

## 妊娠期糖尿病孕妇产后糖尿病发生的高危因子分析

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**摘要:**【目的】探讨妊娠期糖尿病(GDM)孕妇产后糖尿病发生的高危因子。【方法】选择2015年1月至2015年12月在北京大学深圳医院规律产检并分娩的单胎妊娠期糖尿病孕妇342例,所有孕妇在孕24~28周均直接行75 g葡萄糖耐量试验(OGTT)。根据空腹、1 h和2 h血糖值,将仅有一项血糖指标异常的记为GDM I(219例),二项异常的为GDM II(81例)和全部异常的为GDM III(42例)。以同期在本院规律产检,血糖值正常并分娩的968例孕妇设为对照组。所有研究对象均排除家族糖尿病史、产科并发症和其他内科并发症等高危因素。所有受试对象于分娩后一年,再次行OGTT试验,分析比较各组孕妇妊娠期各时间点血糖及糖化血红蛋白(HbA1c)等高危因子与产后糖尿病发生的相关性分析。【结果】复查结果显示,342名GDM孕妇中有27名产后发生2型糖尿病,发病率高于对照组,差异有统计学意义( $P < 0.05$ ),其中GDM III组中发病率为45.23%,发病率高于其他GDM组( $P < 0.05$ );在发生2型糖尿病的GDM孕妇中,与自身妊娠前和同期未发生2型糖尿病的GDM孕妇相比,2 h血糖和HbA1c值明显增加,且差异具有统计学意义( $P < 0.05$ )。Logistic回归分析结果显示,GDM III组别、2 h血糖和HbA1c值,这三种高危因子均是GDM孕妇发生2型糖尿病的危险因素( $P < 0.05$ )。【结论】OGTT血糖全部异常的GDM孕妇产后发生2型糖尿病的发病率明显增加。临床上应对这类孕妇的血糖进行动态的监控,及时发现并纠正2 h血糖和HbA1c值的异常。

**关键词:**妊娠期糖尿病;孕妇;血糖;产后糖尿病

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## High Risk Factors of Gestational Diabetes Mellitus Associated with Development of Postpartum Diabetes

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**Abstract:** 【Objective】 To explore the high risk factors of gestational diabetes mellitus (GDM) associated with the development of postpartum diabetes. 【Methods】 Clinical records of 342 singleton GDM women, which underwent obstetric examination in the Peking University Shenzhen hospital between January 1, 2015 and December 31, 2015, were collected. All patients performed a 75 g oral glucose tolerance test (75 g OGTT) and glycosylated hemoglobin (HbA1c) at 24-28 gestational weeks, and were divided into 3 groups: GDM I (219 cases) defined as one abnormal blood glucose of results. GDM II (81cases): two abnormal blood glucose. GDM III (42 cases): three abnormal blood glucose. 968 cases of healthy pregnant women were selected as the control group. All patients were underwent the follow-up OGTT and HbA1c at 12 mouse postpartum. The characteristics of OGTT and HbA1c outcomes were analyzed and compared among groups. 【Results】 The follow-up OGTT results showed that twenty-seven (27/342, 7.89%) GDM

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women developed type 2 diabetes. The ratio of type 2 diabetes morbidity was higher in the GDM women group than in the control group, which was also higher in GDM III group (45.23%) than in other GDM groups ( $P < 0.05$ ). In the type 2 diabetes GDM women, the value of OGTT-2 h and HbA1c were significantly higher in the postpartum stage than in the prenatal period ( $P < 0.05$ ). Similar data was shown in the type 2 diabetes GDM women group, compared with non-diabetes GDM women group. Logistic analysis showed that the group of GDM III, the value of OGTT-2 h and HbA1c were risk factors for the type 2 diabetes morbidity in GDM women ( $P < 0.05$ ). 【Conclusions】 The current study provides evidence that the GDM women with three abnormal blood glucose have a high risk to develop type 2 diabetes. The blood glucose level of these GDM women should be monitored dynamically, and the abnormal value of OGTT-2 h and HbA1c should be detected and corrected in time.

