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Impact of Educational Intervention on Iranian Adults' Attitudes and Intentions towards the COVID-19 Booster Dose

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Abstract

Background: Vaccination is crucial for controlling COVID-19 transmission and reducing severe illness. Despite the significant impact of initial doses, emerging variants and waning immunity underscore the need for booster doses, particularly the third dose. This study aims to investigate the impact of an educational intervention on the attitudes and behavioral intentions of Iranian adults towards the COVID-19 booster dose.

Materials and Methods: This quasi-experimental study was conducted in Bushehr, Iran, in 2022 and involved 100 individuals aged 18 years or older who had not received the third dose of the COVID-19 vaccine. Participants were selected using the SIB system and a convenience sampling method. The educational intervention consisted of eight training sessions based on the constructs of the Theory of Planned Behavior (TPB). Participants completed a researcher-designed questionnaire before the intervention and two months later. Data analysis was performed using SPSS software (version 16.0).

Results: A total of 100 individuals participated in this study, with a mean age of 36 years (SD = 11.4). The majority of participants were men (68%). Before the intervention, 13% of participants reported a history of chronic disease, and 51% had been infected with COVID-19. The results of the paired t-test demonstrated a significant improvement in participants' attitudes and behavioral intentions toward vaccination after the educational intervention ($p < 0.05$). Specifically, attitudes improved from a mean score of 48.65 to 50.72 ($p< 0.017$), and behavioral intentions increased from 8.78 to 11.94 ($p< 0.001$).

Conclusion: Based on the results, the educational intervention significantly improved participants' attitudes and behavioral intentions toward vaccination. These findings highlight the effectiveness of the intervention in enhancing readiness for vaccination and promoting vaccine uptake.

Key Words: Adults, Booster dose, COVID-19, Educational intervention, Iran.

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1- INTRODUCTION

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, has dramatically transformed global health, economies, and daily life since its emergence in late 2019. The mental health crisis intensified, with significant increases in anxiety, depression, and domestic violence reported worldwide. Economically, the pandemic triggered the largest global downturn in over a century, leading to widespread business closures and unprecedented unemployment rates. Educational institutions faced major disruptions as they shifted to online learning, exposing stark disparities in technological access and readiness across different regions (1-3).

Vaccination efforts have been a central focus in combating COVID-19, with over 13.64 billion vaccine doses administered globally by the end of December 2023 (4, 5). However, vaccine acceptance rates vary significantly by region. For instance, countries like Kuwait (23.6%) and Jordan (28.4%) report low acceptance rates, while Eastern Asian nations such as Malaysia (94.3%) and Indonesia (93.3%) exhibit much higher levels of willingness to be vaccinated (6, 7). This disparity is crucial for understanding public health strategies and tailoring interventions to improve vaccination rates.

Research indicates that COVID-19 vaccine booster doses play a crucial role in combating variants of SARS-CoV-2, the virus responsible for COVID-19. As of late November 2023, over 5.6 billion individuals globally have received at least one vaccine dose, with approximately 2.5 billion having received at least one booster dose (8, 9). Despite the initial high acceptance of primary vaccine doses—approximately 70% in Iran—research indicates a concerning gap regarding booster doses, with willingness as low as 17%. Factors contributing to this hesitancy include misinformation about vaccine safety and efficacy, as well as demographic influences such as age and education level (10, 11). Addressing vaccine hesitancy is essential for public health initiatives aimed at controlling the pandemic. Targeted communication strategies that build trust and clarify the benefits of vaccination are vital for enhancing uptake and effectively combating misinformation (10, 12).

Previous studies in Iran provide significant insights into COVID-19 vaccine attitudes and hesitancy. Acceptance rates initially exceeded 80% but fell to around 62.9% in early 2021 due to safety concerns and misinformation, before rising again to approximately 85.7% by late 2021 (13, 14). Demographic factors, such as age and education, greatly influence willingness to vaccinate; older adults and those with higher education levels are more likely to accept the vaccine, while younger individuals often express negative attitudes (15). Safety concerns remain a major barrier, particularly among those relying on non-reputable information sources (16).

