



# Effectiveness of Theory of Planned Behavior-Based Educational Intervention on Newborn Care in Pregnant Mothers: A Quasi-experimental Study

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## Abstract

**Background:** The neonatal period is one of the most sensitive stages of life, requiring proper understanding and attentive care.

**Objectives:** Accordingly, this study was done to investigate the effectiveness of theory of planned behavior (TPB)-based educational intervention on newborn care in pregnant mothers.

**Methods:** This study was conducted as quasi-experimental research on 100 pregnant mothers who were assigned randomly to two groups of intervention (N = 50) and control (N = 50). The data collection tool was a valid and reliable questionnaire based on TPB, which was completed by both groups before the intervention. Considering the effective constructs of this theory, the educational intervention was performed in the form of four 60-minute education sessions in one month for the intervention group. One month after delivery, the data were recollected from both groups and analyzed using statistical tests.

**Results:** The mean and standard deviation of the mothers' age in both intervention and control groups were  $26.14 \pm 4.7$  and  $26.10 \pm 5.19$  years, respectively ( $P = 0.48$ ). Before the educational intervention, the behavioral intention of the intervention group was 3.33 (out of 5), which significantly increased to 4.54 after the educational intervention ( $P < 0.001$ ). Also, the performance of mothers regarding neonatal care in the intervention group increased from 2.86 to 4.64 ( $P = 0.001$ ) after the education.

**Conclusions:** The TPB-based educational intervention, along with active follow-ups, led to better and more principled behavioral intention and care provided by pregnant mothers to their newborn infants. Therefore, providing TPB-based education in other healthcare centers is recommended.

**Keywords:** Newborn Care, Danger Signs, Pregnant Mother, Theory of Planned Behavior, Education

## 1. Background

The neonatal period (first 28 days after birth) is one of the most sensitive stages of life, requiring proper understanding and attentive care. Any failure to do so causes irreparable damage and increases infant mortality (1). Globally, infant mortality is still a critical public health challenge, with the highest mortality rates among children under age five (2).

About 7.7 million children under age five die worldwide every year, of which approximately 3.1 million infants die during infancy, and nearly all of these deaths (99%) occur in developing countries. According to the estimations reported by the World Health Organization (WHO), infant mortality makes up 45% of the deaths among children under age five, and more than one-third of these mortalities occur during the first 24 hours of birth (3).

In developed countries, including the United States, two-thirds of all deaths during the first year of life occur in infancy. The annual mortality rate in the first year of life is higher than in the seventh decade of life (4, 5). In Iran, the infant mortality rate (IMR) is 12, and the mortality rate in children aged 1-4 years were estimated to be 14.5 per 1000 live births (6, 7).

Child health promotion and maintenance, specifically healthy growth and development, requires the active participation of informed and motivated parents who assume responsibility for caring for their children. Accordingly, promoting awareness and ability of mothers, especially the nulliparous pregnant women, in every society regarding the ways of coping with problems of newborns can be effective in enhancing newborns' health (8). As reported by the WHO, if the knowledge and awareness of parents are

promoted properly, the lives of two-thirds of children dying annually because of different reasons will be saved (7, 9).

However, it was found that only 37% of mothers in a study in Saudi Arabia (10), 30% of mothers in a study in Ekwochi in Nigeria (11), 58% of mothers in a study in Sandberg in Uganda (12), and 20% of mothers in a study in Bulto in Ethiopia (13) were aware of newborn care, and all these studies emphasized on the necessity of educating mothers in this area.

On the other hand, Memon et al. reported the weak performance of Pakistani mothers (14), and Waiswa et al. also revealed weak newborn care methods used by mothers in the Eastern region of Uganda (15).

As implementing educational programs for empowering mothers without the need for modern equipment can be very cost-effective in reducing mortality rate, and the risk of hospitalization and huge costs of mental disabilities resulting from defects in pregnancy and newborn care, the importance of educating mothers is tangible in any society. Besides, newborn care improves cognition, and children who have been in care showed a higher score in intelligence quotient test and improved performance in school performance (10-12).