**Key words:** gestational diabetes mellitus; pregnancy women; blood glucose; postpartum diabetes

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妊娠期糖尿病 (gestational diabetes mellitus, GDM) 是指妊娠前糖代谢正常,在妊娠中后期首次出现或首次诊断的对碳水化合物耐受性降低的疾病,其是妊娠期最常见的并发症之一。随着经济的发展和水平的提高,GDM的发病逐年上升,近年报道发病率达10%<sup>[1]</sup>。越来越多的研究表明,随着口服葡萄糖耐量试验(oral glucose tolerance test, OGTT)值的逐渐升高,患有GDM的孕妇产后发生2型糖尿病的几率也显著升高,其呈正相关趋势<sup>[2-5]</sup>。本研究分别检测了342例GDM孕妇和968例正常对照孕妇,其孕前和产后一年的OGTT和糖化血红蛋白(glycosylated hemoglobin, HbA1c)值等高危因子,探讨其与GDM孕妇产后发生2型糖尿病的关系。

## 1 材料与方法

### 1.1 研究对象

选择2015年1月至2015年12月在北京大学深圳医院规律产检并顺产分娩单胎汉族妊娠期糖尿病孕妇342例,均予饮食控制,其中329例孕妇血糖控制良好,13例GDM孕妇经胰岛素治疗后血糖控制良好。随机选取在本院规律产检并分娩的无GDM孕妇968例为对照组。所有实验对象均排除孕前已确诊为糖尿病、有家族性糖尿病史、未规律产检、临床资料不全、其他内科并发症或其他妊娠并发症。孕妇均签署知情同意书并经本院伦理委员会批复同意实施本研究。

### 1.2 研究方法及诊断标准

所有纳入研究的孕妇均在24~28周行75 g

OGTT试验、体质量指数(body mass index, BMI)及HbA1c的测定。GDM诊断标准:75 g OGTT的正常界值是空腹(fasting plasma glucose, FPG)及服糖后1 h和2 h的血糖值分别是5.1、10.0和8.5 mmol/L,其中任何一项或一项以上达到或超过以上界值即诊断GDM,共收集GDM孕妇342例。如空腹或服糖后1 h和2 h的血糖值,其任意一项数值达到或高于正常值,则定义为GDM I;任意两项数值达到或高于正常值,则定义为GDM II;所有数值均达到或高于正常值,则定义为GDM III。根据其异常血糖值的数量,分别分为GDM I (219例),GDM II (81例)和GDM III (42例)。孕早期空腹血糖 $\geq 7.0$  mmol/L,或者伴有典型的高血糖或高血糖危象症状且任何血糖 $\geq 11.1$  mmol/L诊断为糖尿病合并妊娠,未纳入研究对象<sup>[6]</sup>。所有受试对象均在分娩后1年,再次行OGTT实验,受试者空腹血糖 $\geq 7.0$  mmol/L或OGTT试验2 h血糖值 $\geq 11.1$  mmol/L,均诊断为2型糖尿病<sup>[7]</sup>。

### 1.3 统计学方法

采用SPSS 18.0软件进行统计学分析,各组间计量资料结果以均数 $\pm$ 标准差表示,并采用单因素方差分析进行检验,各组间率的比较采用卡方检验,采用logistic回归分析GDM孕妇发生2型糖尿病的危险因素, $P < 0.05$ 认为差异有统计学意义。

## 2 结果

### 2.1 一般资料

GDM孕妇与正常对照的孕妇在年龄、BMI和

OGTT检测时的胎龄(gestational age, GA)等指标互相比较,差异均无统计学意义(表1)。所有受试对象产后一年复查OGTT,正常对照组孕妇中,有4人(4/968, 0.41%)诊断为2型糖尿病,而GDM孕妇中,共27人(27/342, 7.89%)诊断为2型糖尿病,315人(315/342, 92.11%)血糖在正常范围内。GDM组2型糖尿病发病率高于正常对照组,差异有统计学意义( $P < 0.05$ )。GDM I组和GDM II组内,其妊娠前后2型糖尿病的发病率,差异有统计学意义( $P < 0.05$ )。同时,GDM I组和GDM II组分别与GDM III组相比,其2型糖尿病的发病率也有着明显的统计学差异(表2)。

