



在线全文

产次对妊娠不良结局的关联研究*

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【摘要】目的 探讨产次与不良妊娠结局之间的关系。**方法** 在云南省第一人民医院产检资料库中按照“产次”进行关键词检索并采取随机抽样法,共纳入于2021年6月1日-2022年7月15日分娩的1200例产妇,其中第一次、第二次、第三次分娩者各400例,分别命名为第1组、第2组、第3组。将3组产妇的妊娠结局进行回顾性队列研究,在调整混杂因素后,logistic回归评估产次与妊娠结局之间的关联系数,采用受试者工作特征(ROC)曲线及曲线下面积(AUC)评估产次对相关不良妊娠结局的影响系数。**结果** 多产次(产次 ≥ 2)是早产[比值比(odds ratio, OR)=1.602, 95%置信区间(confidence interval, CI): 1.181 ~ 2.173]、围产期贫血(OR=1.468, 95%CI: 1.099 ~ 1.963)、子宫破裂(OR=2.752, 95%CI: 1.261 ~ 6.007)的危险因素;是低出生体重儿(OR=0.564, 95%CI: 0.321 ~ 0.992)、羊水污染(OR=0.556, 95%CI: 0.418 ~ 0.739)、胎儿窘迫(OR=0.171, 95%CI: 0.080 ~ 0.365)的保护因素($P<0.05$)。**结论** 产次增加与部分不良妊娠结局风险升高相关,需警惕特定并发症(如子宫破裂)的风险增加。严格把控剖宫产指征、孕期合理增重是预防多产次孕妇不良妊娠结局的有效措施。

【关键词】 产次 分娩 妊娠结局

Association Study of Parity With Adverse Pregnancy Outcomes

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[Abstract] Objective To investigate the relationship between parity and adverse pregnancy outcomes. **Methods** Keyword searches were conducted by 'parity', followed by random sampling to select 1200 patients: 400 from each of the first, second and third childbirths, designated as Groups 1, 2 and 3, respectively. A retrospective cohort study examined pregnancy outcomes across these three groups. Logistic regression was used to estimate the association between parity and pregnancy outcomes after adjusting for other confounding factors. We assessed the impact of parity on adverse pregnancy outcomes and the corresponding risk coefficients using receiver operating characteristic (ROC) curves and the area under the curve (AUC). **Results** Multiparity (parity ≥ 2) is a risk factor for preterm birth (odds ratio [OR] = 1.602, 95% CI: 1.181-2.173), perinatal anemia (OR = 1.468, 95% CI: 1.099-1.963), and uterine rupture (OR = 2.752, 95% CI: 1.261-6.007). It is a protective factor against low birth weight (OR = 0.564, 95% CI: 0.321-0.992), meconium-stained amniotic fluid (OR = 0.556, 95% CI: 0.418-0.739), and fetal distress (OR = 0.171, 95% CI: 0.080-0.365) ($P < 0.05$). **Conclusion** Increased parity is associated with a higher risk of certain adverse pregnancy outcomes, so it is important to be vigilant about the increased risk of specific complications, such as uterine rupture. Strictly controlling the indications for cesarean section and maintaining reasonable weight gain during pregnancy are effective measures to prevent adverse pregnancy outcomes in multiparous women.

[Key words] Parity Childbirth Pregnancy outcome

目前,关于多产次对妊娠结局影响的研究仍较为有限,且结论存在一定争议。一项覆盖美国2000-2015年的全国性数据研究,针对高产次人群(妊娠 ≥ 20 周,分娩 ≥ 5

次,含活产及死产)进行分析后显示,高产次与严重孕产妇并发症风险升高无明显相关性^[1]。国内一项大样本回顾性研究显示,经产妇的总体不良分娩结局风险降低,初产妇不良妊娠结局风险高于经产妇^[2];但也有研究得出相反结论,认为经产妇不良妊娠结局发生率更高^[3]。另有研究发现产次与部分妊娠结局之间呈“U”型关联趋势^[4]。