Alam et al. (16), Murthy et al. (17), and Wu et al. (18), in their studies conducted in Bangladesh, India, and China, respectively, have also emphasized the necessity of educating pregnant mothers regarding newborn care and conducting more research in this regard.

This study employed the theory of planned behavior (TPB) because it has the appropriate constructs, including behavioral intention, consistent with the purpose of the study. According to this theory, people enact behaviors when they expect a benefit and value out of those behaviors, and this expectation is based on individual judgment. The TPB assumes that intention is the most important determinant of newborn care, which is influenced by a mother's attitude toward newborn care, subjective norms, and perceived behavioral control (19).

TPB-based education has been positively assessed in various areas of healthcare for vulnerable groups (20, 21).

It is worth noting that most of the previous research has been non-interventional and focused on the problems of premature infants and little research is available on healthy newborn care.

In this study, proper newborn care included keeping the newborn's room temperature at the appropriate level, proper bathing, feeding the newborn with the colostrum, cleaning the umbilical cord, proper reaction to danger signs in the newborn, and regular visits to health centers.

## 2. Objectives

Accordingly, considering multiple problems of newborn care and the importance of educating mothers on taking care of their newborns, this study was designed and conducted aiming to determine the efficiency of TPB-based educational intervention on enhancing newborn care by mothers.

## 3. Methods

### 3.1. Study Design and Participants

This study was conducted as interventional and quasi-experimental research. The study population included all third-trimester pregnant mothers who were referred to the health centers of Arak, Iran. Inclusion criteria were being a nulliparous pregnant woman and willingness to participate in the study. Exclusion criteria were reluctance to continue participating in the study and being absent more than two-thirds of the educational sessions.

The sample size required for this study was determined as 100 people. According to the study by Ghasemi et al. (20), considering type I error of 5%, and type II error of 10% based on the performance construct, the sample size of 40 participants was obtained in each group. Finally, considering the sample loss, 50 participants were included in each group of intervention and control.

In order to sample among health centers located in Arak, four health centers out of the total of 24 centers were selected based on socioeconomic conditions and were randomly divided into two groups of intervention and control (two centers for each). Also, 50 mothers from the intervention centers and 50 mothers from the control centers were selected through convenience sampling and included in the study according to the family file number available in the health centers.

The primary outcomes included awareness and constructs of the TPB, including attitude, subjective norm, and perceived behavioral control. The secondary outcomes included the intention and behavior of pregnant mothers regarding their newborn babies.

In this study, first, the information was collected from both the intervention and control groups through a reliable and valid questionnaire before the intervention. Then, the intervention group received TPB-based educational intervention for one month, and the control group received routine educations provided by the health centers. At last, the information was collected from both the intervention and control groups one month after delivery.

### 3.2. Data Collection Tool

The data collection tool in this study was a questionnaire composed of the following sections:

- Demographic information: Including the mother's age, parents' job, parents' education, pregnancy age, and the age of marriage.

- The mothers' awareness assessment on newborn care, including 8 multiple-choice questions, was completed by mothers.

- Theory of Planned Behavior Section included the following constructs: (1) mothers' attitudes, including four questions to be answered on a 5-point Likert scale (totally agree: 5 points, agree: 4 points, no idea: 3 points, disagree: 2 points, and totally disagree: 1 point); (2) mothers' subjective norms, including 6 questions to be answered on a 5-point Likert scale; (3) mothers' perceived behavioral control, including 6 questions to be answered on a 5-point Likert scale. This construct addresses the factors, which facilitate or prevent the behaviors and mothers' ability to perform the behaviors; (4) mothers' intention, including 3 questions to be answered on a 5-point Likert scale. Behavioral intention is the intent to enact a behavior, and when the actual behavior cannot be easily measured, behavioral intent can be used as a helpful indicator; (5) mothers' performance, including 6 questions to be answered on a 5-point Likert scale. In this study, proper newborn care included keeping the newborn's room temperature at the appropriate level, proper bathing, feeding the newborn with the colostrum, cleaning the umbilical cord, proper reaction to danger signs in the newborn, and regular visits to health centers.

