



• 儿童早期发展 •

中国0~9月龄胃肠不适婴儿功能性胃肠病的患病率及影响因素: 一项多中心横断面调查研究*

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【摘要】 目的 调查功能性胃肠病在中国不同城市0~9月龄胃肠不适婴儿中的发病情况, 并分析相关影响因素。方法 采用多中心横断面调查研究的方法, 参考婴幼儿功能性胃肠病罗马IV诊断性问卷并结合已发表的文献设计调查问卷, 收集中国东中西部14座城市17家医院0~9月龄胃肠不适婴儿的信息, 主要包括家庭基本情况、婴儿出生史、喂养史、胃肠不适症状的类型及频率等, 并采用logistic回归进行影响因素分析。结果 共纳入0~9月龄胃肠不适婴儿2528例, 其中男婴1315例(52.02%), 女婴1213例(47.98%)。在受调查的婴儿中, 诊断功能性胃肠病者占72.55%, 男女患病率差异无统计学意义($P=0.397$), 其中反流患病率最高, 为39.83%。反流、腹绞痛随月龄增加患病率逐渐降低, 而排便困难及功能性便秘随月龄增加患病率逐渐增高; 单种症状患病率为57.48%, 两种或两种以上症状者约为15%, 0~3月龄婴儿有兩種及以上症状的比例最高(22.02%), 而6~9月龄婴儿以单一症状为主(65.96%)。单因素分析结果显示, 不同地区、父母学历、家庭人均月收入、患儿日龄、出生胎龄、纯母乳喂养时间以及是否使用益生菌与功能性胃肠病的发生有关(均 $P<0.05$), logistic回归分析结果显示: 西部地区[比值比(odds ratio, OR)=0.407, 95%置信区间(confidence interval, CI): 0.324~0.510]、使用益生菌(OR=0.69, 95%CI: 0.560~0.847)、出生胎龄(OR=0.914, 95%CI: 0.837~0.998)以及纯母乳喂养时间>4个月(OR=0.75, 95%CI: 0.595~0.946)是影响功能性胃肠病发生的显著因素(均 $P<0.05$)。结论 功能性胃肠病在0~9月龄胃肠不适婴儿中较为常见, 其发生与地区分布、益生菌使用、出生胎龄及纯母乳喂养时间存在关联, 加强护理和喂养知识的指导, 如维持肠道菌群平衡、提倡母乳喂养等可能有助于预防婴儿功能性胃肠病的发生。

【关键词】 功能性胃肠病 婴儿 患病率 影响因素 横断面研究

Prevalence and Influencing Factors of Functional Gastrointestinal Disorders Among Infants Aged 0 to 9 Months With Gastrointestinal Discomfort in China: A Multicenter Cross-Sectional Survey

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* 中华国际医学交流基金会基金(No. Z-2017-27-2001)资助

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出版日期: 2025-11-20

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[Abstract] Objective To determine the prevalence of functional gastrointestinal disorders (FGIDs) in infants aged 0-9 months with gastrointestinal (GI) discomfort in different cities in China, and to investigate the associated influencing factors. **Methods** A multicenter cross-sectional survey was conducted. The questionnaire was developed based on the Rome IV Diagnostic Questionnaire for FGIDs in Neonates and Toddlers and published literature. Data were collected from infants aged 0-9 months with GI discomfort at 17 hospitals across 14 cities in eastern, central, and western China. Information on family demographics, neonatal records, feeding history, types and frequency of GI symptoms was collected. Logistic regression was performed to explore factors associated with FGIDs. **Results** A total of 2528 infants aged 0-9 months with GI discomfort were enrolled, with 1315 males (52.02%) and 1213 females (47.98%). Among the surveyed infants, 72.55% were diagnosed with FGIDs, with no statistically significant difference in prevalence between male and female infants ($P = 0.397$). Regurgitation, with a prevalence of 39.83%, was the most common FGID. The prevalence of regurgitation and colic in infants decreased with increasing age, while the prevalence of dyschezia and functional constipation increased with increasing age. The prevalence of a single symptom was 57.48%, and approximately 15% of infants presented with 2 or more symptoms. The proportion of those presenting with 2 or more symptoms was the highest in infants aged 0-3 months (22.02%), whereas infants aged 6 to 9 months predominantly presented with a single symptom (65.96%). Univariate logistic regression identified significant associations between FGIDs and the geographic region, parental educational attainment, monthly per capita household income, infant age in days, gestational age at birth, duration of exclusive breastfeeding, and probiotic use (all $P < 0.05$). Logistic regression analysis results showed that residing in the western region (odds ratio [OR] = 0.407, 95% CI: 0.324-0.510), probiotic use (OR = 0.69, 95% CI: 0.560-0.847), gestational age at birth (OR = 0.914, 95% CI: 0.837-0.998), and the duration of exclusive breastfeeding > 4 months (OR = 0.75, 95% CI: 0.595-0.946) were significant factors influencing the occurrence of FGIDs (all $P < 0.05$). **Conclusion** FGIDs are highly prevalent among infants aged 0-9 months with gastrointestinal symptoms in China. Their occurrence is linked to geographic region, probiotic use, gestational age, and breastfeeding duration. Future studies should focus on whether improved feeding guidance and breastfeeding promotion can help prevent FGIDs.