表1 各组孕妇基本临床资料比较  
Table 1 General data in each groups ( $\bar{x} \pm s$ )

Groups	n	Age/Years	BMI	GA at OGTT (weeks)
GDM	342	33.1 ± 4.6	28.9 ± 1.3	24.1 ± 3.1
I	219	33.0 ± 5.1	28.5 ± 1.5	24.2 ± 3.7
II	81	33.2 ± 4.9	29.1 ± 1.2	23.9 ± 3.6
III	42	32.1 ± 5.6	28.8 ± 2.7	24.4 ± 3.1
Control	968	32.8 ± 4.9	28.8 ± 1.6	24.1 ± 3.3
F		0.43	0.38	0.32
P		0.51	0.54	0.57

## 2.2 GDM孕妇产后未发生和发生2型糖尿病各时间点血糖值的比较

OGTT检查结果显示,对照组2型糖尿病的发

表2 各组孕妇产后发生2型糖尿病发病率的比较  
Table 2 The comparison of the ratio of type 2 diabetes morbidity in each groups [(n)%]

Groups	Diabetes	Non-diabetes	$\chi^2$	P
GDM	27(7.89)	315(92.11)	61.24	<0.001
I	5(2.28)	214(97.72)	8.30	0.004
II	3(3.70)	78(96.30)	12.21	<0.001
III	19(45.23) <sup>1)</sup>	23(54.77)	363.45	<0.001
Control	4(0.41)	964(99.59)		

Diabetes vs Non-diabetes,  $P < 0.05$ ; 1)  $P > 0.05$ .

病率明显低于GDM孕妇组。为进一步探讨血糖值等高危因子对GDM孕妇产后发生2型糖尿病的影响,观察GDM孕妇产后未发生和发生2型糖尿病各时间点血糖值,发现其OGTT-2 h和HbA1c相比较有显著的统计学差异(表3)。各组间各指标进行两两比较发现:产后发生2型糖尿病的GDM孕妇,其OGTT-2 h和HbA1c值在妊娠前后均显著高于未患2型糖尿病的GDM孕妇( $P < 0.001$ ),而空腹血糖(fasting plasma glucose, FPG)和OGTT-1 h值,两组GDM孕妇比较无统计学差别( $P > 0.05$ )。在发生2型糖尿病的GDM孕妇中,其产后OGTT-2 h和HbA1c值也显著高于妊娠前( $P < 0.001$ )。

## 2.3 logistic回归分析GDM孕妇发生2型糖尿病的危险因素

Logistic回归分析结果显示,GDM III组别、2 h血糖和HbA1c值,这三种高危因子均是GDM孕妇

表3 GDM孕妇未发生和发生2型糖尿病各时间点血糖值的比较  
Table 3 The comparison of different time points blood glucose between GDM women who developed/ not developed postpartum diabetes ( $\bar{x} \pm s$ )

Items	Diabetes (n = 27)	Non-diabetes (n = 315)	( $\bar{x} \pm s$ )		
			F	P	
Prenatal OGTT	FBG/(mmol/L)	4.33 ± 0.37	4.28 ± 0.22	0.35	0.55
	OGTT-1 h/(mmol/L)	8.83 ± 1.82	7.89 ± 0.97	0.81	0.37
	OGTT-2 h/(mmol/L)	7.88 ± 1.36	6.62 ± 1.27	14.92	<0.001
	HbA1c %	5.06 ± 0.33	4.57 ± 0.25	11.03	<0.001
Postpartum OGTT	FBG/(mmol/L)	4.74 ± 1.02	4.59 ± 0.78	0.57	0.45
	OGTT-1 h/(mmol/L)	8.96 ± 1.63	8.01 ± 1.43	0.84	0.36
	OGTT-2 h/(mmol/L)	8.57 ± 2.02	6.81 ± 0.97	13.96	<0.001
	HbA1c %	5.82 ± 0.17	4.61 ± 0.21	19.38	<0.001

Diabetes vs Non-diabetes,  $P < 0.001$ ; Prenatal OGTT vs Postpartum OGTT.