The questions were also assessed during pregnancy based on the mothers' perceptions of whether they will enact the desired certain care behaviors if they have a baby.

To score the items in the mothers' awareness assessment on newborn care section, one point was given to each correct response and zero to each incorrect response. Thus, the points ranged from zero to 1. The points in the constructs of the TPB ranged from 1 to 5.

In this study, content validity was assessed both quantitatively and qualitatively with the help of 10 experts in the fields of health education, midwifery, pediatrics, and maternal and child health. To quantitatively assess content, the content validity ratio (CVR) and content validity index (CVI) were calculated. Obtaining CVI of at least 0.79 and CVR of at least 0.62 by referring to Lawshe's table and the number of experts in the study, the items' validity was confirmed. To determine the reliability of the questionnaire using the internal consistency, Cronbach's alpha coefficient was obtained as 0.8 for awareness, 0.75 for attitude, 0.7 for perceived behavioral control, 0.7 for behav-

ioral intention, 0.7 for subjective norms, and 0.8 for performance.

### 3.3. Educational Intervention

The educational intervention was designed based on the initial needs analysis of the pre-test results and was implemented in the form of four sessions as follows:

The first session was held for one hour, focusing on enhancing the pregnant mothers' awareness of the neonatal period, newborns' needs, and danger signs in newborns.

The second session was held for one hour, focusing on changing the pregnant mothers' attitudes and subjective norms. According to the process recommended by Sharma and Romas (19), brainstorming and group discussion techniques were used in order to modify and or change incorrect beliefs and strengthen correct ones.

The third session was held for one hour, focusing on the perceived behavioral control. This session tried to make the mothers familiar with the barriers to proper care and enhance their confidence in their ability to take care of their newborns.

The fourth session was held for one hour, focusing on the mothers' behavioral intention and performance. The purpose of this session was to make the mothers familiar with proper newborn care. Using educational videos and pictures, certain behaviors, such as keeping the newborn's room temperature at the appropriate level, proper bathing, feeding the newborn with the colostrum, cleaning the umbilical cord, and proper reaction to danger signs in the newborn were taught.

The intervention protocol is summarized in Table 1.

One month after the educational intervention, the questionnaires were again completed by both groups.

### 3.4. Data Analysis

The data were analyzed using SPSS 20, and descriptive statistics of mean and SD were used. Then, non-parametric Mann-Whitney and Willcoxon tests were used in cases where the data distribution was abnormal based on the Kolmogorov-Smirnov test.

### 3.5. Ethical Considerations

This study was approved and financially supported by the Faculty of Health of Arak University of Medical Sciences in the form of a master's thesis in Health Education and Promotion (No. 2957). Also, the research was approved by the Committee of Ethics in Research of Arak University of Medical Sciences (IR.ARAKMU.REC.1397.169).

