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Effect of education, based on the theory of planned behavior on promoting oral health behaviors of pregnant women with gestational diabetes mellitus

Maryam Rezai[1], Sediqe Ebrahimipour[2*], Kowsar Khosravi[3], Fahime Talebi[4]

[1] Assistant Professor, Department of Endocrinology and Metabolism, Medical Toxicology and Drug Abuse Research Center (MTDRC), Birjand University of Medical Sciences, Birjand, Iran

[2] Associate Professor, Department of Endodontics, Faculty of Dentistry and Dental Clinical Research Development Unit of Medical Science, Birjand, Iran

[3] General Dentist, Qaem Comprehensive Health Services Center, Birjand University of Medical Sciences, Birjand, Iran

[4] General Dentist, Doroh Comprehensive Rural- Urban Health Services Center, Birjand University of Medical Sciences, Birjand, Iran

Abstract

Background: Oral health of pregnant women especially women who have Gestational Diabetes Mellitus (GDM) is very important, because of the adverse effects of pregnancy on the oral hard and soft tissues and vice versa and also because of its adverse effects on the fetus health.

Objectives: The aim of this study was to evaluate the effect of education based on the theory of planned behavior (TPB) on oral health behaviors of pregnant women who have GDM in Birjand in 2018.

Methods: This experimental study was carried out on 86 pregnant women, (43 pregnant women in each intervention and control group). Educational intervention based on TPB was performed in the intervention group. Two sessions of oral health education were conducted. Then, the questionnaire was given to the two groups. Data were collected and analyzed by SPSS 22 software at 0.05 significance level.

Results: The mean age of participant in intervention group was 30.16±5.02 and in control group was 31.28±5.90.the results of the study indicating that after the educational intervention, the knowledge and attitude of the intervention group significantly increased compared to the baseline (P<0.001). However, intergroup comparative evaluation showed that constructions of subjective norms (intervention: 6.65±2.34, control: 7.56±2.18, $P = 0.03$), perceived behavioral control (intervention: 10.49±2.54, control: 10.76±2.21, $P = 0.38$), intention (intervention: 8.51±2.46, control: 13.7±2.37, $P < 0.001$) and performance (intervention: 10.77±2.11, control: 13.6±1.84, $P < 0.001$) did not increase under the influence of educational intervention in the intervention group.

Conclusions: Considering that health education based on TPB in pregnant women with diabetes did not lead to changes in oral health behaviors; so it is suggested that oral hygiene instruction programs be included in the pre-pregnancy care schedule and periodic examinations be carried out to evaluate adherence and maintaining good oral hygiene among women.

Keywords: pregnant women, education, planning theory, gestational diabetes, oral hygiene

Introduction

A healthy life requires physical and mental health. Oral health is also one of the issues that affect each individual's quality of life [1].

Adherence to oral hygiene can prevent many diseases, so attention to this issue is one of the programs of World Health Organization in the field of prevention of chronic diseases and health promotion [2].

Diabetes is a chronic metabolic disease characterized by increased blood glucose levels and impaired carbohydrate, protein, and fat metabolism [2]. This disease is one of the most important medical and socio-economic problems in the world [3]. Diabetic patients are more susceptible to some infections. Oral disorders such as xerostomia (dry mouth), lichen planus, lichenoid reactions, gum disease, periodontal disease, caries, and tongue change sand oral candidiasis are common due to poor or lack of proper diabetes control [3-5].

For example, periodontitis, that is severe inflammation and destruction of the supporting tissues of the tooth, is one of the most common complaints of diabetic people which progresses faster and more severely in these patients, and its prevalence is twice as high in diabetic patients. In periodontitis, the *Porphyromonas gingivalis* bacterium invades the endothelial cells of the arteries, causing the accumulation and activity of monocytes and macrophages. This process produces inflammatory mediators (cytokines) that have adverse effect on the body, and a chronic increase in cytokines in the pancreas can lead to injury or destruction of insulin-secreting cells [6].

