

PHYSICAL ACTIVITY BEHAVIOUR AMONG WOMEN WITH GESTATIONAL DIABETES MELLITUS AND EARLY POST-PARTUM

Nur Hani Syazwani, Denise Koh Choon Lian, Shuhaila Ahmad, Khadijah Shamsuddin

Universiti Kebangsaan Malaysia

*Email: nurhanisyazwani@gmail.com

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Abstract

Women with previous history of gestational diabetes mellitus (GDM) have been found to have higher risk of developing type 2 diabetes mellitus (T2DM). Participation in adequate physical activity during and after pregnancy has been found to mitigate this risk. The main purpose of this study was to determine the status of physical activity among women with recent GDM during pregnancy and 8-weeks post-partum. A secondary aim of the study was to explore factors associated with physical activity during and 8-weeks post-partum. Physical activity status was measured using the International Physical Activity Questionnaire (IPAQ). The data were collected during pregnancy through a self-reported questionnaire (n=336) and via telephone interview 8-weeks post-partum (n=117). The results uncovered a significant association between physical activity and status of GDM during pregnancy. Women who reported higher physical activity participation during pregnancy were less likely to have GDM. However, there were no significant association between physical activity participation and GDM status post-partum. Age was associated with participation in physical activity during pregnancy. Self-efficacy and risk perception of developing T2DM were associated with physical activity participation at 8-weeks post-partum. In conclusion, this study highlighted the different factors that should be targeted (for during pregnancy and post-partum) to promote physical activity among this high-risk population.

Keywords: Health, physical activity, women with gestational diabetes

Introduction

The prevalence of diabetes has been increasing globally for the last 34 years, with the number of adults with diabetes increasing from 108 million in 1980 to an estimated 425 million in 2017 (NCD-RisC, 2016; IDF, 2017). A recent study reported that diabetes has been reported as the cause of death for 1.6 million people worldwide, highlighting the 'epidemic' nature of this disease (WHO, 2016). According to the National Health and Morbidity Survey (NHMS), Malaysia has experienced a drastic increase in the prevalence of T2DM, from 11.6% in 2006 to 15.2% in 2011 and 17.5% in 2015. This is projected to increase to 21.6% in 2020 (Institute for Public Health, 2015). This will likely cause significant economic and social burdens in Malaysia.

Previous studies have shown that women with a history of GDM are at higher risk of developing T2DM. Studies have shown that women with previous Gestational Diabetes Mellitus (GDM) have a 7-fold higher risk of being diagnosed with T2DM compared to women who do not have a history of GDM (Bellamy, Casas, Hingorani, et al., 2009). Another study found that approximately 50% of women with a history of GDM progressed to T2DM within 5 years after pregnancy (Metzger, Cho, Roston, et al., 1993; Kwak et al., 2013), and the onset of T2DM among these women can be as early as two-months post-partum (Kwak et al., 2013). The time to progression to diabetes among women with previous GDM differs widely, highlighting the importance of regular follow-up checks post-partum for the early detection and management of T2DM in this population.

Studies have shown that adequate physical activity is associated with decreased risk of developing T2DM. A study in China found 46% risk reduction if an individual gets involved for 140 min/wk for individuals aged above 50, and 280 min/wk for those aged below 50 (Li, Chang and Wang, 2008). In Japan, a study found that participation in 210-280 min/wk of moderate to vigorous physical activity can cause a 67% risk reduction in T2DM (Kosaka, Noda & Kuzuya, 2005). In a review study, Hamasaki inferred a minimum of 30 minutes per day of walking in order to reduce or prevent the onset of T2DM (Hamasaki, 2016). Participation in various types of physical activity has been found to improve insulin sensitivity, cardiorespiratory fitness, glycemic control, and overall health (Hamasaki, 2016; Burr et al., 2010; Hordern et al., 2011). Among interventions suggested to prevent T2DM for GDM women, lifestyle modifications showed a significant effect for reducing the risk – especially through exercise and diet control (Shek, Ngai, Lee, Chan et al., 2014; Moon, Kwak and Jang, 2017).

Women with previous GDM are a high-risk population for early onset of T2DM. These women are easily identifiable through their antenatal care, where GDM is routinely screened for. This presents an opportunity for early intervention to manage their higher risk of developing T2DM in a systematic way with minimum additional cost. Further, these women are also mothers, and their lifestyle will have an impact on their family, especially their children. A recent study has found an association between mothers' and their children's physical activity levels (Song, Dieckmann, Stoyles et al., 2017).

Before effective physical activity intervention programs can be developed for this high-risk population, it is important to first understand the physical activity behaviors of this population. Currently, there is no data on physical activity behavior among women with GDM during pregnancy, and very limited data for women with a history of GDM during the early stages of post-partum in Malaysia. Therefore, this study aims to determine the status of physical activity among women with GDM during pregnancy and in early post-partum, in order to determine the relevant associated factors to determine early intervention strategies for this population.