**Table 1.** Intervention Protocol

Time & Session	Intervention Steps (Activities & Content)	Objectives
<b>First session</b>	Focusing on enhancing the pregnant mothers' awareness of the neonatal period, newborns' needs, and danger signs in newborns.	To reinforce important information on newborn care knowledge and practical skills.
<b>Second session</b>	Group education: A one-hour session was provided, including lecture and video watching for information about newborn care, emphasizing the benefit of newborn care, modifying the wrong idea on the newborn care, discussion and sharing with other experienced mothers, health educators, or midwife staff for successful newborn care experience. The participants' significant others (midwife or physician) were invited to the session. Mothers and their significant others were reformed about the long-term benefits and importance of newborn care. In this session, role-play, brainstorming, group discussion, and critical thinking techniques were used in order to modify and or change incorrect beliefs and strengthen correct ones.	To change newborn care attitudes and enforce subjective norms
<b>Third session</b>	The educational videos were used to show the effects of behavior-facilitating factors, such as providing incentives, reducing and eliminating perceived barriers, breaking behaviors into small steps, practical demonstrations, and successful experiences of mothers on perceived behavioral control. Moreover, in this session, individual instruction and support with practicing correct newborn care techniques using slides, pictures, and video were provided.	To improve perceived behavior control by learning practice skills and solving problems about newborn care.
<b>Fourth session</b>	In this session, using educational videos and pictures, certain behaviors, such as keeping the newborn's room temperature at the appropriate level, proper bathing, feeding the newborn with the colostrum, cleaning the umbilical cord, and proper reaction to danger signs in the newborn were taught. Individual newborn care advice by telephone support to follow up newborn care practice and solve problems was provided once a week during four weeks post-partum. For major problems or asking a question, researchers provided a health center visit or telephone counseling for further help.	To equip women by focusing on the mothers' behavioral intention and performance.

#### 4. Results

The average age of the mothers in the intervention and control group was  $26.4 \pm 4.76$  and  $26.1 \pm 5.19$  years, respectively, which showed no significant difference based on the results of the Mann-Whitney test ( $P = 0.310$ ). Other demographic characteristics of the studied mothers are listed in Tables 2 and 3.

The results showed that there was no significant difference between the intervention and control groups in terms of the constructs of the TPB. Before the intervention. However, the Mann-Whitney test showed a significant difference between the intervention and control groups in terms of constructs of the TPB and proper newborn care behavior after the educational intervention (Table 4). Also, the performance of the intervention group regarding the proper newborn care behavior significantly enhanced from  $02.86 \pm 0.42$  before the educational intervention to  $4.64 \pm 0.14$  after the intervention ( $P < 0.001$ ).

#### 5. Discussion

Based on the results of this study, the training intervention resulted in a significant enhancement in newborn care in the intervention group compared to the control group. This enhancement can be attributed to edu-

cational methods, including educational videos, booklets, role plays, critical thinking, etc.

In this study, the mothers' awareness was significantly enhanced after the educational intervention. As reported by the WHO, if the knowledge and awareness of parents are promoted properly, the lives of two-thirds of children dying annually because of different reasons will be saved (7, 9). This shows the necessity of educating mothers for and enhancing their awareness of newborn care.

However, it was found that only 37% of mothers in a study in Saudi Arabia (10), 30% of mothers in a study by Uchenna in Nigeria (11), 58% of mothers in a study by Sandberg in Uganda (12), and 20% of mothers in a study by Bulto in Ethiopia (13) were aware of newborn care. Also, Tsegay et al. reported weak awareness of 25% of midwives about newborn care (22). All these studies emphasized the necessity of educating mothers in this area.

It is noteworthy that the effectiveness of educational intervention in enhancing mothers' awareness in the present study was consistent with the results of many other studies. Ghasemi et al. also reported enhanced awareness of mothers regarding newborn care after an educational program (20). However, Salem in Saudi Arabia showed no increase in the knowledge of nurses before and six months after an educational program on neonatal growth monitoring, which is not consistent with the

**Table 2.** Comparison of the Intervention and Control Groups Concerning the Quantitative Demographic Variables

Variables	Intervention		Control		P-Value <sup>a</sup>
	Mean	SD	Mean	SD	
<b>Mothers' age (y)</b>	26.4	4.76	26.1	5.19	0.310
<b>Age of marriage (y)</b>	22.42	2.13	22.14	2.31	0.755
<b>Age of pregnancy</b>	28.22	3.33	27.5	2.91	0.389
<b>BMI (kg/m<sup>2</sup>)</b>	26.60	3.9	26.99	4.12	0.34

<sup>a</sup> Mann-Whitney test.**Table 3.** Comparison of the Intervention and Control Groups Concerning the Qualitative Demographic Variables

