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Major Article

Predictors on parent's attitudes toward the measles-rubella (MR) vaccine in Jordan: An education program

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Background: Vaccine hesitancy is considered 1 of the top 10 threats to global health. This study aims to assess the impact of an education program on parents' attitudes toward the measles-rubella vaccine.
Methods: A study was conducted with 250 parents using a randomized controlled trial design. The intervention group (125 parents) received training, education programs, and video, while the control group (125 parents) only received video. The Parent Attitudes about Childhood Vaccines (PACV) scale, including its behavior, safety and efficacy, and trust subscales, was used for pre-post assessment. This allowed for comparison between the groups and measurement of score differences. The PACV scale (range 0-42) identified vaccine hesitancy, with a score below 21 indicating "non-hesitant" and 21 or higher indicating "hesitant."
Results: The intervention group had a significant decrease in PACV scores after the program (17.54 ± 4.7, $P = .001$), mainly in behavior, safety, efficacy, and trust (6.4 ± 3.6, 9.8 ± 4.7, 3.9 ± 2; $P = .001, .011, .002$). The control group showed no changes (23.6 ± 3.5; $P = .402$). Postintervention PACV score differences were significant ($t = 11.562$, $P = .001$).
Discussion: Findings indicate that the education program had a positive effect on changing vaccine hesitancy.
Conclusions: The education programs promoted vaccine acceptance among parents.

BACKGROUND

Vaccination is one of the most essential strategies of cost/effective intervention in the prevention/control of common infectious diseases such as measles, pneumonia, or polio;[1] it prevents 2 to 3 million deaths a year among children worldwide.[2,3] Despite the availability of vaccination, its uptake has declined to serious levels worldwide; this decline is reflected in several factors, including a lack of understanding of the possible risks, the inefficiency of the vaccine in the event of a disease, the changeable perception of family life, and the health of the child, and a lack of knowledge of the immune system.[4] In addition, parental hesitancy to vaccinate due to a lack of education and awareness, and affected by the side effects of previous negative experiences of vaccination of their children.[5,6] The World Health Organization ranks vaccine hesitancy as 1 of the top 10 global health threats.[7]

In Jordan, parental hesitancy toward measles-rubella (MR) vaccination is a significant concern, with around 86% of parents expressing either resistance or hesitancy.[8] The MR vaccine is highly effective in preventing measles and rubella infections. Still, factors driving parental hesitancy include the combination of 2 vaccines into 1 shot, misinformation on social media, cultural or religious beliefs, lack of trust in the health care system, safety concerns about

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Conflicts of interest: None to report.
Ethics approval and consent to participate: The Ethical Committee of the Medical Research Ethics Committee, Hashemite Ministry of Health, and Ministry of Education approved the study. Parents were assured of the study's confidentiality. Anonymity was established by using codes, rather than parent's names. Informed written consent was obtained from the parents after explaining the objectives and details of the study.
Availability of data and materials: Data will be made available on request.

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vaccine components, and the influence of social media platforms spreading information questioning vaccine safety and efficacy.[9,10] Additionally, parents' lack of knowledge, dissatisfaction with information from health care professionals, conflicting information, negative emotions from personal experiences or adverse reactions to vaccinations, and negative relationships with health care workers contribute to vaccine hesitancy.[11,12]

Literature on vaccine hesitancy revealed a decrease of 5% in measles, mumps, and rubella vaccine uptake in the United States,[13] while a study in rural Puducherry indicated that nearly 20% of parents were hesitant to vaccinate their children. Factors such as social media misinformation, parental ignorance, and insufficient time for planning were identified as significant contributors to this hesitancy.[14]

It is important to address these concerns, provide accurate information, and build trust in health care systems to increase acceptance of the MR vaccine and other vaccines, as they undergo rigorous testing for safety and efficacy before being approved for use and are critical tools in preventing serious diseases and protecting public health. Health care providers can play a vital role in addressing hesitancy by providing accurate information and building trust. Targeted educational campaigns, engagement with community leaders, and efforts to improve health care system trust are recommended to increase MR vaccination acceptance rates in Jordan.[8]

The effectiveness of the vaccination program depends on how well parents understand the benefits of the MR vaccine, and addressing their concerns through education may be crucial in increasing acceptance and uptake of the vaccine for their children. This study aimed to assess the impact of an education program on parents' attitudes toward the MR vaccine and their decision to uptake it.