These findings emphasize the need for targeted public health campaigns in Iran that address safety concerns and misinformation about the COVID-19 vaccine. Many individuals express doubts about vaccine efficacy due to unreliable information sources. By providing clear, accurate information and engaging trusted community leaders, health authorities can enhance public trust and improve vaccination uptake.

The present study aims to determine the attitudes and behavioral intentions of Iranian adults aged 18 and older in Bushehr city who have not yet received the third dose of the COVID-19 vaccine. Understanding these attitudes is essential for developing targeted public health campaigns that address safety concerns and misinformation, ultimately enhancing public trust and improving vaccination uptake in the region.

2- MATERIALS AND METHODS

2-1. Study Design and Methodology

This study is a quasi-experimental intervention research conducted among Iranian citizens aged 18 and older in Bushehr city, specifically targeting individuals who had not received the third dose of the COVID-19 vaccine in 2022. The sample size was determined using Cohen's method with G*Power software, which estimated an initial requirement of 90 participants based on a significance level of 95% ($\alpha = 0.05$), a power of 80% ($\beta = 0.2$), three repetitions, and an average effect size ($d = 0.25$). The final sample size was increased to 100 participants to accommodate a potential dropout rate of 10%. Participants who had not received the third booster vaccine were identified and randomly selected from two comprehensive health service centers in Bushehr using the Integrated Health System (SIB). Approval for accessing participant information from these centers was obtained from the Deputy Health Authority of Bushehr city.

2-2. Inclusion Criteria

The inclusion criteria for the study were as follows: participants must be willing to participate, aged 18 years or older, and native citizens of Bushehr. Additionally, they must not have received the third dose of the COVID-19 vaccine and must possess reading and writing literacy.

2-3. Exclusion Criteria

Exclusion criteria included individuals who had received the first and second doses of the COVID-19 vaccine, those who were unwilling to participate, and participants who failed to attend training sessions more than once. Additionally, any individual who did not complete the questionnaire accurately or fully, or who submitted a distorted questionnaire, was excluded from the study.

2-4. Data Collection Tools

The data collection tool used in this study was a researcher-designed questionnaire divided into two sections. The first section gathered demographic information, including age, gender, marital status, education level, occupation, income, chronic disease status, personal history regarding COVID-19, and family history of coronavirus infection. The second section comprised a questionnaire with 18 items that assessed two key components: attitude structures (15 items), and behavioral intention (3 items). The items related to attitudes and behavioral intentions were measured using a five-point Likert scale, ranging from "completely agree" (score of 5) to "completely disagree" (score of 1). In this scoring system, a total score of 1 to 75 points was allocated to the attitude section, while the behavioral intention section could score between 1 and 15 points.

2-5. Reliability and Validity

The reliability and validity of the questionnaire used in this study were rigorously assessed. The Content Validity Index (CVI) was found to be 0.72 for the attitude items and 0.73 for the behavioral intention items, indicating a satisfactory level of content validity. Additionally, the Content Validity Ratios (CVR) were calculated at 0.71 for attitudes and 0.68 for behavioral intentions. Cronbach's alpha coefficients were computed to evaluate internal consistency, yielding a value of 0.70 for the attitude section and 0.72 for the behavioral intention section.

2-6. Procedure

Permissions for the study were obtained from the Vice-Chancellor of Research at Yasuj University of Medical Sciences and Bushehr University of Medical Sciences. Conducted during the peak of the Delta variant outbreak, the research involved randomly selecting two out of 14 urban health centers in Bushehr. Individuals who had not received the third COVID-19

vaccine dose were identified using the Integrated Health System (SIB), an electronic health record system implemented by the Ministry of Health and Medical Education.

After obtaining informed consent, participants completed a researcher-designed questionnaire assessing their attitudes and behavioral intentions regarding the third dose of the COVID-19 vaccine. A needs assessment was conducted to identify training requirements, which informed the development of an eight-session training program lasting 45 to 60 minutes each. This program included an educational booklet, poster, and film. At the end of the sessions, participants received an educational CD and pamphlet for further review. Two months after the intervention, participants completed the questionnaire again, enabling a comparison of pre- and post-intervention data.