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2011年,中国各地开始实施双独二孩政策;2013年,单独二孩政策落地;2015年,全面二孩政策推行;2021年,为进一步优化生育政策,三孩政策开始实施。当前我国正处于全面实施三孩政策阶段,本研究进一步探讨产次与不良妊娠结局的关联,旨在对第三次妊娠相关危险因素进行科学评估,降低母婴不良妊娠结局的发生风险,为更好地落实三孩生育政策提供合理依据与参考。

1 资料与方法

1.1 研究对象

选取2021年6月1日–2022年7月15日于云南省第一人民医院分娩的患者,按照纳入、排除标准筛选合格患者。纳入标准:在我院规律产检至分娩(孕周 ≥ 28 周)且资料完善的产妇。排除标准:资料缺失、诊断不明确的患者。本院对所有孕妇均按照统一诊断标准进行诊断,“GXPX孕X周”,其中G代表孕次,P代表产次,X为具体数值。通过病历数据库对“产次”进行检索词检索,第一次、第二次、第三次分娩的患者分别按照“P1”“P2”“P3”进行检索。共检索出415例“P3”患者,其中15例患者在我院分娩,但系外院建卡、产检,因孕期资料部分缺失,未纳入研究。最终纳入400例第三次分娩的患者并命名为第3组。将“P1”“P2”检索出的所有患者按住院号从小到大排序,以 $K=N/n$ (N 为筛选合格人数, $n=400$)计算抽样间隔,按抽样间隔选取纳入患者,并分别命名为第1组、第2组。本研究已通过云南省第一人民医院伦理审查,审批号:KHLL 2021-102。

1.2 一般资料

对3组患者基本资料进行记录,包括年龄、体质量指

数(body mass index, BMI)、孕周、孕期增重、瘢痕子宫、分娩方式(阴道分娩/剖宫产/剖宫产后阴道分娩(vaginal birth after cesarean section, VBAC)、妊娠方式[自然受孕/辅助生殖技术(assisted reproductive technique, ART)]、胎数(单胎/多胎);对三组患者及新生儿的结局变量进行记录,包括早产、胎膜早破、前置胎盘、妊娠期高血压疾病(hypertensive disorders of pregnancy, HDP)、妊娠期糖尿病(gestational diabetes mellitus, GDM)、妊娠期肝内胆汁淤积症(intrahepatic cholestasis of pregnancy, ICP)、甲状腺功能减退、围产期贫血、产后出血、子宫破裂、低出生体重儿、巨大儿、羊水过多、羊水污染、胎儿窘迫、肺栓塞、妊娠合并心脏病。

1.3 统计学方法

采用SPSS27.0统计软件处理数据,One-way ANOVA比较三组间计量资料,结果以 $\bar{x} \pm s$ 表示; χ^2 检验比较分类变量,以率(%)表示; $P < 0.05$ 表示差异有统计学意义,进一步采用 χ^2 分割进行组间两两比较, $P < 0.0167(0.05/3)$ 表示差异有统计学意义。调整混杂影响因素,对结局变量进行多因素logistic回归分析,采用受试者工作特征(receiver operating characteristic, ROC)曲线及曲线下面积(area under the curve, AUC)评估产次对相关不良妊娠结局的预测效能,计算其敏感度、特异度, $P < 0.05$ 表示差异有统计学意义。