METHODS

Design

An experimental randomized controlled trial, pretest-posttest design was used to examine the effect of training education programs on Jordanian parents' attitudes toward the MR vaccine in Jordan.

Setting

A teaching community health center in northern Jordan served as the study's location. The researchers chose it because it was the largest teaching center in northern Jordan, equipped with numerous halls for conducting the educational program. Researchers selected study participants from a large school near the health center. This school serves a large community in north Jordan, with students ranging from 1st grade to 10th grade.

Participation and sampling

The target group consists of parents with children attending Jordanian schools who are scheduled to receive the MR vaccine. A school in North Jordan near a community health center was chosen for the study, with a student population of N = 620. Parents were eligible if they met the following criteria: either a mother or father of a child aged 6 to 15 without mental or physical disabilities, regular school students (students are organized in classes that meet on a regular basis),[15] married, Arabic-speaking, and hesitant to vaccinate their child or children. Vaccine hesitancy refers to a delay in acceptance or refusal of vaccination despite the availability of vaccination services.[16] A total of 540 parents met the eligibility criteria and agreed to participate. It is important to note that hesitancy was defined during subject enrollment. The study randomly selected a sample size of 250. The power analysis, using the Raosoft sample size calculator, determined that a sample size of 225 was required at a 95% confidence level. The researchers recruited 250 individuals to account for a 10% dropout rate. The researchers used random sampling to select participants and randomly assigned 125 individuals to both the control and intervention groups. To minimize bias, the principal investigators, co-investigators, and study statisticians were blind (1:1) (Fig 1).

Instruments

The researchers used 2 instruments in this study. These instruments included a demographic data questionnaire and the Parent Attitudes about Childhood Vaccines (PACV) Scale. Based on a literature review, the researchers divided the demographic data questionnaire into 2 parts: the first part covers student details such as gender, grade, family structure, number of family members, birth order, economic status, living arrangements, and routine childhood immunizations. The second section focuses on parental information (including age, relationship to the child, level of education, and occupation).[17–19] The PACV has designed an instrument to identify vaccine-hesitant parents with under-immunized children. This study used the PACV scale, which included 14 items rated on a 4-point Likert scale from "always" to "often," "sometimes," and "never." One of the items asked parents to rate their hesitancy about the MR vaccine, with "always" indicating resistance, "never" indicating acceptance, and "sometimes/often" indicating hesitancy.[8] The PACV scale's internal consistency was 0.745, indicating acceptable internal consistency.[8] The internal consistency for the entire Arabic version scale was 0.80. The PACV consists of 14 items, scoring 0 for never resistance, 1 for sometimes resistance, 2 for often resistance, and 3 for always resistance, with a minimum score of 0 and a maximum score of 42. Higher scores reflect stronger resistance. A total score of less than 21 was considered "non-hesitant," while a score of 21 or higher was considered "hesitant."

The Interventional Education Program

The educational program planned by researchers to educate parents about the importance of the MR vaccine and address common myths and cultural beliefs that contribute to vaccine hesitancy. The program consisted of 2 phases: an informational stage and a supportive stage.

In the first phase, parents attended a 60-minute session where they received information about the significance of the MR vaccine in preventing MR and the impact of vaccine hesitancy on public health; presentation on common myths and misinformation about vaccines circulating on social media; exploration of cultural beliefs surrounding vaccines and conspiracy theories that fuel vaccine hesitancy; importance of trust in health care providers in vaccine decision-making; strategies for building trust and effective communication with health care professionals. The session was presented by the researchers (one public health nurse and one psychiatric nurse).

In the second phase, parents had a 60-minute session to express their concerns and feelings about the vaccine, including an interactive session to address parents' concerns and provide accurate information, and case studies and group discussions on how to address these beliefs effectively.