发生2型糖尿病的危险因素( $P < 0.05$ ,表4)。

表4 Logistic回归分析GDM孕妇产后发生2型糖尿病的危险因素

Table 4 The logistic regressive analysis the high risk factors in GDM women who developed postpartum diabetes

	OR	95%CI	P
OGTT-2 h	3.89	2.96 ~ 5.12	0.017
HbA1c%	5.44	1.64 ~ 18.01	< 0.001
GDM III	2.92	2.06 ~ 4.14	0.031

OR: odds ratio; 95%CI: 95% confidence interval.

### 3 讨论

随着社会的进步和饮食结构的变化,GDM已逐渐成为妊娠期最常见的并发症之一。妊娠合并糖尿病一般来说存在两种形式,一是在已患有糖尿病的基础上合并妊娠,称为糖尿病合并妊娠;另一种是妊娠前血糖在正常值范围内,而在妊娠期出现糖代谢异常的情况,称为妊娠期糖尿病。目前,GDM的发病率在西方发达国家约为2%~10%<sup>[8]</sup>,据统计,在我国的发病率约为2%~17.5%<sup>[9-10]</sup>。流行病学资料显示:GDM孕妇分娩的婴儿更易出现围产期低血糖、低血钙、红细胞增多症、黄疸和呼吸窘迫综合征等临床症状,并且其后期发生肥胖和2型糖尿病的几率要远高于其他同龄儿童<sup>[11-13]</sup>。McGovern等<sup>[14]</sup>的回顾性研究表明:2016例诊断为GDM的孕妇,如仅在其产后6月检测其血糖值,对预测其患2型糖尿病的概率无明显帮助,并建议改良检测的时间及指标,以免耽误最佳的干预时机。

已有学者将包括体质量指数、家族性糖尿病史、是否白人种族、平均孕龄、GDM最初的诊断、OGTT的空腹和后期的血糖值、HbA1c的表达水平、是否初产、高血压和分娩的方式等一系列因素视为GDM孕妇是否会发生2型糖尿病的高危因子<sup>[15]</sup>。本研究通过严格筛选,受试对象均排除家族性糖尿病史、经产、高血压、种族和分娩方式等因素的差异。同时,为进一步观察是否GDM孕妇血糖值的异常程度与其产后发生2型糖尿病存在相关性,根据24~28周75 g OGTT血糖值,将受试对象分为了3组,并于其产后一年重复进行75 g OGTT测试。结果发现,在发生2型糖尿病GDM孕妇中,其OGTT-2h和HbA1c值均高于同时期未患病GDM孕妇,差异具有明显的统计学意义。Ekelund等<sup>[16]</sup>的研究发现,HbA1c比值高于5.7%的GDM孕妇,其发生2型糖尿病的几率是其他孕妇的4.8~6.8倍。可能因研究的人群或受试者数量的不同,在本研究中,发现HbA1c的比值高于5.06%,则产后2型糖尿病的发病率已高于其他孕妇。采用logistic回归分析结果显示,GDM III组别、2 h血糖和HbA1c值,这三种高危因子均是GDM孕妇发生2型糖尿病的危险因素。

综上所述,本研究分析了不同GDM孕妇在产前和产后其血糖和HbA1c比值与发生产后2型糖尿病的关系。本文为回顾性研究,样本量较小,但研究结果在一定程度上提示,孕前经OGTT检测:血糖值3项异常、2 h血糖和HbA1c高于正常值的GDM孕妇,均需密切监控其血糖变化,并适当给予胰岛素治疗,减少发生产后2型糖尿病的风险。

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