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Effects of telephone follow-up on blood glucose levels and post-partum screening in mothers with Gestational Diabetes Mellitus

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Abstract

Background: Gestational diabetes mellitus (GDM) is a form of diabetes that occurs in pregnancy. GDM, defined as glucose intolerance, first diagnosed or initiated during pregnancy affects 1-14% of pregnancies based on various studies. Screening and early diagnosis and appropriate glycemic control can improve prenatal outcomes. Telephone follow-up seems to be a reasonable way for pregnant women follow-up. The present study evaluated the effects of telephone follow-up on blood glucose level during pregnancy and postpartum screening.

Methods: Eighty mothers with GDM were enrolled in this clinical trial and randomly divided into intervention and control groups. All mothers were asked to check their blood sugar levels fivetimes daily. In intervention group, telephone intervention was performed for 10 weeks. In each follow-up, individuals were followed for insulin injections, diet, clinical tests and reminding the next visit. In control group, three times of telephone call was established to record blood sugar levels. Another telephone call was established at 6 weeks of postpartum in both study groups to evaluate the performance of the screening test for blood sugar.

Results: The mean age of mothers was 30.9±5 years in the control and 30.7±5.1 years in the intervention groups In intervention group, mean level of blood glucose, 2 hours after lunch at 28 weeks of pregnancy was significantly lower than the control group ($P<0.05$). Mean differences in levels of fasting blood glucose between 28 weeks and 32 and between 28 and 36 weeks of pregnancy were significantly higher in the intervention than the control group ($P<0.05$). Rate of postpartum glucose screening test was significantly higher in the intervention group ($P<0.001$).

Conclusion: The findings of this study demonstrated that telephone follow-up could significantly reduce fasting blood glucose levels in mothers with gestational diabetes and also increased the rate of postpartum screening test.

Keywords: Gestational diabetes mellitus, Postpartum screening, Telephone, Follow-up.

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Introduction

Gestational diabetes mellitus (GDM) is a form of diabetes that occurs in pregnancy. GDM, defined as glucose intolerance, first diagnosed or initiated during pregnancy (1-3) affects 1-14% of pregnancies according to various studies. The most important risk factors for GDM are high maternal age, family history of type 2 diabetes, overweight before pregnancy and GDM or glucose intolerance in pervious pregnancies (4). Gestational diabetes usually recovers after delivery, but these women are at high risk for type 2 diabetes; according to previous studies, it is around a 7-12 fold increased risk for future type 2 diabetes (5). Many national and international organ-

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izations and conferences recommend the screening for type 2 diabetes in women with history of gestational diabetes 6-12 weeks after the delivery (6). Gestational diabetes and glucose intolerance during pregnancy are associated with poor outcomes (7). Macrosomia (birth weight ≥ 4000 g) and related health problems in newborns are more in women with gestational diabetes than other women (8). Screening and early diagnosis of women with gestational diabetes and appropriate glycemic control can improve prenatal outcomes (9,10). Thus, prevention or postponing overt diabetes in women of childbearing age also protects infants from the harmful effects of intrauterine hyperglycemia. These include macrosomia, increased rate of cesarean section, birth defects, and infants predisposed to obesity and diabetes in their lifetime (11,12). However, despite the hyperglycemic complications in pregnancy, increased risk for type 2 diabetes after delivery, and recommendations for follow-up and screening during and after childbirth (13,14), studies have shown that unfortunately the rate of postpartum screenings is still low (7,15). So it seems that it's quite necessary to provide a suitable way for pregnant women follow-up and inform them about the risks and medical requirements. One of these ways is telephone follow-up, which is the application of information technology in clients' health care, administered in self-assessment, monitoring, decision making and advising and is planned based on client needs, when the client is not available. In this method, based on age, sex and health problems, the patients explain their physical performance status for the health care provider and receive the necessary care through the telephone (16). The telephone has a significant potential; relatively inexpensive, widely available, unlimited by geographical barriers, and is approved by large governmental agencies and NGOs with the capacity to provide large-scale interventions (17). Considering the importance of follow-up by midwives in high-risk pregnancies such as gestational diabetes mellitus and lack of a study in Iran in this issue, the present study evaluated the effects of telephone follow-up on blood glucose level during pregnancy, maternal weight changes, newborn weight and postpartum screening in mothers with gestational diabetes