The MR video

The video script was written at a sixth-grade reading level to cater to various literacy levels. It covers the introduction to the MR vaccine, explaining what vaccines are, how they work, and their importance for public health. The video also discusses the effectiveness of the MR vaccine, explaining how vaccines are evaluated for preventing diseases and reducing infections. Safety concerns

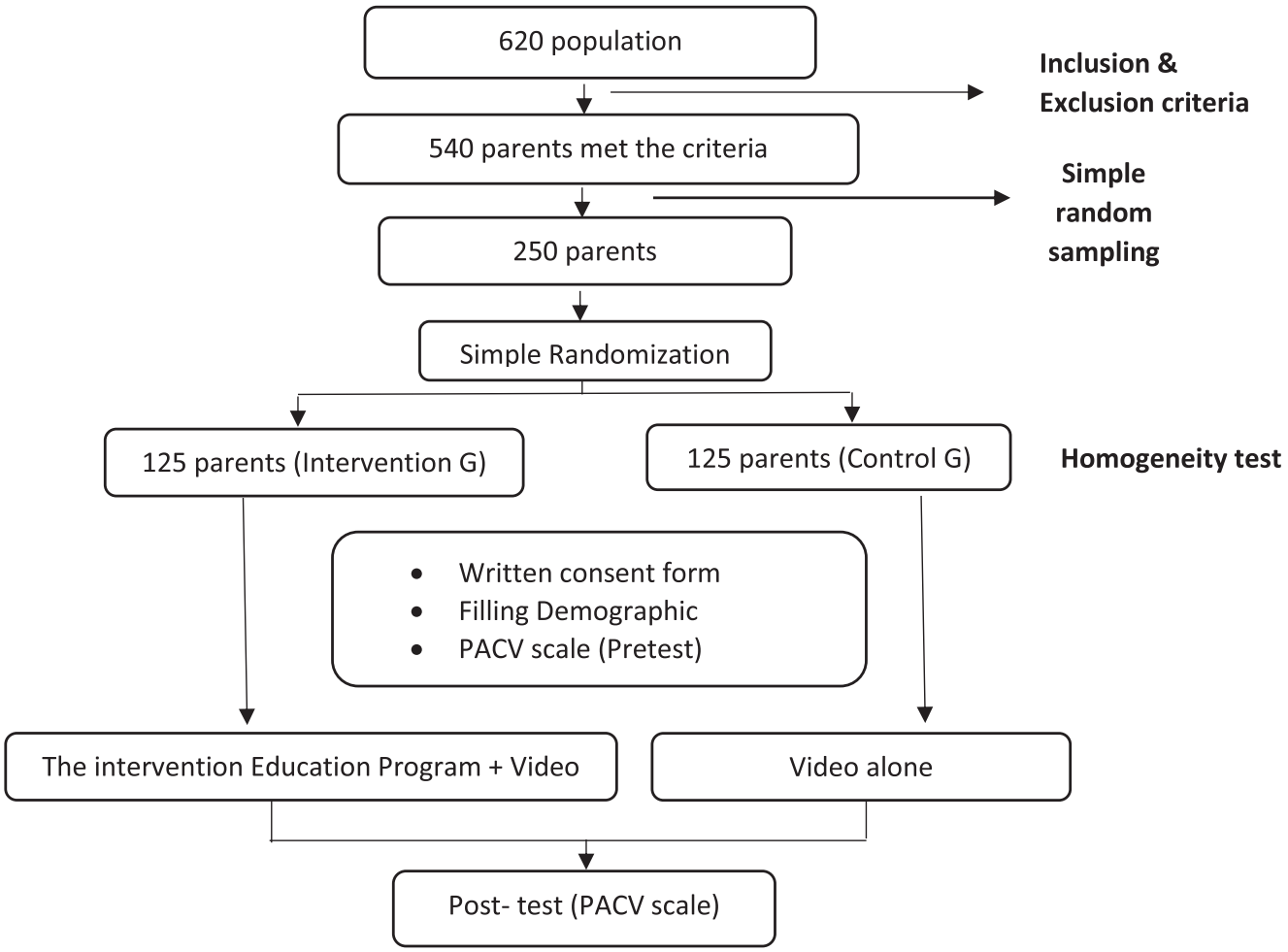

Fig. 1. Sample and study process. PACV, Parent Attitudes about Childhood Vaccine.

about the MR vaccine are addressed, emphasizing the rigorous safety monitoring systems in place and the low risk of serious side effects. Common myths about the MR vaccine are debunked with evidence-based information. The content was reviewed and approved by public health nurses and medical experts. The video was presented in Arabic by a public health nurse, accompanied by relevant visuals consistent with the slides. It comprised approximately 15 slides in a clear and logical organization, lasting 5 minutes, and was edited for high-quality visuals.