2 结果

2.1 一般资料比较

三组产妇的年龄、BMI、孕周,高龄、瘢痕子宫占比、分娩方式、受孕方式存在差异,见表1。

表 1 3组产妇一般资料比较

Table 1 General characteristics of the three groups of pregnant women

Index	Parity			P
	1st (n = 400)	2nd (n = 400)	3rd (n = 400)	
Age/yr.	28.82 $\pm$ 4.01	32.33 $\pm$ 4.30	33.80 $\pm$ 4.49	< 0.001 ^a
BMI/(kg/m ²)	26.31 $\pm$ 3.04	27.08 $\pm$ 3.17	27.57 $\pm$ 3.36	< 0.001 ^a
Gestational weeks	39.13 $\pm$ 1.67	38.70 $\pm$ 1.71	38.36 $\pm$ 1.82	< 0.001 ^a
Gestational weight gain/kg	13.87 $\pm$ 4.18	13.51 $\pm$ 6.26	13.06 $\pm$ 5.11	0.095 ^a
Age $\geq$ 35 yr./case (%)	29 (7.2)	106 (26.5)	165 (41.3)	< 0.001 ^b
Obesity/case (%)				< 0.001 ^b
BMI $\geq$ 28 kg/m ²	101 (25.3)	143 (35.8)	165 (41.3)	
BMI $\geq$ 30 kg/m ²	48 (12)	69 (17.3)	103 (25.8)	
Scar uterus/case (%)	3 (0.8)	148 (37)	248 (62)	< 0.001 ^b
VBAC/case (%)	—	9 (2.3)	14 (3.5)	0.056 ^b
Vaginal birth/case (%)	311 (67.8)	233 (58.3)	137 (34.3)	< 0.001 ^b
Cesarean section/case (%)	89 (32.3)	167 (41.8)	263 (65.8)	< 0.001 ^b
ART/case (%)	39 (9.8)	12 (3)	16 (4)	< 0.001 ^b
Multi-fetus/case (%)	11 (2.8)	10 (2.5)	7 (1.8)	0.573 ^b

BMI: body mass index; VBAC: vaginal birth after cesarean; ART: assisted reproductive technology. ^a ANOVA test for numerical data. ^b χ^2 test for categorical data.

2.2 组间母婴妊娠结局及并发症比较

随着产次增加, 早产、子宫破裂的发生率, GDM、围产期贫血的患病率逐渐增加; 胎膜早破、羊水污染、胎儿窘迫的发生率逐渐降低; 低出生体重儿发生率、ICP的患病率在组间存在差异; $P<0.05$ 。χ²分割进行三组间两两比较, 研究数据采用Bonferroni校正, $P=0.05/3\approx0.0167$, 检验水准 $\alpha=0.0167$ 。对比前两次生育, 第三次生育会增加早产、子宫破裂的发生率及GDM、围产期贫血的患病率, 会降低胎膜早破、羊水污染、低出生体重儿、胎儿窘迫的

发生率, 3组与1、2组间差异有统计学意义($P<0.0167$), 见表2。

2.3 产次对妊娠结局及并发症的影响

多因素logistic回归调整年龄、BMI、受孕方式、瘢痕子宫在三组间的影响(表3、图1)。产次是低出生体重儿、羊水污染、胎儿窘迫的保护因素; 是早产、围产期贫血、子宫破裂的独立危险因素。三组间GDM、ICP、胎膜早破的差异受年龄、BMI、受孕方式、瘢痕子宫因素的影响, 与产次没有独立关联。采用ROC曲线及AUC(图2、表4)

表 2 三组产妇妊娠结局及并发症比较
Table 2 Pregnancy outcomes of study participants by parity

Pregnancy outcomes	Parity			P
	1st (n = 400)	2nd (n = 400)	3rd (n = 400)	
Preterm birth/case (%)	22 (5.5)	36 (9.0)	53 (13.3)*	0.001
PROM/case (%)	95 (23.8)	77 (19.3)	58 (14.5)*	0.004
Placenta previa/case (%)	4 (1.0)	11 (2.8)	13 (3.3)	0.086
HDP/case (%)	34 (8.5)	19 (4.7)	30 (7.5)	0.096
GDM/case (%)	50 (12.5)	70 (17.5)*	75 (18.8)*	0.040
Hypothyroidism/case (%)	46 (11.5)	57 (14.2)	42 (10.5)	0.242
Perinatal anemia/case (%)	29 (7.2)	36 (9.0)	60 (15.0)*, Δ	0.001
PPH/case (%)	17 (4.3)	21 (5.3)	29 (7.3)	0.170
Uterine rupture/case (%)	2 (0.5)	4 (1.0)	29 (7.2)*, Δ	< 0.001
LBW/case (%)	24 (6.0)	5 (1.3)*	8 (2.0)*	< 0.001
Macrosomia/case (%)	13 (3.3)	5 (1.3)	12 (3.0)	0.142
Polyhydramnios/case (%)	21 (5.3)	15 (3.8)	20 (5.0)	0.560
MSAF/case (%)	86 (21.5)	53 (13.2)*	20 (5.0)*, Δ	< 0.001
Fetal distress/case (%)	36 (9.0)	7 (1.7)*	2 (0.5)*	< 0.001
ICP/case (%)	0	9 (2.3)*	5 (1.3)	0.012
Pulmonary embolism/case (%)	0	4 (1.0)	4 (1.0)	0.134
Pregnancy with cardiac disease/case (%)	0	1 (0.3)	4 (1.0)	0.073