2-7. Educational Intervention

The educational intervention for the target group involved structured sessions designed to enhance awareness and attitudes toward COVID-19 and vaccination, particularly the third dose (**Table 1**). It began with an introductory session outlining the study's objectives, followed by sessions that provided reliable information on COVID-19, its risk factors, and prevention methods through lectures, group discussions, and educational materials such as pamphlets and videos.

The key topics covered included subjective norms, perceived behavioral control, and behavioral intentions related to vaccination. The intervention, developed based on the Theory of Planned Behavior (TPB) model and approved by faculty from various health disciplines, was delivered by the primary researcher using a combination of face-to-face lectures and multimedia presentations. Each session included interactive elements such as question-and-answer (Q&A) segments and a dedicated telephone line for inquiries. At the end of the intervention, participants received an educational CD containing all training materials and a targeted educational booklet to further enhance their understanding and acceptance of the COVID-19 vaccine.

2-8. Data Analysis

The normality of the data was assessed using the Shapiro-Wilk test ($p > 0.05$), indicating a normal distribution. Data analysis was performed using SPSS software version 16.0, employing descriptive statistics (frequency, percentage, mean, and standard deviation) to summarize participant demographics and responses. A paired t-test was conducted to compare pre- and post-intervention means, with a p-value of less than 0.05 considered statistically significant.

2-9. Ethical Considerations

This article is based on the first author's master's thesis, which was approved by the ethics committee of Yasuj University of Medical Sciences (approval code: 1400/12/43) and also received prior approval from Bushehr University of Medical Sciences. Participants who had not received the third booster vaccine were identified and selected using the Integrated Health System (SIB). All participants provided written informed consent after being thoroughly briefed on the study's objectives and their rights. Participation was voluntary, cost-free, and anonymous to ensure privacy protection. A quasi-experimental design was used to assess outcomes without withholding vaccination, thereby ensuring participant safety while adhering to ethical standards. Throughout the process, cultural sensitivities related to health issues were respected to guarantee fair treatment and transparency for all participants.

Table 1: Overview of Educational Intervention Sessions

Session	Topic	Materials	Strategy	Time
Introduction	Overview of research and expectations	PowerPoint presentation	Lecture, Q&A	15 min
Session 1	Awareness and attitudes toward COVID-19	Booklet, PowerPoint, and Video	Lecture, Discussion, and Q&A	45 min
Session 2	Group discussion	Booklet, Poster	Q&A	60 min
Session 3	Subjective norms about COVID-19	Booklet, PowerPoint, and Video	Lecture, Discussion, and Q&A	60 min
Session 4	Group discussion	Booklets, posters	Q&A	60 min
Session 5	Perceived behavioral control	Booklet, PowerPoint, and Video	Lecture, Discussion, and Q&A	50 min
Session 6	Group discussion	Booklets, Posters	Q&A	60 min
Session 7	Behavioral intention regarding vaccination	Booklet, PowerPoint, and Video	Lecture, Discussion, and Q&A	60 min
Session 8	Final summary of training	Booklets, Posters	Q&A	60 min

Q&A: Question and Answer.

3- RESULTS

The baseline characteristics of the study participants (n = 100) indicate a predominantly young and educated group, with 64% under 40 years old and over half holding at least a bachelor's degree. The sample consisted primarily of males (68%) and married individuals (59%). In terms of occupation, 46% were employed, 20% were housewives, and 16% were students. Only 13% had a history of chronic diseases, suggesting good overall health. Half of the participants reported personal COVID-19 infections, which aligns with the infection rates among family members. The average age was approximately 36 years, with a standard deviation of 11.4 years (**Table 2**).

Table 2: Demographic and Health-Related Characteristics of Participants (n = 100).