Among diabetic people, mothers with gestational diabetes are particularly important because of their hormonal and nutritional conditions, which prone mother and fetus to a variety of diseases [7].

There are several complications, such as macrosomia, preterm labor, neonatal metabolic disorders (hypoglycemia, hyperglycemia, and hyperbilirubinemia), and late complications such as maternal type 2 diabetes [7].

Combination of hormonal changes with placental secretions

such as progesterone, placental lactogen, corticotropin-releasing hormones and growth hormone cause insulin resistance and increases its secretion. Therefore, pregnancy is a diabetogenic condition and diabetes is the most common medical complication in pregnancy that 88% of its cases are gestational diabetes type (GDM) [8].

GDM is the intolerance to carbohydrates of varying severity that is first started or detected during pregnancy [9]. Of all pregnant women 14-18% is at risk for gestational diabetes [10].

Pregnant women have high levels of sex hormones that cause changes in their blood vessels and increase the response to local factors such as plaque and calculus so they are more prone to periodontal disease and dental caries [8].

Pregnant women are 2.9 times more likely to develop caries than non-pregnant women [1] prevalence of periodontal disease in pregnancy is reported to be between 40 and 50 percent [8] and gestational gingivitis, gestational tumors, and inflammation of the oral tissues are the most common forms of periodontal disease [8].

According to previous studies, untreated periodontal disease in pregnant women is an important risk factor for preterm labor (less than 37 weeks) and low birth weight babies (less than 2,500 grams) which impose heavy cost to the community [1].

Morning sickness or severe nausea can cause oral manifestations of Perimolysis or acidic corrosion of the teeth, loosening of the teeth and an increase in the depth and fluid of the gingival groove during pregnancy [11].

On the other hand, we are faced with a decrease in oral hygiene because of bleeding and nausea due to use of toothbrushes and toothpaste in pregnant women [12]. Decreased oral pH due to nausea and vomiting increases tooth decay, which this itself requires more attention to oral hygiene [12].

In a study by Thomas *et al*, More than half of pregnant women did not see a dentist during their recent pregnancy [7] in another study, half of pregnant women had gingivitis, while 5% were aware of their gums sickness [13]. These findings indicate lack of awareness about oral hygiene among pregnant women

According to the World Health Organization report, health education is the best and most effective way to ensure the health of people in the community, both in supply human resources and medical expenses [14].

Acknowledging that health education alone will not have a beneficial effect on oral health, transforming awareness into active thinking and health behavior requires a change in attitude. It is therefore revealed the importance of developing an appropriate training program based on a model [7].

One of the most widely used social cognitive models is the theory of planned behavior (TPB) [15, 16]. The success of this theory has been proven in better understanding and explaining wide range of health behaviors [15, 16].

Theory of Planned Behavior (TPB) is a social cognitive model which states intention is the main determinant of behavior. Intention is influenced by the three independent components of attitude, subject norm and perceived behavioral control. Attitude reflects a person's positive or negative thinking or filling of a behavior. The subject norm implies that perceived social pressures may cause a person to perform certain behaviors, and that perceived behavioral control is the difficulty or ease of performing a particular behavior. It seems to be affect directly or indirectly on performance.

A review of past studies showed that TPB has been used regularly in the field of oral health [15, 16]. The results of a randomized controlled trial of 170 adolescent showed significant effect of intervention using dental floss in experimental groups [17].

Objectives

Because of the adverse effects of diabetes on oral health and the particular importance of oral health in diabetic pregnant women, as well as the lack of knowledge about the effectiveness of his theory on women with GDM, so the aim of this study was to determine the effectiveness of a theory-based educational intervention on self-care behaviors of oral health in diabetic pregnant women in Birjand.

