a predictor of COVID-19 vaccine uptake. Older adults are at greater risk of severe illness and death from COVID-19; therefore, they may be more motivated to get vaccinated to protect themselves from the disease. However, this finding could also be affected by Iraq's vaccination delivery strategy, which prioritized the elderly during the first three months of the vaccination program [17].

Occupation was another variable that played a role in COVID-19 vaccine uptake in the present study. People who had government jobs received the vaccine more than others. In agreement with the present study, Alhlew et al. in Iraq [19] and Khubchandani et al. in the United States [22] demonstrated that employed people had higher vaccination rates compared to unemployed people. Smith et al. also reported that lower income is one of the factors affecting unwillingness to be vaccinated against COVID-19 [21]. This may be due to workplace policies that require vaccination or provide opportunities for vaccination.

Participants whose family members had a history of COVID-19 had a 1.764 times higher chance of receiving the COVID-19 vaccine. The presence of a person with COVID-19 in the family can increase the likelihood of vulnerability or the perception of a higher risk of COVID-19. It is worth noting that risk perception is affected by various factors, such as personal experiences. Therefore, interventions aimed at increasing the uptake of the COVID-19 vaccine should consider the multiple factors that influence risk perception.

Among the components of COM-B, automatic motivation and physical capability had a significant effect on COVID-19 vaccine uptake. Consistent with our findings, Abascal Miguel et al. in the Spanish-speaking population of San Francisco revealed that the behavioral factors affecting receiving the vaccine were mainly related to physical opportunity, automatic motivation, and psychological capability [15]. Moreover, Liu and Liu carried out a content analysis based on COM-B in order to determine the factors correlated with COVID-19 vaccine uptake and reported that COVID-19 vaccine uptake was mainly related to the motivation component [16]. In the present study, the ability to walk, drive, or use public transportation was measured as physical capability. It seems that interventions to remove barriers to accessing the centers for the injection of the COVID-19 vaccine and environmental restructuring can be useful in promoting the COVID-19 vaccine uptake among the Kurdish population in Iraq.

The success of large-scale COVID-19 vaccination campaigns depends on people's willingness to receive the vaccine [23]. We have demonstrated that automatic motivation is one of the components influencing COVID-19 vaccine uptake. In the current study, worry and anxiety about vaccine side effects and lack of trust in the government in the COVID-19 vaccine program were automatic motivation measurement items. This finding can be considered in the development of campaigns. Campaigns to gain public confidence in the COVID-19 vaccination program and to inform about the low risk of COVID-19 vaccines can lead to beneficial outcomes in increasing the COVID-19 vaccine uptake.

To the best of our knowledge, this is the first study using COM-B to understand the factors related to COVID-19 vaccine uptake in the Iraqi Kurdish community, and the findings of this research can be helpful in developing campaigns to promote the COVID-19 vaccine. Among the notable limitations of this study, we can refer to its cross-sectional nature and no long-term follow-up. Moreover, the use of an online form to collect questionnaire responses prevented the participation of people who did not have access to the Internet. Furthermore, given that the study relied on self-reported data, there was the possibility of reporting bias, where participants may have answered questions based on what they thought was expected of them rather than their actual beliefs or behaviors.

Conclusions

The current study utilized the COM-B model to offer valuable insights into the adult population in Iraqi Kurdistan to enhance the acceptance of the COVID-19 vaccine. The COM-B model proves to be effective in explaining the uptake of the COVID-19 vaccine in Iraqi Kurdistan. Alongside improving physical capability, it is suggested that health policymakers in Iraq focus on implementing campaigns that encourage automatic motivation.

Compliance with ethical guidelines

The research ethics committee of KUMS approved the study protocol (IR.KUMS.REC.1401.391). All procedures conducted followed the ethical standards set by the institutional and national research committee where the studies took place, as well as the 1964 Helsinki Declaration and its subsequent amendments or similar ethical standards. Participants were informed about the study details, including how it would be carried out, the confidentiality of their information, and the purpose of the study, before agreeing to participate.

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Authors' contributions
M.MA and F.J designed the research and wrote the manuscript. I.AF collected data and wrote the manuscript. A.K edited the manuscript. MMA and FJ described and analyzed the data and edited the manuscript. All authors read and approved the edited manuscript.

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Conflicts of Interest
The authors declare that they have no conflict of interest.

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