Methods

Eighty mothers with gestational diabetes mellitus, who were referred to prenatal clinic of Imam Khomeini hospital and signed consent form, were enrolled in this clinical trial, which consisted of a telephone follow-up as the intervention. This trial has been registered in Iranian Registry of Clinical Trials (IRCT ID: IRCT138904143037n3). The Institutional Review Board approval was granted by the Research Ethic Committee of Tehran University of Medical Sciences. Inclusion criteria were single pregnancy, gestational age between 24-28 weeks, access to telephone, not using medications which increase blood glucose such as corticosteroids, no history of chronic diseases such as chronic hypertension, no history of psychiatric disorders, no history of diabetes apart from pregnancy, no history of infertility or using assisted reproductive plan and no history of hearing loss. Exclusion criteria were loss of pregnancy, premature delivery, individuals without telephones and conditions that increase blood sugar such as stress, death of relatives, drugs consumption such as steroids and, etc. we conducted a single- blind randomized clinical trial on 80 mothers with gestational diabetes who were divided into two groups with 40 mothers in each (intervention and control groups). During the study participants did not have any information about telephone follow- up procedure. The list of allocation sequence was created by computer- generated randomization and base on it, each mother with unique identification number was assigned to study group. Demographic information was gathered at enrollment. The mothers were weighed at the time of enrollment, 28 weeks of pregnancy and at the end of the intervention (at 38 weeks of pregnancy). All mothers were asked to check and document their blood sugar levels 5 times daily (fasting, 2 hours after breakfast, 2 hours after lunch, 2 hours after dinner and before sleeping).

In the intervention group, telephone intervention was performed for 10 weeks. In each telephone follow-up, individuals were followed for insulin injections, diet, clinical tests and reminding the next visit. Meanwhile, all mothers' questions and concerns about pregnancy and diabetes-related problems were also replied. Ultimately, possible solutions were proposed to the clients in order to solve their problems. Telephone follow-ups were performed every 2 weeks from 28 to 36 weeks of pregnancy and every week from 36 weeks to 38 weeks of pregnancy. The average call duration was 10 to 15 minutes. In control group, 3 times of telephone call was established at weeks 28, 32 and 36 to record blood sugar levels but no consultation was performed through the telephone calls. Another telephone call was established at 6 weeks of postpartum in both study groups to evaluate the performance of a screening test for blood sugar after the delivery. The two study groups were just different in the quality of telephone follow-ups however all other medical cares were exactly identical in both groups. Newborns' birth weight was also documented.

Statistical analysis

Data analyses were performed using SPSS Version 16.0. Descriptive and inferential statistics were used to describe the data. Descriptive statistics including mean and standard deviation and inferential statistics such as chi-square test, Fisher exact test were used. Chi-square test and Fisher exact test were used to compare demographic characteristics,

qualitative and nominal variables. T-test was used to compare quantitative variables. P Values of less than 0.05 were considered as significant.

Results

In this clinical trial, mean±SD age of mothers was 30.9±5 years in control group and 30.7±5.1 years in intervention group (p>0.5). At enrollment, both control and intervention groups were not significantly different in the level of education, occupation status, parity, number of born children, history of abortion, history of stillbirth, time of diabetes diagnosis, age at diagnosis, history of gestational diabetes, history of macrosomia and participation in diabetes educational workshop (p>0.05). Mean±SD level of fasting blood glucose at 28 weeks of pregnancy was 104.3±18.7 mg/dl in control and 100.2±21.2 mg/dl in intervention group (p=0.09). Mean±SD level of blood glucose 2 hours after breakfast at 28 weeks of pregnancy was 131.2±20.9 mg/dl in control and 123.2±18.8 mg/dl in intervention group (p=0.058). Mean±SD level of blood glucose 2 hours after lunch at 28 weeks of pregnancy was 137.5±25.7 mg/dl in control and 123±18 mg/dl in intervention group (p=0.008). Mean±SD level of blood glucose 2 hours after dinner at 28 weeks of pregnancy was 131.1±22.1 mg/dl in control and 122.5±19.7 mg/dl in intervention group (p=0.06). Mean±SD level of blood glucose before sleeping at 28 weeks of pregnancy was 124.7±13.9 mg/dl in control and 113.2±15.8 mg/dl in intervention group (p=0.1). Mean±SD level of fasting, 2 hours after breakfast, 2 hours after lunch, 2 hours after dinner and before sleeping blood glucose in both groups at 28 weeks of pregnancy are shown in Table 1. The differences between blood glucose levels at 28 weeks and 32 weeks and between 28 and 36 weeks for intervention and controls are also shown in Table 2 and 3, respectively. As shown in the tables, Mean±SD of differences in levels of fasting blood glucose between 28 and 32 weeks and between 28 and 36 weeks of pregnancy were significantly higher in the intervention than the control group (p<0.05).

Mean±SD changes in maternal weight between 28 and 38 weeks of pregnancy was 5.4±3.3 kg in control and 5.3±5.9 kg in intervention group (p=0.1). Mean±SD infants' birth weight was 3482.5±692.4 gr in control and 3307.9±713.4 gr in intervention group (p=0.2)

In control group 14 mothers (34.1%) performed postpartum glucose screening test while 37 mothers (94.9%) of the intervention group conducted the screening test and the difference was statistically significant (p<0.001).