Material and Methods

This experimental study was performed on 86 pregnant women with GDM from 100 examined women who admitted to health centers and endocrinology clinics in Birjand in 2018. They were selected according to their medical records, based on fasting blood sugar (FBS) and with the opinion of endocrinologist and entered the study by simple random sampling. These people were filled the questionnaire and then divided into two equal groups in terms of age, level of education, history of diabetes and age of first pregnancy, etc. In each group n = 43 which is calculated from the formula

$$\frac{((z(1-\frac{\alpha}{2})+z(1-\beta))\ast 2\ \delta 1+\delta 2\ast 2)}{(\mu 1-\mu 2)\ast 2}$$

And the adjust formula of.

$$\frac{n=n_{\circ}}{(1+\frac{n_{\circ}}{N})}$$

Inclusion criteria were consent of women to participate the study, gestational age of less than 24 weeks, having gestational diabetes mellitus, the ability to read and write, not affecting advanced oral disease, and not employed in professions related to dentistry. Exclusion criteria were absence from the educational program, unwillingness to complete the questionnaire or incomplete response to the questionnaire.

The data collection tool was a standard questionnaire used in the study by Ebrahimipoor *et al* [18]. The validity and reliability of the questionnaire in different components obtained above 0.7 by Cronbach's alpha [18].

The questionnaire consisted of 10 demographic questions, 12 awareness questions, 7 attitude questions, 4 subjective norm questions, 5 perceived behavioral control questions, 5 intention questions, and 7 performance questions.

After completing and collecting the questionnaires in the first stage, the individuals randomly entered the study and based on the list of their names, they divided into two groups of intervention and control.

(n=43 in each group).

Educational interventions based on the theory of planned behavior, were held for the test group during two one-hour training sessions, two weeks apart. The trainings were defined based on the objectives and were conducted by the

project executives under the supervision using Power Point and lecture along with questions and answers. In order to facilitate the change in the behavior of pregnant women, at the end of session package containing a toothbrush, toothpaste and dental floss made available for intervention group.

Due to the lack of cooperation of pregnant women to participate in all 4 training sessions, with the opinion of the research team, it was considered appropriate to hold two training sessions.

In the first session, in order to increase the awareness of pregnant women and create a positive attitude to importance of oral health, the following educational materials were taught: adverse effects of oral and dental problems during pregnancy, conditions that can cause poor oral hygiene during pregnancy, adverse effects of oral and dental problems during pregnancy for the fetus, adverse effects of diabetes on teeth and gums.

In the second session, which was held by inviting a companion (spouse, mother, sister, friend, etc.), while increasing the awareness in the field of health and changing attitudes about common wrong habits in this field and emphasizing the right way to perform oral and dental hygiene, we sought to change behavior and behavioral control. The training materials were as follows: the correct method of brushing, features of a suitable toothbrush, proper flossing, good times to use toothbrushes and floss, the impact of others on women's oral hygiene during pregnancy, practical tutorial on how to brush and floss using a replica and Q&A.

Due to the lack of participation of women in training classes at the same time, the sessions were held in smaller groups of 10 t0 15. One month after the interventions, the questionnaires were re-completed by participants in both the experimental and control groups. In the control group, the training was conducted by distributing oral health educational pamphlets after completing the second stage of the questionnaire.

Participation in this research was optional and complete information about the goals and how to participate and conduct the research is provided to participants. The participants were reassured that their information was confidential and it did not conflict with the culture and beliefs of the community.

The data were entered into SPSS software version 22 and was analyzed using descriptive statistical tests (mean, standard deviation, frequency and percentage), independent and paired t-test and Mann-Whitney U test, at a significance level of 0.05.