Data collection

Before commencing the study, the researchers distributed a survey form to students to be completed by their families. The form requested details such as parental names, contact numbers, student names, student grade level, any reported physical or mental illnesses, and whether they were willing to administer the MR vaccine to their child. The researchers requested the completed forms to be returned the following day. All forms were returned promptly, findings that all parents declined to vaccinate their children with the MR vaccine. Subsequently, a random selection of 250 parents was made, and they were contacted by phone to seek their participation in the study.

The researchers asked the child's mother or father to come to the Comprehensive Health Center, where they explained the purpose and importance of the study, highlighting that participation was voluntary and they could withdraw at any time. Before including the parents in the study, the researchers made sure to keep their data confidential and obtained their written consent. The researchers then randomly assigned the parents to 2 groups. Both groups completed a self-reported questionnaire as a preparation for the educational session. The control group, watched an MR video, completed a posttest, and finished their participation, while the intervention group, watched the MR video and also participated in the Interventional Education Program, then completed the posttest and ended their involvement with appreciation (Fig 1).

Data analysis

Statistical Package for Social Sciences (SPSS) IBM Corporation version 25.0 was used to analyze relationships among the variables. Descriptive and inferential statistics were used to describe the sample's sociodemographic data and independent t tests to compare the effectiveness of the education program on PACV levels between the experimental and control groups. The correlation coefficient (r) measures the strength and direction of the relationship between the 2 variables, and relationships between categorical and continuous variables were analyzed using the Mann-Whitney or Kruskal-Wallis tests.

RESULTS

A total of 250 parents, 125 parents in each group, responded to their demographic characteristics and pre-posttest PACV scale. The

Table 1
Similarity of demographic data between the intervention (n = 125) and control groups (n = 125)

Variable	Category	Education program group		Control group		*P* value
		N = 125	%	N = 125	%	
Student's data						
Gender	Male	53	42.4	58	46.4	.524*
	Female	72	57.6	67	53.6	
Class	Primary school	49	39.2	44	35.2	.513*
	High school	76	60.8	81	64.8	
Family type	Nuclear	112	89.6	107	85.6	.337*
	Extended	13	10.4	18	14.4	
Family members	≤4	56	44.8	61	48.8	.526*
	>4	69	55.2	64	51.2	
Student's order	First	46	36.8	37	29.6	.087†
	Middle	49	39.2	42	33.6	
	Last	30	24	46	36.8	
Economic status	High	14	11.2	12	9.6	.466†
	Moderate	80	64	89	71.2	
	Low	31	24.8	24	19.2	
Living place	City	81	64.8	90	72	.220*
	Village	44	35.2	35	28	
Routine childhood immunizations	Yes	125	100	125	100	1.00*
	No	0	0	0	0	
Parent's data						
Age	≤40	59	47.2	52	41.6	.372*
	>40	66	52.8	73	58.4	
Relation to the students	Father	55	44	53	42.4	.416*
	Mother	71	56	72	57.6	
Education level	High school or less	42	33.6	39	31.2	.712†
	Undergraduate	67	53.6	73	58.4	
	Postgraduate	16	12.8	13	10.4	
Occupation	Working (HCW)	32	25.6	24	19.2	.193†
	Working (non-HCW)	69	55.2	83	66.4	
	Not working	24	19.2	18	14.4	

HCW, Health care worker; *MR*, measles-rubella.
*Independent t test.
†Mann-Whitney U test.

homogeneity test showed that no significant differences were observed between the 2 groups based on the initial data ($P > .05$). The majority of parents were classified as nuclear families, accounting for 89.6% and 85.6% in the intervention (I) and control (C) groups, respectively. Most parents reported a moderate economic level (I: 64% and C: 71.2%) and resided in urban areas (I: 64.8% and C: 72%). Notably, all of the students had received the routine childhood vaccine (Table 1).