Research Design and Methods

This is a repeated cross-sectional study. Potential subjects were approached during their scheduled appointment for an oral glucose tolerance test (OGTT) between 24 to 28 weeks of pregnancy at a major hospital in Kuala Lumpur. Women who consented to participate in the study was asked to complete a questionnaire during the 2-hour duration of the OGTT. They were then followed-up eight-weeks post-partum via telephone.

Measures

1) Physical activity

Physical Activity was measured using the International Physical Activity Questionnaire (IPAQ) [18]. Participants was identified as participating in sufficient physical activity if they meet the recommendation for health-enhancing physical activity. Participants were categorized as 'meet recommendation' for health-enhancing physical activity if they reported an accumulation of 10-min bouts of moderate to vigorous-intensity physical activity of ≥ 150 min during most (at least 5) days of the week.

2) Psycho-social correlates

Social support was measured using the Social Support for Exercise questionnaire developed by Sallis et al. (1987). Mean scores were calculated from the 12 items that measured social support. The higher scores indicate higher social support to participate in physical activity.

Self-efficacy was measured using the five-item scales from Marcus and Owen (1992), and an additional seven items measuring commonly reported constraints among women with young children to participate in physical activity (Miller et al., 2002). Items referencing inclement weather (e.g. snowing) were modified to "raining", as it does not snow in Malaysia. Mean scores were calculated from the 12 items. Higher scores showed higher self-determination to participate in physical activity.

3) Statistical Analysis

The prevalence of GDM and logistic analysis to explore factors that were associated with sufficient physical activity were both calculated for both pregnancy and post-partum. Logistics regression were conducted, and odds ratio (OR) reported, to explore factors associated with physical activity. Chi-square analysis was conducted to identify changes in physical activity behavior among women with GDM, and this analysis only included women who were diagnosed with GDM and completed the study protocol at both time points.

Results

A total of 336 women participated in the study during pregnancy. The prevalence of GDM for this study was relatively high at 39.9%. A total of 117 women were successfully followed-up with at 8-weeks post-partum, with the prevalence of GDM at 41.0%. This study found that about half of the women (52.4%, n=176) reported participating in sufficient physical activity during pregnancy, and less than half at 8-weeks post-partum (47.8%, n=56). There was a significant association between GDM status and physical activity during pregnancy (Table 1). Women who had participated in sufficient physical activity were less likely to have GDM compared to women who did not participate in sufficient physical activity, $X^2 (1, N=336) = 6.232, p=0.013$. However, the same association was not found at 8-weeks post-partum, $X^2 (1, N=117) = 0.149, p=0.700$ (Table 1). There was also no significant association between physical activity status during pregnancy and at 8-weeks post-partum, $X^2 (1, n=117) = 1.34, p=0.385$ (Table 2).

Logistic regression was used to explore the factors that are associated with physical activity status during pregnancy and at 8-weeks post-partum among women with GDM. During pregnancy, age was significantly associated with participation in sufficient physical activity, as older women were found to be more active. compared to younger women. Women who were older were more likely to be sufficiently active during pregnancy (OR=0.24, p=0.039). However, at 8-weeks post-partum, self-efficacy (OR=0.104, p=0.020) and perception of their risk in developing T2DM (OR=0.914, p=0.045) were significantly associated with participation in sufficient physical activity (Table 3).

Table 1: Association between physical activity and GDM status during pregnancy (n=336) and at 8-weeks post-partum (n=117).

		Frequency of status of physical activity		χ^2 (P)
		Not Meet	Meet	
		Recommendation	Recommendation	
During Pregnancy				
GDM Status	No GDM	85	117	6.232 (0.013*)
	GDM	75	59	
8-weeks Postpartum				
GDM Status	No GDM	37	32	0.149 (0.700)
	GDM	24	24	

* $p < 0.05$ **Table 2:** Chi-square analysis on the changes in physical activity status of during pregnancy and postpartum among women GDM (n=48).

		8-weeks postpartum		χ^2 (P)
		Not Meet	Meet	
		Recommendation	Recommendation	
During Pregnancy	Not Meet Recommendation	15	11	1.343 (0.385)
	Meet Recommendation	9	13	

Table 3: Factors and status of physical activity among women with previous GDM during pregnancy (n=134) and 8-weeks post-partum to prevent T2DM (n=48): Logistic regression analysis.

Factors	OR	SD	P value	95%CI		R ²
				Low	High	
During pregnancy						
Age	0.240	0.116	0.039*	1.012	1.596	0.458
Education level	1.601	0.868	0.065	0.905	27.161	
Job status	1.181	1.012	0.243	0.448	23.696	
Self-efficacy	0.084	0.050	0.090	0.987	1.198	
Social support	0.015	0.046	0.744	0.927	1.111	
Advise – diabetic	-0.711	2.904	0.807	0.002	145.531	
Advise – physical Activity	-0.442	1.570	0.778	0.030	13.951	
Diabetic risk – 10 years	0.748	0.635	0.239	0.609	7.337	
Postpartum						
Age	-0.049	0.089	0.625	0.783	1.158	0.364
Education level	0.525	0.100	0.511	0.353	8.100	
Job status	-0.283	0.990	0.775	0.108	5.247	
Self-efficacy	0.104	0.044	0.020*	1.101	1.210	
Social support	-0.022	0.048	0.652	0.891	1.075	
Advise – diabetic	0.175	1.099	0.874	0.138	10.260	
Advise – physical activity	-0.530	1.765	0.764	0.019	18.704	
Diabetic risk – 10 years	0.918	0.458	0.045*	1.021	6.146	
Follow-up check-up	-0.285	0.836	0.734	0.146	3.876	