Conclusion

The mean age of pregnant women was 30.16±5.02 and 31.28±5.90 years in the intervention and control group, respectively. The independent t-test showed that the two groups did not differ in terms of age and number of children (P> 0.05).Other demographic characteristics mentioned in Table 1. Intergroup comparative evaluation at baseline showed that the mean grades score of knowledge, attitude, subjective norms, perceived behavioral control, and performance were comparable and had no significant differences (table 2 and table 3)

However, intergroup comparative evaluation after the educational intervention showed that the constructions of knowledge and attitudes had a significant increase in the intervention group compared to the control group. The, subjective norms, perceived behavioral control, intention and performance did not increase under the influence of educational intervention in the intervention group (table2 and table3)

Data analysis using paired *t*-test and Wilcoxon test showed that after education in the intervention group the constructions of knowledge and attitudes had improved significantly but subjective norms, intention perceived behavioral control and performance were not improved rather than baseline.

The constructions of knowledge, perceived behavioral control and performance increased significantly in the control group rather than baseline (table 2, 3)

The purpose of this study was to evaluate the effect of education based on the theory of planned behavior (TPB) on oral health behaviors of pregnant women who have GDM in Birj and in 2018.

The findings showed that the difference between the score of knowledge and attitude after the intervention in the test group was significant. the study of Shamsi *et al*., Haji Kazemi *et al*. showed similar results [19, 20].

Table 1: Demographic characteristics of participants in the intervention and control group

Demographic Characteristic	Intervention Group		Control Group		P value K^2 test
	NO	%	NO	%	
Level of education					
Elementary and middle school	18	41.9	10	23.3	0.12
High school	13	30.2	13	30.2	
College or university	12	27.9	20	46.5	
Job					
Yes	8	18.6	10	23.3	0.23
No	35	81.4	33	76.8	
Monthly family income					
low	14	43.8	9	26.5	0.33
moderate	6	18.8	9	26.5	
high	12	37.5	16	47.1	

Table 2: Comparison of the mean scores of attitude, intention and performance in the study groups before and after the intervention

	Mean±SD		*P independent t test*
	Intervention Group	**Control Group**	
Attitude			
Before Intervention	19.95±3.32	19.93±3.61	0.97
After Intervention	23.23±5.23	20.02±3.73	0.001*
P Value (paired t test)	P<0.001*	P=0.82	
Intention			
Before intervention 12.98±2.41		13.7±2.37	P=0.53
After Intervention	8.51±2.46	12.39±3.14	P<0.001*
P Value (paired t test)	P<0.001*	P=0.67	
Performance			
Before Intervention	12.98±2.41	13.7±2.37	P=0.85
After Intervention	10.77±2.11	13.6±1.84	P<0.001*
P Value (paired t test)	P=0.06	P<0.001*	

*the differences are significant.

Table 3: Comparison of the mean scores of knowledge, Subjective norm and Perceived behavioral control in the study groups before and after the intervention

	Median and Percentile		*P Mann Whitney*
	Intervention Group	**Control Group**	
Knowledge			
Before Intervention	8.21±1.70	8.51±1.84	P=0.33
After Intervention	9.79±1.30	8.93±1.64	P=0.02*
P Value (Wilcoxon)	P<0.001*	P<0.001*	
Subjective Norm			
Before Intervention	7.49±2.51	7.81±2.96	P=0.69
After Intervention	6.65±2.34	7.56±2.18	P=0.03*
P Value (Wilcoxon)	P=0.007*	P=0.35	
Perceived Behavioral Control			
Before Intervention	10.51±3.17	10.39±2.39	P=0.84
After Intervention	10.49±2.54	10.76±2.21	P=0.38
P Value (Wilcoxon)	P=1	P=0.02*	

*the differences are significant.

Findings show that there is a relationship between awareness and attitude. In fact, with increasing awareness, mothers' attitudes toward oral care have improved [20].

Contrary to expectations, after the intervention, the mean score of behavioral intention in the test group decreased. However, the study by Hatefnia *et al*. showed that after training, the behavioral intention score in the intervention group increased significantly [21]. Also the mean score of performance on the test group decreased after intervention

These findings are Contrary to the results of other studies [19, 20].