The majority of parents had received an undergraduate education (I: 53.6% and C: 58.4%). A significant proportion (I: 55.2% and C: 66.4%) was not employed in the health care sector. A majority of parents (I: 56% and C: 57%) were mothers of the students. However, all of them had decided to refuse the MR vaccine for their child (Table 1).

The average PACV scale score at baseline was 24.12 ± 4.1 for the intervention group and 24.01 ± 4.2 for the control group, no significant difference was found between the 2 groups ($P = .834$). After implementing the education program, the intervention group showed a significant PACV score decrease (17.54 ± 4.7, $P = .001$). No significant difference was found in PACV score within the control group (23.6 ± 3.5; $P = .402$).

Regarding the 3 constructs of PACV, in the intervention group, the baseline average score of the behavior construct was 9.5, the safety and efficacy construct was 11.4, and the trust construct was 7.6. A significant PACV score decrease was shown after the education program in the behavior, safety and efficacy, and trust construct (6.4 ± 3.6, 9.8 ± 4.7, and 3.9 ± 2; $P = .001$, 0.011, and .002, respectively.

In the control group at baseline, the behavior construct was 9.8 ± 4.4, the safety and efficacy construct was 11.2 ± 5.6, and the trust construct was 7.8 ± 2.6. No significant changes were found in the 3 constructs in the posttest ($P > .05$). However, a significant difference was observed between the intervention and control groups in the behavior and trust construct after the education program (*P* value > .05). No significant differences were found between the 2 groups in the safety and efficacy construct ($P = .132$) (Table 2).

An independent t test indicated that there were statistically significant differences in PACV between the interventional and control groups for mean postintervention scores ($t = 11.5619$, $P = .001$), where the control group achieved a mean score of 23.6 ± 3.5 and the experimental group achieved an average score of 17.54 ± 4.7 (Table 3).

The correlation coefficient (r) measures the strength and direction of the relationship between the 2 variables. A value of 1 indicates a perfect positive correlation, while a value of 0 indicates no correlation. Based on these results, it appears that in the intervention group, there is a statistically significant positive correlation between "PACV score < 21" and "Decision to uptake MR vaccine" after the intervention. In contrast, in the control group, there is no significant correlation between these variables (Table 4).

DISCUSSION

This study provides valuable insights into the attitudes and perceptions of parents toward the MR vaccine in Jordan. Furthermore, the study reported that all parents who participated refused to vaccinate their children with the MR vaccine. This discrepancy highlights a specific hesitancy or reluctance toward the MR vaccine compared to other vaccines. Prior research indicates that most Jordanians have a positive attitude toward vaccines, with a high percentage of parents willing to undergo vaccination.[20,21] However, when it comes to the MR vaccine, a notable number of parents in Jordan demonstrated reluctance or hesitancy. Specifically, 43.2% of

Table 2
Changes in PACV total and the 3 constructs in the 2 groups before and after the education program

Variables		Intervention group n = 125	Control group n = 125	t (123)	*P* value between groups
		Mean (SD)	Mean (SD)		
PACV* score	Pretest	24.12 (4.1)	24.01 (4.2)	0.2095	.834
	Posttest	17.54 (4.7)	23.6 (3.5)	11.5619	.001*
	Within groups P value	.001*	0.402		
Behavior construct	Pretest	9.5 (4.5)	9.8 (4.4)	0.5329	.594
	Posttest	6.4 (3.6)	8.8 (3.7)	5.1978	.001*
	Within groups P value	.001*	0.052		
Safety and efficacy construct	Pretest	11.4 (5.2)	11.2 (5.6)	0.292	.770
	Posttest	9.8 (4.7)	10.6 (3.6)	1.5108	.132
	Within groups P value	.011*	0.314		
Trust construct	Pretest	7.6 (2.5)	7.8 (2.6)	0.6199	.536
	Posttest	3.9 (2.0)	7.4 (2.5)	12.2225	.001*
	Within groups P value	.001*	0.216		

PACV, Parent Attitudes about Childhood Vaccines.
*Significant *P* value.