PROM: premature rupture of membranes; HDP: hypertensive disorders of pregnancy; GDM: gestational diabetes mellitus; PPH: postpartum hemorrhage; LBW: low birth weight; MSAF: meconium-stained amniotic fluid; ICP: intrahepatic cholestasis of pregnancy. * $P<0.0167$, vs. the 1st; Δ $P<0.0167$, vs. the 2nd.

表 3 妊娠结局及并发症的多因素logistic回归
Table 3 Logistic regression analysis results

Pregnancy outcomes	Parity			Age			BMI			ART			Scar uterus		
	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI
Preterm birth	0.002	1.602	1.181-2.173	0.641	0.989	0.945-1.036	0.243	0.963	0.904-1.026	0.006	2.706	1.326-5.522	0.221	1.340	0.839-2.141
PROM	0.238	0.876	0.703-1.092	0.156	1.025	0.990-1.062	0.903	0.997	0.951-1.045	0.932	0.974	0.528-1.794	< 0.001	0.428	0.285-0.642
GDM	0.327	0.885	0.693-1.130	< 0.001	1.119	1.079-1.161	0.010	1.066	1.015-1.119	0.916	0.965	0.495-1.878	0.551	1.123	0.767-1.644
Perinatal anemia	0.009	1.468	1.099-1.963	0.350	0.979	0.937-1.023	0.252	0.966	0.909-1.025	0.046	2.098	1.013-4.347	0.057	1.547	0.987-2.425
Uterine rupture	0.011	2.752	1.261-6.007	0.712	1.016	0.935-1.103	0.340	0.949	0.852-1.057	0.997	0.000	0.000	< 0.001	11.289	3.216-39.625
LBW	0.047	0.564	0.321-0.992	0.762	1.013	0.934-1.098	0.056	0.891	0.792-1.003	0.030	2.938	1.113-7.754	0.699	0.811	0.281-2.344
MSAF	< 0.001	0.556	0.418-0.739	0.074	0.962	0.922-1.004	0.003	1.083	1.027-1.142	0.666	1.161	0.588-2.293	0.083	0.628	0.371-1.063
Fetal distress	< 0.001	0.171	0.080-0.365	0.257	1.044	0.969-1.124	0.002	1.152	1.051-1.262	0.456	0.624	0.181-2.155	0.648	0.740	0.204-2.691
ICP	0.843	0.913	0.369-2.257	0.153	1.090	0.968-1.228	0.328	0.917	0.772-1.091	0.649	1.658	0.188-14.626	0.030	4.906	1.168-20.607

OR: exponent of beta; CI: confidence interval.