Variables	Intervention		Control		P-Value <sup>a</sup>
	Frequency (N)	Percent (%)	Frequency (N)	Percent (%)	
<b>Mother' job</b>					0.62
Housewife	45	90	44	88	
Employee	5	10	6	12	
<b>Husband's job</b>					0.174
Employee	14	28	8	16	
Manual worker	10	20	7	14	
Unemployed	26	52	35	70	
<b>Level of mother's education</b>					0.75
Elementary	1	2	2	4	
Diploma	8	16	10	20	
University	41	82	38	76	
<b>Level of husband's education</b>					0.824
Elementary	12	24	14	28	
Diploma	24	48	21	42	
University	14	28	15	30	
<b>Residential status</b>					0.599
Personal	21	42	20	40	
Rental	29	58	30	60	

<sup>a</sup> Chi-square.

results of the present study. Therefore, researchers have recommended new methods of education, active participatory education, and practical work, as well as support monitoring and evaluation (23).

In this study, the attitude of the mothers in the intervention group was enhanced after implementing the educational intervention. This finding was compatible with similar studies by Darabi et al. on reproductive health and Jalambadani et al. on iron supplementation among pregnant women (24, 25).

In the present study, this enhancement can be the result of holding educational sessions (playing educational videos and using educational booklets with relevant pic-

tures) about the benefits of newborn care and the adverse consequences of improper newborn care.

However, Abdolkarimy et al. (26) showed that pregnant mothers did not have a good attitude toward taking care of their newborns due to being addicted, which is not consistent with the findings of the present study. Salem in Saudi Arabia (23), Deng in China (27), and Chia in Melbourne (28) assessed nurses' attitudes toward newborn care as low or average. The reasons can be the staff's heavy workload, insufficient education, lack of organizational support, and lack of transparent protocols, especially for low birth weight babies.

Also, Berhe et al. in Ethiopia evaluated mothers' atti-

**Table 4.** Comparison of the Intervention and Control Groups Concerning the Theory of Planned Behavior (TPB) Constructs Before and After the Intervention

Variables	Intervention		Control		P-Value <sup>a</sup>
	Mean	SD	Mean	SD	
Knowledge					
Before	0.61	0.25	0.55	0.210	0.230
After	0.825	0.324	0.745	0.144	0.001
P-value <sup>b</sup>	0.001		0.772		
Attitude					
Before	3.08	0.37	3.28	0.33	0.466
After	4	0.01	3.51	.42	0.001
P-value <sup>b</sup>	0.001		0.645		
Subjective norm					
Before	2.50	0.311	2.56	0.268	0.413
After	3.70	0.296	2.43	0.235	0.001
P-value <sup>b</sup>	0.001		0.167		
Perceived behavior control					
Before	3.65	0.425	3.92	0.267	0.064
After	4.34	0.367	3.99	0.315	0.001
P-value <sup>b</sup>	0.001		0.279		
Intention behavior					
Before	3.33	0.301	3.44	0.061	0.432
P-value <sup>b</sup>	4.54	0.219	4.02	0.272	0.001
After	0.001		0.367		
Performance					
Before	2.86	0.42	2.45	0.259	0.135
After	4.64	0.14	3.32	0.555	0.001
P-value <sup>b</sup>	0.001		0.167		

<sup>a</sup> Mann-Whitney test.<sup>b</sup> Wilcoxon.

tudes toward newborn care as low in some aspects, which were not compatible with their religious beliefs (29).

In other studies, traditional attitudes and methods of newborn care and arbitrary use of drugs for infants were the leading causes of death and high infant mortality rate in some countries (30, 31).

Another finding of the present study was an increase in the subjective norm construct in the intervention group after performing the educational intervention. As most of the pregnant mothers mentioned their husbands as subjective norms, the relevant contents were included in the designed educational booklets and were provided to them.

Rempel in Vietnam assessed the role of fathers in newborn care and found that greater sensitivity and interaction between father and infant could promote the emo-

tional development of the child (32).