Variables	Sub-group	Number (%)
Age, year	<30	33 (33)
	30-39	31 (31)
	40-49	23 (23)
	≥50	13 (13)
	total	100 (100)
Gender	Men	68 (68)
	Women	32 (32)
	Total	100 (100)
Marital status	Single	41 (41)
	Married	59 (59)
	Total	100 (100)
Educational level	Less than a High School Diploma	5 (5)
	Diploma	29 (29)
	Associate degree	13 (13)
	Bachelor	43 (43)
	Master's degree and above	10 (10)
	Total	100 (100)
Participant Occupation	Employee	46 (46)
	Non-Government job	10 (10)
	House wife	20 (20)
	Academic students	16 (16)
	Other	8 (8)
	Total	100 (100)
History of chronic disease	Yes	13 (13)
	No	87 (87)
	Total	100 (100)

History of getting infected with COVID-19	Yes	51 (51)
	No	49 (49)
	Total	100 (100)
History of family members being infected with COVID-19	Yes	51 (51)
	No	49 (49)
	Total	100 (100)
Average age, year	36±11.400	

The findings from **Table 3** illustrate changes in vaccination perceptions following a targeted intervention. Initially, 76% of respondents viewed vaccination positively, believing it was easier than other preventive measures and beneficial for health. After the intervention, these figures rose to 92.6% and 83.2%, respectively. Agreement on the effectiveness of the third dose increased from 55% to 75.8%, and the intention to receive it within a month jumped from 16% to 60%. Concerns about disease incidence among those not receiving the third dose also increased, from 49% to 75.8%. Although worries about vaccine complications rose from 7% to 37.8%, the overall trend indicates that the intervention successfully improved positive attitudes and intentions toward COVID-19 vaccination among participants.

Table 3: Frequency of Changes in Attitudes and Behavioral Intentions toward COVID-19 Vaccination Pre- and Post-Intervention.

Attitudes Towards the Coronavirus Vaccine	Intervention	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Getting vaccinated is easier than engaging in other preventive behaviors.	Before	0	8 (8)	16(16)	31 (31)	45 (45)
	After	1 (1.1)	0	0	6 (6.3)	88 (92.6)
Getting vaccinated will improve my health.	Before	3 (3)	7 (7)	14 (14)	35 (35)	41 (41)
	After	3 (3.2)	3 (3.2)	0	10 (10.5)	79 (83.2)
The third dose will enhance my protection against COVID-19.	Before	3(3)	12 (12)	30 (30)	23 (23)	32 (32)
	After	3 (3.2)	5 (5.3)	2 (2.1)	13 (13.7)	72 (75.8)
Disease incidence is higher among individuals who do not receive the third dose of the COVID-19 vaccine.	Before	9 (9)	13 (13)	29 (29)	20 (20)	29 (29)
	After	3 (3.2)	3 (3.2)	1 (1.1)	16 (16.8)	72 (75.8)
Individuals who receive their third dose of the vaccine on time tend to lead healthier lives.	Before	5 (5)	13 (13)	35 (35)	18 (18)	29 (29)
	After	7 (7.4)	7 (7.4)	3 (3.2)	13 (13.7)	65 (68.4)
The risk of vaccine complications is higher with the third dose.	Before	6 (6)	16 (16)	47 (47)	24 (24)	7 (7)
	After	25 (26.3)	32 (33.7)	2 (2.1)	18 (18.9)	18 (18.9)
Not getting vaccinated will restrict my social activities.	Before	8 (8)	27 (27)	32 (32)	24 (24)	9 (9)
	After	34 (35.8)	32 (33.7)	1 (1.1)	14 (14.7)	14 (14.7)
Receiving the third dose of the COVID-19 vaccine may carry some risks.	Before	8 (8)	27 (27)	31 (31)	26 (26)	8 (8)
	After	24 (25.3)	30 (31.6)	2 (2.1)	25 (26.3)	14 (14.7)
Mass COVID-19 vaccination is one of the primary ways for manufacturers to generate revenue.	Before	16 (16)	14 (14)	40 (40)	11 (11)	19 (19)
	After	30 (31.6)	20 (21.1)	10 (10.5)	12 (12.6)	23 (24.2)
The COVID-19 vaccine will help us return to normal life.	Before	5 (5)	11 (11)	32 (32)	33 (33)	19 (19)
	After	3 (3.2)	11 (11.6)	4 (4.2)	40 (42.1)	37 (38.9)
I am still concerned about the effectiveness of the COVID-19 vaccine.	Before	8 (8)	16 (16)	30 (30)	27 (27)	19 (19)
	After	5 (5.3)	7 (7.4)	0	48 (50.5)	35 (36.8)
Despite having received the first and second doses of the COVID-19 vaccine, I remain concerned about the long-term side effects.	Before	8 (8)	14 (14)	25 (25)	30 (30)	23 (23)
	After	6 (6.3)	7 (7.4)	1 (1.1)	49 (51.6)	32 (33.7)
I am getting a third dose of the vaccine so that I can care for people with weakened immune systems.	Before	6 (6)	18 (18)	22 (22)	34 (34)	20 (20)
	After	6 (6.3)	4 (4.2)	6 (6.3)	35 (36.8)	44 (46.3)
I avoid interacting with individuals who have not been vaccinated.	Before	13 (13)	34 (34)	29 (29)	15 (15)	9 (9)
	After	36 (37.9)	39 (41.1)	1 (1.1)	4 (4.2)	15 (15.8)
Rumors about the potential risk of death from the third dose of the vaccine have made me hesitant to get vaccinated.	Before	15 (15)	29 (29)	36 (36)	13 (13)	7 (7)
	After	62 (65.3)	19 (20)	0	4 (4.2)	10 (10.5)