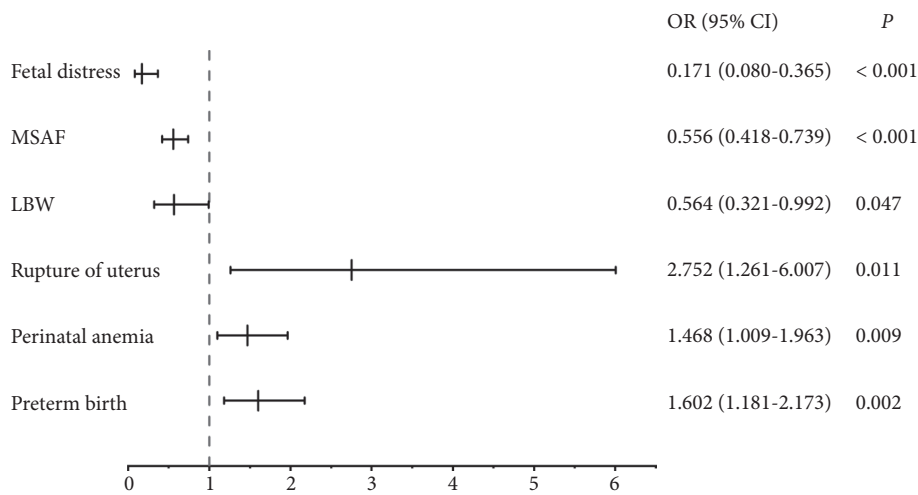


图 1 产次与相关妊娠结局的森林图
Fig 1 Forest-plot of parity and correlated outcomes

OR: exponent of beta; CI: confidence interval.

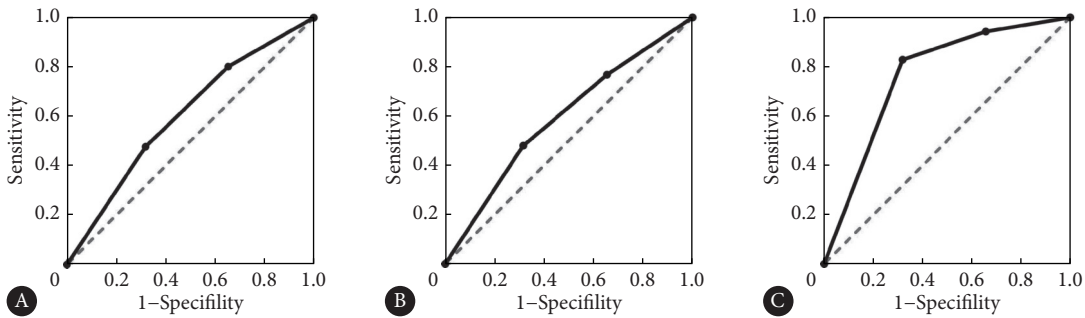


图 2 产次与不良妊娠结局的ROC曲线图
Fig 2 The ROC curve of the effect of parity

A, Parity on preterm birth; B, parity on perinatal anemia; C, parity on uterine rupture.

表 4 产次对相关不良妊娠结局的预测效能

Table 4 Prediction efficacy of parity for adverse pregnancy outcomes				
Predictor	AUC (95% CI)	Sensitivity	Specificity	P
Parity-preterm birth	0.603 (0.549-0.656)	0.477	0.681	0.002
Parity-perinatal anemia	0.592 (0.539-0.645)	0.480	0.684	0.009
Parity-uterine rupture	0.765 (0.696-0.834)	0.829	0.682	0.011

AUC: area under the curve; CI: confidence interval.

评估产次对相关不良妊娠结局及并发症的影响,结果显示产次对围产期贫血、早产具有一定的预测能力,对子宫破裂的预测效能较好。

3 讨论

本研究随机纳入了1200名患者,随着产次的增加,患者年龄明显增大,第三次分娩的患者中高龄占比41.3%。高龄是导致不良妊娠结局及影响分娩方式的一个关键因素^[5-7],在适龄受孕是减轻孕产妇、胎儿、社会负担的有益措施。随着产次增加患者的BMI增大,肥胖占比也随之

增大,此现象与PAULINO等^[8]报道的相同。肥胖与妊娠期糖尿病、巨大儿、新生儿窒息、远期心血管代谢性疾病息息相关^[9-10]。本研究结果得出随着BMI增加,妊娠期糖尿病、羊水污染、新生儿窒息的风险增加。瘢痕子宫率随着产次明显增加,其一方面是人们的健康意识在不断增强,部分子宫肌瘤患者及时治疗形成瘢痕子宫,但主要原因仍然是剖宫产的广泛开展。2010年世界卫生组织报告中国剖宫产率高达46.2%^[11],中国二胎政策开放后部分地区甚至达到70%~80%。本研究中首次分娩的患者剖宫产率为32.3%,第二次分娩的患者剖宫产率为41.8%,第三次分娩的患者剖宫产率为65.8%,三次分娩的剖宫产率均远超世卫组织设置的警戒线15%。造成如此高剖宫产率有几个主要原因。臀位外倒转术在临床还未广泛开展,这是导致高剖宫产率的一个因素。另外,超声检查是一把双刃剑,它能有效地帮我们评估胎儿的情况,但过度的超声检查增加了胎儿异常的诊断,如巨大儿增加了剖宫产的干预,但实际出生体重与超声估重不符合,其诊断