It is commonly expected that awareness and attitude affect women's performance and as awareness increases, health behaviors improved too. But some studies have shown that mothers' knowledge and practice about oral care are irrelevant [21, 22].

The mean score of perceived behavioral control in the two study groups before and after the intervention did not differ significantly. The study by HatefNia *et al*., showed the opposite results [23].

Several factors are involved in influencing performance, intention and behavioral control that increased knowledge leads to change in attitude and consequently leads to change in behavior. These include: socio-economico-cultural conditions, as well as literacy level and the health status of the community. There is a possibility that oral hygiene of the participants is in good condition at baseline. A study that examines and records the status of caries and periodontal disease in pregnant women before the study can resolve these ambiguities.

Since, according to these results, contrary to other research, the change in knowledge and attitude did not lead to a positive change in oral health care behaviors, the following reasons can also justify the results: since more than 70% of the studied population were people with non-academic education, and this certainly has not positive effect on the perception that improved knowledge must lead to oral health performance. More than 50 percent of the population had low income. Thus there are many concerns that may prioritize over personal health. More than 75% of the study population consists of housewives and generally is limited only within the family and has less contact with the community; so practice a series of behaviors and beliefs is more difficult due to the previous background and less information. So despite increased knowledge, one does not realize the importance of turning this knowledge into action and considers it a trivial matter. Furthermore participants in this study were people who, as well as to pregnancy, had to take medication or dietary control of sugar, so this can be a reason for people to be bored with oral hygiene; between different medical prescriptions, which are more important for the health of mother and the fetus, they may neglected oral hygiene and made it their next priority. Also it is possible for women to turn acquired knowledge and attitudes into practical behavior after childbirth and in pregnancy they attributed more importance to health of the baby than for themselves. One of the reasons for the low impact of education on other constructions could be the

reduction of training sessions due to lack of cooperation of participants.

Whether better education on dental health in pregnancy can lead to improved dental practices, improved health and better pregnancy health outcomes requires further investigation.

The results of this study showed that the score of subjective norms, that discuss the influence of relatives and society, decreased significantly after the intervention in the intervention group. This was consistent with a study by Ebrahimipoor *et al*. that showed teaching pregnant women based on the theory of planned behavior improves all constructs of health behavior except subjective norms [18].

Since spouse plays an important role in persuading and motivating of woman, the role of the individual's spouse is more important than the other people in the case of subjective norm. In the other words about 70 percent of men had non-university education, and only a few of them attendedin the second session of counseling, the ineffectiveness of the intervention on the subjective norm was somewhat predictable.

Of the significant results in this study was improving the constructions of knowledge, perceived behavioral control and performance of control group in the second stage of completing the questionnaire compared to the baseline.

Questionnaire distribution seems to have acted as a confounding factor in improving health behaviors.

Of the limitations in this study were time limitation and the need to rush in carrying out the study due to termination of pregnancy, difficulty completing the questionnaire because of physical condition of mothers, unwillingness to attend training classes and use of self-reporting tools to gather information. Despite the results of the present study that show the effect of the TPB was not felt in all fields, however, the role of education cannot be ignored as a key element in the success of health care services, including oral health, especially face-to-face training based on regular planning, which leads to learning consolidation and ultimately behavioral changes.

Therefore, it is recommended to consider the obstacles that were cited as reasons for ineffectiveness in intention, behavioral control, subjective norms and performance for further research, so by effective training in the field of oral health we can take a long step in protecting the health of diabetic pregnant women and their babies, and by implementing this process to other sectors, we can prevent the heavy costs of dental treatment and create a healthy society.

Conclusion

Education based on the theory of planned behavior can improve the knowledge and attitude of women with GDM, but it has failed to improve other construction of the theory. The reasons could be diabetes, boredom and/or inadequacy of training sessions. It is suggested that oral hygiene instruction programs be included in the pre-pregnancy care schedule and periodic examinations be carried out to evaluate adherence and maintaining good oral hygiene among women.

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