Behavioral Intention to Receive the COVID-19 Vaccine	Intervention	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I plan to receive my third dose of the COVID-19 vaccine within the next month.	Before	11 (11)	21 (21)	32 (32)	20 (20)	16 (16)
	After	15 (15.8)	7 (7.4)	0	16 (16.8)	57 (60)
I plan to receive the third dose of the COVID-19 vaccine on schedule and in accordance with the recommended timing for the injection.	Before	13 (13)	18 (18)	32 (32)	20 (20)	17 (17)
	After	16 (16.8)	6 (6.3)	0	17 (17.9)	56 (58.9)
I do not intend to receive a third dose of the COVID-19 vaccine until a safe vaccine is available.	Before	5 (5)	11 (11)	42 (42)	17 (17)	25 (25)
	After	48 (50.5)	15 (15.8)	24 (25.3)	1 (1.1)	7 (7.4)
Frequency distribution of intentions to receive the third dose of the COVID-19 vaccine after educational intervention.	I received the vaccine.	64 (67.4)				
	I did not receive the vaccine.	31 (32.6)				

The paired t-test results indicated a statistically significant increase in participants' attitudes and behavioral intentions toward vaccination after the educational intervention ($p < 0.05$, **Table 4**). Attitudes improved from a mean score of 48.65 (SD = 7.84) to 50.72 (SD = 6.70), with a significant t-test result of -2.434 ($p<0.017$). Behavioral intentions also increased significantly, rising from 8.78 (SD = 2.75) to 11.94 (SD = 3.92), with a highly significant t-test result of -7.740 ($p< 0.001$). These findings underscore the effectiveness of the intervention in enhancing readiness for vaccination.

Table 4: Impact of the Intervention on Attitudes and Behavioral Intentions toward Vaccination.

Variable	Before Intervention	After Intervention	Mean Difference	Paired t-test	P-value
Attitude	48.65 (SD = 7.84)	50.72 (SD = 6.70)	+2.07	-2.434	< 0.017
Behavioral Intentions	8.78 (SD = 2.75)	11.94 (SD = 3.92)	+3.16	-7.740	< 0.001

SD: Standard Deviation.

4- DISCUSSION

This study aimed to investigate the impact of educational interventions on the attitudes and behavioral intentions of Iranian adults toward the COVID-19 booster dose. The results indicated a significant increase in participants' attitudes and behavioral intentions following the educational intervention. These findings highlight the effectiveness of educational interventions in enhancing vaccine acceptance.

The study findings demonstrate the significant impact of educational interventions on improving attitudes and behavioral intentions regarding vaccination. Participants showed a notable increase in positive attitudes and substantial growth in behavioral intentions. These outcomes highlight the effectiveness of the intervention in enhancing readiness to accept vaccination, which is vital for public health strategies aimed at increasing vaccine uptake and addressing vaccine hesitancy. These results align with previous research indicating that educational interventions can significantly improve knowledge and attitudes toward vaccines. For instance, a study conducted in 2018 noted that educational efforts led to increased vaccine acceptance and a better understanding of vaccination benefits among participants, particularly in the context of COVID-19 (17). A systematic review of peer-based education interventions found that these strategies can significantly improve vaccination beliefs and behaviors. Out of 16 studies reviewed, 11 reported positive impacts,

especially when peer interventions were combined with healthcare expert involvement (18). This aligns with the current study's findings that targeted educational interventions can enhance vaccine uptake and attitudes through various methodologies.