Discussion

Gestational diabetes and glucose intolerance during pregnancy are associated with poor outcomes. Recent studies have shown promising results in using telephone as the primary method for presenting a lifestyle and chronic disease management interventions. But most of these studies have been done on type 2 diabetic patients and a few on type 1 diabetes and a small number of studies have been conducted on pregnant women with GDM (18-20).

The results of the present study showed that tele-

Table 1. Daily glucose levels at 28 weeks of pregnancy in both groups

Time	28 week		
Group	Control	Intervention	
	Mean (SD)	Mean (SD)	p
Fasting	104.3 (18.75)	100.2 (21.27)	0.097
2 hours after breakfast	131.2 (20.96)	123.2 (18.85)	0.058
2 hours after lunch	138.5 (25.71)	123 (18.08)	0.008
2 hours after dinner	131.1 (22.13)	122.5 (19.76)	0.065
Before sleeping	124.7 (13.94)	113.2 (15.89)	0.134

Table 2. Differences between blood glucose levels at 28 weeks and 32 weeks in both groups

Group	Control	Intervention	
	Mean (SD)	Mean (SD)	p
Fasting	0.14 (20.32)	-8.13 (18.47)	0.013
2 hours after breakfast	-2.41 (27.74)	-4.89 (22.14)	0.625
2 hours after lunch	-4.73 (28.11)	-6.02 (14.89)	0.613
2 hours after dinner	-1.26 (26.74)	-3.45 (19.71)	0.639
Before sleeping	0.65 (16.52)	-0.89 (17.74)	0.541

Table 3. Differences between blood glucose levels at 28 weeks and 36 weeks in both

Group	Control	Intervention	
	Mean (SD)	Mean (SD)	p
Fasting	-0.365 (18.99)	-9.11 (19.43)	0.023
2 hours after breakfast	-4.41 (21.93)	-5.71 (17.83)	0.749
2 hours after lunch	-13.82 (25.40)	-9.37 (17.22)	0.413
2 hours after dinner	-5.97 (27.41)	-7.62 (18.34)	0.956
Before sleeping	-4.21 (17.65)	-2.74 (16.07)	0.734

phone intervention was more effective in lowering fasting blood glucose level in intervention group comparing to control group that may be due to more and better adherence to diet, and drug therapy prescribed by the doctor. Our results were in consistent with Kim & Oh's study (21) which evaluated the effect of telephone follow-up on adherence to treatment recommendations in patients with diabetes. In their study, patients were divided into two telephone and control groups. One of the researchers conducted a telephone intervention which included a weekly call for continuing education, forced diet, exercise, regulation of medications and monitoring blood glucose level. Patients in the telephone group showed a reduction of 1.2% in HbA1c comparing to 0.6% in the control group. The results of our study were also compatible with Mons et al's (22) results that assessed the impact of telephone calling by a nurse (over 12 months) on medical and psychosocial outcomes in type 2 diabetes patients. Intervention group in their study demonstrated reduction in cardiovascular risk factors, quality of life and depression after 6, 12 and 18 months telephone follow-up, which was significant as compared to control group. Also HbA1c decreased significantly from the baseline in both intervention and control group.

Dunbar et al (17) evaluated the benefits of the diabetes prevention program and the role of telephone follow-up. In this study, the patients who attended in a 12-month diabetes prevention program were randomly divided into telephone support and self-care groups. The changes between 12-30 months were not significantly different in telephone support group comparing to the self-care group. The positive results obtained in the 12-month program usually last 18 months. Telephone support did not seem to have additional benefits. Their results were inconsistent with the results of our study that may be because of the presence of a relatively long-term educational program in diabetes prevention, which can serve as a useful tool in patient adherence and reducing the benefits of telephone follow-up.

In our study, maternal weight changes and newborns' birth weight were not significantly different between control and intervention groups. They may be due to the fact that the researchers did not provide a special educational program in telephone counseling intervention, and the mothers were only followed for doctor's prescribed treatment plan.

The results showed that postpartum screening test was more performed in the intervention group. Hunt & Conway (27) stated that postpartum diabetes screening increases by nurses' follow-up for reminding blood sugar level testing and health-care providers can notify patients about the importance of glucose testing and long-term risks of diabetes.

Clark et al (28) also evaluated the effect of reminding postpartum screening of diabetes mellitus in women with gestational diabetes. They divided the patients into 4 groups: patient/physician reminder, physician only reminder, patient only reminder, no reminder. They showed that the screening rate was significantly increased in physician/patient reminder group, patient-only reminder group, and physician only reminder group respectively as compared to no reminder group. Their findings correspond to the result of our study.

Conclusion

The result of the current study demonstrated that telephone follow-up as an easy and inexpensive supportive program could significantly reduce fasting blood glucose levels in mothers with gestational diabetes and also increased the rate of postpartum screening test.

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