Gu et al. evaluated the effectiveness of TPB-based education on promoting exclusive breastfeeding in Chinese nulliparous pregnant women and showed that the subjective norms of Chinese women were their husbands and mothers (21), which was consistent with the finding of the present study.

After the educational intervention, the perceived behavioral control construct increased, which is consistent with the results of some studies on premature newborn care (20). As newborn care is considered as a value among Iranian families, highlighting the value and importance of newborn care in the educational sessions could increase the perceived ability of mothers and their self-confidence in this regard.



Tahir and Al-Sadat also showed that one of the barriers that mothers face in the early postpartum period is the low milk supply, and telephone counseling for educating breastfeeding can improve breastfeeding methods (33).

Esan in Nigeria found that 75% of mothers had perceived ability in taking care of their underweight newborns, which was due to education provided by clinical staff (34). However, in a study by Mansourian in Iran, nurses in the neonatal intensive care units found their educational role for the parents to be poor (37%), which was due to staff shortage, heavy workload, and no time to educate parents (35).

In terms of behavioral intention construct, the finding of the present study showed a significant difference in the intervention group before and after the educational intervention. In order to increase the behavioral intention of pregnant mothers during the educational intervention, they were informed that they could get any required information from their local health centers. Also, the behavioral intention was enhanced by watching educational videos and reading the booklets. This finding was consistent with some studies; for example, Ghaffari et al. on increasing mothers' intention for the behavior of pregnant women related to exclusive breastfeeding (36).

In their study on increasing mothers' intention to breastfeed in Spain, Bonuck et al. stated that breastfeeding counseling in two sessions before delivery and one session after delivery was effective in promoting mothers' behavioral intention in exclusive breastfeeding (37).

Promoted performance of mothers in the present study could be due to the emphasis of educational intervention sessions on learning newborn care skills by mothers participating in the intervention group. The newborn care skills emphasized in the educational intervention were cleaning the umbilical cord, bathing, proper breastfeeding, regular visits to health centers, seeing a doctor when noticing danger signs, maintaining the appropriate body temperature, etc., which all were emphasized in training sessions while providing videos and pictures.

Global evidence shows that women's groups practicing participatory learning and action can improve maternal and child survival in low-income settings. This finding is consistent with the results of several interventional studies conducted based on TPB on various health subjects (20). The results of the mentioned studies show that this theory can be effectively used to promote the attitude and performance of mothers in various fields.

The positive effects of the educational intervention were reported in the studies by Alam in Bangladesh on education via weekly voice messaging (16), Murthy in India on education via mHealth voice messaging service on newborn care (17), Wu in China on education using WeChat

social network for improving exclusive breastfeeding (18), and de Jongh on education via SMS for improving self-efficacy skills of patients and vulnerable groups of pregnant mothers (38). However, According to the researchers, the effectiveness of health interventions needs to be studied further.

One of the limitations of the present study was collecting data through self-reporting. However, it was tried to increase the quality of the collected data by providing transparent information to mothers.

### 5.1. Conclusions

Considering the results of the study, the TPB can be served as a useful model for promoting the behavior of the intervention group. Therefore, based on the obtained results, it is hoped that we can take an effective step toward the enhanced health of newborns and infants of our country by conducting more studies on this field and educating other influential individuals, especially healthcare providers and all those who have an important role in mother and child care, as the importance of the health of infants as future capitals of the country is one of the undeniable facts. Therefore, TPB-based educational interventions are recommended to be held for better newborn care in healthcare centers and educating mothers through mass media in studies with a wider scope, longer follow-up, and for other groups, including nurses, midwives, and physicians.

### Footnotes

**Authors' Contribution:** Study design, AN, MS, and MKh; Study design, data collection, drafting of the manuscript, AN; Analysis and interpretation of the data, MZ, MS, MKh, and AN; Critical revision of the manuscript, MS; Study supervision. All authors read and approved the final manuscript.

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