OR, odds ratio; SD, standard deviation; CI, confidence interval, * $p < 0.05$

Discussion

A total of 336 women consented to participate in the study, and 117 completed the follow-up questionnaire via telephone. Of the 366 women who consented to the study, more than one third (39.9%, n=134) had been diagnosed with GDM. Of the 117 women who completed the follow-up protocol, 41.0% (n=48) were GDM patients. The low retention rate for this study was due to withdrawal and also numbers that were no longer contactable. However, although the retention rate was low, the proportion of women with previous GDM and without GDM were very similar to their baseline proportions.

The prevalence of GDM for this study was relatively high (39.9%) compared to a recent study in Selangor, which reported a prevalence of 27.9% (Logakodie, Azahadi, Fuziah et al., 2017). The difference may be that the recruitment for this study was conducted in a major hospital in Kuala Lumpur while Logakodie et al. (2017) recruited from health clinics around Selangor. The higher prevalence compared to Logakodie et al.'s (2017) study could also be because the current study recruited from urban areas which may have higher prevalence of GDM compared with rural areas (Bhavadharini, Mahalakshmi, Anjana et al., 2016; Mwanri, Kinabo, Ramaiya, et al. 2014).

The prevalence of sufficient physical activity during pregnancy was quite high compared with a previous study on a similar population (Anjana, Sudha, Lakshmipriya et al., 2016), with half of the women in this study reporting that they participated in sufficient physical activity. There was a significant association between GDM status (with or without GDM) and status of sufficient physical activity during pregnancy. Although a recent study did not find a significant association between physical activity behavior and GDM (Mishra, Shetty, Rao et al., 2018), this study found that women who reported sufficient physical activity during pregnancy were less likely to be diagnosed with GDM. These results support a recent meta-analysis examining physical activity and the risk of gestational diabetes which supported a significant inverse association between physical activity before pregnancy and during early pregnancy with the risk of GDM (Aune, Sen, Henriksen et al., 2016).

Age has been found to be the primary factor associated with changes in physical activity behavior among women with GDM during their pregnancy. However, this finding contradicted a previous study conducted in Malaysia in which increased age was associated with reduced involvement in physical activity (Yong & Poh, 2014). However, it must be noted that Yong and Poh (2014) sampled both men and women participants, whereas this study only included women. Furthermore, the study by Yong and Poh (2014) was a national survey and included an adult sample with a much wider age range compared with this study, which only included women from the child-bearing age. This relationship between age and physical activity behavior among pregnant women with GDM may be due to their increased awareness of the importance of physical activity and healthy lifestyle in general for maintaining their health. This is supported by a previous study which found age to be associated with improved awareness of the risk of contracting diabetes (Gabda, Ahmed, Aris et al., 2004).

However, the main factor associated with physical activity among the same women during postpartum was no longer age but self-efficacy. This is supported by previous studies that had also reported self-efficacy as the main factor associated with behavior changes among adults (McAuley and Blissmer, 2000) and women with a history of GDM (Smith, Wah, Bauman et al., 2005). While some studies have shown that social support is an important factor strongly associated with physical activity in populations of different ages (Scarapicchia, Amireault, Faulkner et al., 2016; Smith, Banting, Eime et al., 2017; Mendonca, Cheng, Melo et al., 2014), and specifically among women with previous GDM (Kim, McEwen, Kieffer et al., 2008), this study did not find an association between social support and physical activity participation. This may be because general social support for these women was very low, meaning that their decision to participate in physical activity may be due to another factor, namely their perceived risk for developing T2M later on in life.

Additionally, this study found that the higher a woman perceived her risk of developing T2DM, the more likely she was to participate in post-partum physical activity. This finding highlights the fact that knowledge and awareness among adults can influence their physical activity behavior (Knowler et al., 2002). Therefore, the low prevalence of women who recall being informed of their higher risk of developing T2DM after a previous GDM pregnancy (25.4% during pregnancy and 18.8% post-partum) is alarming.

Conclusion

The prevalence of physical activity among pregnant women was lower before pregnancy and higher during pregnancy, but unfortunately lower again during post-partum. This is possibly because women do not have time to engage in physical activity due to increasing workloads. Health professionals need to help pregnant women, and especially those with GDM, to be aware of their higher risk for getting T2DM 5 - 10 years after giving birth. Thus, effective strategies are needed to help reduce the risk of T2DM among women with a history of GDM. A health promotion program should target this high-risk group with the aim of reducing the risk for T2DM. In addition, post-partum programs can also be designed to encourage women with recent GDM to be more physically active.

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