Table 3
Total score of PACV and mean differences in the preintervention and postintervention phases between the experimental (n = 125) and control groups (n = 125)

Variables	Experimental group	Control group	t Test	*P* value	95% CI	
	n = 125	n = 125			Lower	Upper
	M (SD)	M (SD)				
Pretest	24.12 (4.1)	24.01 (4.2)	0.2095	.834	−0.9240	1.1440
Posttest	17.54 (4.7)	23.6 (3.5)	11.5619	.001	−7.0923	−5.0277

CI, confidence interval; *PACV*, Parent Attitudes about Childhood Vaccines.

Table 4
Association of PACV score with decision to uptake MR vaccine in the 2 groups before and after the education program

Groups	Variables	Before %	After %	Direction	*P* value
Intervention group	PACV score < 21	14	54	Positive	.006
	Decision to uptake MR vaccine	0	41		
Control group	PACV score < 21	16	20	-	.877
	Decision to uptake MR vaccine	0	0		

MR, measles-rubella; *PACV*, Parent Attitudes about Childhood Vaccines.

parents resisted, 43.0% expressed hesitancy, and only 13.8% accepted the MR vaccine for their children.[22] Moreover, the most common cause that leads parents to refuse the MR vaccine is misinformation from social media. Social media and false information play a crucial role in molding the attitudes of parents toward vaccination. These factors have a significant impact on individuals' willingness to receive vaccinations. To address any concerns or misconceptions, it is crucial to provide accurate and clear information.[23–25] A recent study on the Jordanian perspective on the MR vaccine suggests that immediate and focused actions are necessary to tackle this concern.[8] Specifically, researchers recommended implementing mass campaigns that aim to instill confidence in the safety and effectiveness of the MR vaccine.[8,10]

We found that the intervention group had higher change scores than the control group ($t = 11.5619$, $P = .001$), indicating the education program changed parents' attitudes about the MR vaccine for the better. Parents who participated in the education program showed a more significant enhancement in their attitudes toward the MR vaccine compared to the parents in the control group, who only watched the MR video. The study supports this, demonstrating a decrease in PACV scores and a decision to uptake the MR vaccine among the intervention group following the educational programs, while the control group showed no change in PACV scores and their decision. Numerous prior studies have shown that educational programs, designed to shift people's attitudes and behaviors, produce notable improvements and positive results.[19,26,27] However, the control group did not report positive results, highlighting the influence of targeted educational interventions on parental vaccination decision-making. In addition, several studies have shown that targeted interventions, such as educational materials, counseling sessions, and interactive workshops, can lead to increased vaccine acceptance among parents.[28–31] One study, for instance, discovered that a social media intervention targeting parental vaccine concerns significantly increased vaccine acceptance rates.[22] Research confirms that the intervention videos had an impact on factors influencing vaccination behavior, thereby indirectly boosting vaccination rates.[32] Similarly, a systematic review by Jarrett and his colleagues[29] concluded that educational interventions could improve knowledge, attitudes, and beliefs related to vaccination.

Overall, these results highlight the importance of targeted education programs in influencing parental attitudes and decisions regarding vaccination. By addressing specific concerns related to behavior, safety, efficacy, and trust, interventions can help increase vaccine acceptance among parents. The study's findings have implications for public health strategies aimed at promoting vaccine uptake. Future research could explore the long-term effects of education programs on vaccination decisions and assess the sustainability of attitude changes over time. Additionally, qualitative studies could provide insights into the factors influencing parental attitudes toward vaccines and inform the development of more effective intervention strategies.

CONCLUSIONS

The findings of this study contribute to the growing body of evidence supporting the effectiveness of education programs in promoting vaccine acceptance among parents. By targeting key factors influencing attitudes toward vaccination, interventions can

play a crucial role in improving immunization rates and reducing vaccine-preventable diseases.

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