为假阳性。最重要的是,很多医生及患者因担心子宫破裂停留在“一次剖宫产,终身剖宫产”的观念中,这是剖宫产率随着产次增加而增加的一个主要原因。然而,自1982年美国妇产科医师协会发布第1版剖宫产后阴道试产指南至今已40年,大量研究表明^[12-13]瘢痕子宫患者在排除禁忌后经阴道分娩的母婴结局远优于多次选择性剖宫产,即便是子宫破裂,其发生率较于剖宫产带来的不良结局也是微不足道的。本研究中1组有2名患者既往子宫肌壁间肌瘤剥除术后经阴道分娩,2组9名患者既往一次剖宫产后经阴道分娩,3组14名瘢痕子宫患者经阴道分娩,其中2例为二次剖宫产后阴道分娩,这25名患者均未发生子宫破裂。MILLIER等^[14]对12 707例有剖宫产史的孕妇进行试产,1次、2次剖宫产史的子宫破裂率为0.6%、1.8%。子宫破裂的概率远低于剖宫产导致的母婴不良结局概率。

目前已有一些关于产次与癫痫、痴呆、骨密度、癌症、代谢性疾病等远期临床病症的相关研究^[15-20],而产次对母婴妊娠结局的影响缺少报道。本研究得出产次是早产、围产期贫血、子宫破裂的独立危险因素。产次每增加一次,发生早产的风险增加1.602倍,考虑一方面原因是随着产次的增加,宫腔扩张导致胎膜完整性早,另一方面是随着产次的增加,发生宫颈机能不全、宫内感染的风险增加,这将导致胎膜早破性早。产次每增加一次,发生围产期贫血的风险增加1.468倍,LIPOETO等^[21]的研究也得出多产次会增加妊娠期贫血的风险,贫血的发生率随着妊娠次数的增加而增加。由于贫血给母儿带来的危害不容小觑,围产期贫血可能与孕产妇围产期死亡、胎儿生长受限等不良结局有关^[22],因此,计划怀孕的妇女应在孕前、孕早中晚期进行相应的检查,必要时补充铁剂及维生素。子宫破裂的研究多与剖宫产相关联,而产次与子宫破裂的关系鲜为报道,产次每增加一次,发生子宫破裂的风险增加2.752倍。多次妊娠导致宫腔扩张、子宫肌层菲薄,在孕晚期或分娩期宫腔内压力升高,宫缩频繁,增加了子宫破裂的风险。因此,建议瘢痕子宫患者在孕晚期加强产检,严密监测宫缩及腹痛情况,根据瘢痕厚度、既往手术方式、母儿一般情况适时终止妊娠。值得注意的是,本研究在控制了年龄、BMI、产次、IVF这些混杂因素后发现瘢痕子宫显著增加了患ICP的风险,与无子宫手术史的患者相比,瘢痕子宫患者患ICP的风险增加了1.168~20.607倍。在本研究中,1组无ICP患者,2组中9位、3组中5位孕妇分别患ICP。ICP是一种妊娠中晚期特发性疾病,目前病因还未明确,发生率在世界范围内从0.1%到15%不等^[23]。以往的研究报道^[24]ICP可能与遗传、

免疫、激素、种族差异有关,近期的研究^[25-26]报道其与多胎妊娠、辅助生殖技术、低硒、低维生素、肝胆疾病、甲状腺疾病等相关。目前有关ICP的研究均围绕内分泌疾病、BMI、年龄等一般资料做相关预测,有关瘢痕子宫与ICP的关系尚无报道。本研究由于病例数较少缺乏有力证据,但相当宽的置信区间($n=14$, $OR=4.096$, $95\%CI: 1.168 \sim 20.607$)使我们猜测瘢痕子宫也是ICP的其中一个危险因素,这可能与瘢痕子宫患者子宫肌层、子宫内膜受损,发生局部免疫炎症反应、激素调节变化等相关。在未来,需大样本临床研究进一步证实其相关性。