This suggests that similar strategies could be employed across different public health challenges to enhance community engagement and trust in vaccines. In contrast, a study focusing on adolescents assessed two types of educational interventions—interactive workshops versus standard lectures—for their impact on vaccination attitudes. Unlike the current study, which demonstrated significant improvements in attitudes, this research found no significant changes in attitudes post-intervention. However, it did note an increase in knowledge and confidence among participants receiving the interactive workshop intervention. This suggests that while some interventions may not directly alter attitudes, they can still empower individuals with knowledge (19). Another study examining educational interventions during the COVID-19 pandemic reported increased vaccine acceptance following various educational formats (video vs. infographics). While both formats improved knowledge and attitudes, there was no significant difference between them. This reflects a broader trend where educational interventions can enhance understanding and acceptance of vaccines but may not always lead to immediate behavioral changes (20).

The increase in behavioral intentions post-intervention suggests that when individuals are provided with accurate information and supportive messaging about vaccines, they are more likely to commit to vaccination. This is consistent with findings from UNICEF, which emphasize the importance of knowledge and awareness as fundamental elements for fostering positive attitudes toward vaccination (18). Additionally, the study results contribute to the broader discourse on vaccine hesitancy, often fueled by misinformation and distrust in healthcare systems. Research has shown that misinformation on social media can significantly affect vaccine acceptance (19). Therefore, interventions that not only provide factual information but also build trust within communities are essential for combating hesitancy.

Research on educational interventions for healthcare workers demonstrates that personalized reminders and comprehensive strategies are the most effective methods for increasing vaccination rates among older adults. This finding underscores the vital role that healthcare professionals play in influencing patients' vaccination decisions, indicating that educational initiatives should also focus on those responsible for communicating health information (21). The current study reinforces this perspective by highlighting the necessity of effective communication strategies to enhance vaccine uptake. Although the WHO has declared an end to the COVID-19 public health emergency, vaccination remains crucial for safeguarding vulnerable populations and preventing future outbreaks (22, 23)

4-1. Study Limitations

This study on the impact of educational interventions on Iranian adults' attitudes and behavioral intentions toward the COVID-19 booster dose has several limitations:

Sample Size and Generalizability: The study had a small sample size of 100 participants, limiting the generalizability of the findings to the broader Iranian adult population.

Lack of Control Group: The quasi-experimental design lacked a control group, making it difficult to attribute

changes in attitudes and intentions solely to the educational intervention.

Short Follow-Up Period: A two-month follow-up may be insufficient to assess the long-term retention of improved attitudes and intentions; longer studies are needed for sustainability evaluation.

Potential Bias in Self-Reported Data: The researcher-designed questionnaire may introduce bias, as participants might report more favorable attitudes and intentions due to social desirability or recall bias.

Cultural Context Limitations: Conducted in Bushehr, Iran, the study may not represent other regions with different cultural or socio-economic contexts. Future research should explore diverse settings to understand cultural influences on vaccine perceptions.

Focus on Attitudes over Actual Behavior: While the study assessed changes in attitudes and intentions, it did not evaluate actual vaccination behavior post-intervention. Future studies should link educational interventions with vaccine uptake rates.

5- CONCLUSION

Despite the WHO's declaration of an end to the COVID-19 public health emergency, vaccination remains vital for protecting vulnerable populations and preventing future outbreaks. The educational intervention significantly improved participants' attitudes and behavioral intentions toward vaccination, with mean scores rising notably after the program. Positive perceptions of vaccination increased substantially, and the intention to receive the third dose surged from 16% to 60%. These findings emphasize the effectiveness of structured educational initiatives in enhancing vaccination readiness and highlight the ongoing need to integrate COVID-19 vaccination into routine immunization programs to sustain public health gains.

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7- CONFLICT OF INTEREST: None.

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