产次也是妊娠的保护性因素,随着产次的增加,低出生体重儿、羊水污染、胎儿窘迫的风险降低。一项在亚洲、非洲、拉丁美洲等29个国家的研究结果显示,无生育史的孕妇孕育小于胎龄儿的风险更大^[27]。CHEN等^[28]报道中国大陆地区初产妇的低出生体重儿患病率为6.1%,本研究结果与其一致,其中1组低出生体重儿患病率6%、2组1.3%、3组2%。由于经产妇的子宫适应性增强,子宫血管分布及胎盘功能更稳定,更有利于胎儿获取丰富的营养物质和氧气^[29]。中国河北省的多中心大数据研究^[30]指出,经产妇是低出生体重儿的保护性因素,可能与子宫环境更适宜胎儿生长发育有关,多次妊娠妇女的子宫纤维弹性较好,可减少因子宫收缩异常导致的胎儿生长受限。一项澳大利亚的研究也指出经产妇对孕期保健的医从性增加,不良生活习惯如吸烟、营养障碍等减少,每增加一次妊娠,新生儿体重平均增加约100 g^[31]。经产妇发生胎儿宫内缺氧的风险也明显降低,其胎盘血管和胎盘生长因子表达水平更高,抗氧化酶活性更强,能有效清除缺氧产生的自由基,母胎间血氧运输及交换屏障更稳定^[32-33]。众所周知,羊水胎粪污染与胎儿宫内窘迫相关^[34],但相关研究指出影响胎粪排出的最主要因素是孕周,孕周越大羊水胎粪污染的概率越高^[35]。随着产次的增加,平均孕周缩短,羊水污染的发生率降低,发生胎粪吸入综合征的风险也随之降低。因此这也是减少胎儿窘迫发生的一个原因。此外,考虑到产程延长会增加胎儿宫内缺氧的风险,经产妇的产程进展更快,减少了胎儿窘迫的发生。总之,本研究及相关研究均证实了多产次使低出生体重儿、羊水污染、胎儿窘迫的发生率降低,但仍需排除高龄、前次妊娠并发症、妊娠间隔过长、过短等混杂因素,需综合评估、个性化保健,最大程度保障母婴健康。

多产次与部分妊娠结局存在双向影响,多产次是导致早产、产褥期贫血、子宫破裂的独立危险因素,但同时也是低出生体重儿、羊水污染、胎儿窘迫的保护性因

素。产次对早产、围产期贫血的单独预测效能 $0.6 \sim 0.7$,具有一定的预测能力,也说明导致早产、围产期贫血的原因众多,多产次并非关键因素。产次对子宫破裂的预测效能达 0.765 ,其预测效能较好,但产次对子宫破裂的危险作用显著低于瘢痕子宫($OR: 2.752$ vs. 11.289),在无其他危险作用下,多产次并不会显著增加子宫破裂的风险。多产次带来的不良妊娠结局不足以成为再生育的困扰甚至禁忌,但经产妇在孕期加强产检是有必要的,尤其是孕晚期监测好胎动及宫缩情况以防止延误早产及子宫破裂的诊治。重要的是,严格把控剖宫产指征、孕期合理增重可能是我国三孩政策开放后预防不良妊娠结局的最有效措施。

本研究为一项回顾性队列研究,存在一定的局限性。本文虽然对部分混杂变量进行了多因素logistic回归,但部分变量(如妊娠间隔时间、教育水平、营养状况等)未作为混杂因子纳入分析,可能影响结果的稳健性,仍需在后续研究中改进。

* * *

作者贡献声明 姚俊秀负责论文构思、数据审编、正式分析、调查研究、研究方法、初稿写作和审读与编辑写作,郭欣负责数据审编和调查研究,董旭东负责论文构思、经费获取、调查研究、研究项目管理、监督指导和审读与编辑写作。所有作者已经同意将文章提交给本刊,且对将要发表的版本进行最终定稿,并同意对工作的所有方面负责。

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利益冲突 所有作者均声明不存在利益冲突

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