[Key words] Functional gastrointestinal disorders Infants Prevalence Influencing factors
Cross-sectional study

功能性胃肠病(functional gastrointestinal disorders, FGIDs)概念于上世纪90年代初期由罗马标准首次定义^[1]。FGIDs是一组以慢性或复发性胃肠道症状为主要特征且缺乏明确器质性或生化异常的疾病。儿童FGIDs较为常见,其症状及患病率在不同发育阶段差异显著^[2-3]。2006年罗马Ⅲ标准首次根据年龄段区分婴幼儿和儿童的FGIDs诊断标准^[4]。罗马Ⅳ标准则进一步细化症状定义和分类,提高了FGIDs诊断的特异性^[5-6]。

婴儿FGIDs临床表现复杂多样,常见症状包括反流、肠绞痛、功能性便秘和排便困难等。这些症状多为生理性,但常引起婴儿和家庭焦虑,为儿科常见就诊原因^[7-8]。其患病率地区差异明显,部分地区可达半数^[2,9-10]。FGIDs不仅影响婴儿生活质量,还会加重家庭心理压力和经济损失^[11-12]。在医疗资源有限的地区,可能挤占儿科资源^[13]。因此,深入研究婴儿FGIDs的发病率及其危险因素对优化诊疗、早期识别和减轻社会负担具有重要意义。

现中国婴幼儿FGIDs流行病学研究多基于普通人群,未能充分反映临床就诊患儿特征^[14-16]。实际就诊患儿多为症状较为严重或复杂的亚群,其患病率、临床特征及相关危险因素可能与普通人群存在差异。目前针对这一群体的研究仍不足,限制了对其疾病负担及病因机制的深入认识。为此,本研究聚焦于中国东中西部0~9月龄因胃肠道不适就诊的婴儿,系统分析其FGIDs的发生情况及相关因素,以揭示该群体的疾病特征,为临床实践和科研提供依据。

1 资料和方法

1.1 研究方法

本研究为多中心横断面调查研究,调查时间从2020年11月-2021年9月。本研究已在中国临床试验注册平台注册,注册号为ChiCTR2000033937。

1.2 调查对象

研究对象为中国东中西部14座城市(参照《2020中国卫生健康统计年鉴》中的城市区域划分,位于东部的城市有北京、天津、上海、福州、济南、广州、东莞、沈阳,位于中部的城市有武汉、郑州、长沙,位于西部的城市有成都、重庆、西安),共计17家具有区域影响力的医疗机构中以胃肠不适症状(反流、腹绞痛、排便困难、便秘或腹泻)就诊的0~9月龄婴儿。本研究获得四川大学华西第二医院医学伦理委员会批准,批准号为y2020014,所有参

与调查的家庭均签署知情同意书。纳入标准:① 0~9月龄单胎、足月、适于胎龄儿;② 以反流、腹绞痛、排便困难、便秘或腹泻为主要临床表现;③ 自愿参加,并填写知情同意书。排除标准:① 家长不愿意填写问卷者;② 不签署知情同意书者;剔除标准:① 未按纳入标准选择的受试者;② 未完成问卷内容者。

诊断标准:以罗马Ⅳ^[16-17]中婴幼儿功能性胃肠病的诊断标准为依据。需要说明的是,根据此诊断标准,腹绞痛的发病年龄为0~5月龄,功能性腹泻的发病年龄为6月龄以上,故此两种疾病未涉及本研究全部年龄段。

1.3 样本量估计

样本计算公式为 $n = \frac{Z_{\alpha}^2 \times pq}{d^2}$,式中 Z_{α}^2 表示置信水平为95%时对应的标准正态分布临界值,故 $Z_{\alpha}^2 = 1.96$, p 为预期现患率, $q = 1 - p$, d 为容许误差。将既往已发表文献中反流、腹绞痛、排便困难、功能性腹泻、功能性便秘的患病率^[6,11,14,18]分别代入上式,取最大值,计算出本次调查所需样本量为2123例。

1.4 调查内容

信息收集采用问卷调查的方式,调查问卷参考婴幼儿功能性胃肠病罗马Ⅳ诊断性问卷^[6]并结合已发表的文献由本研究团队自行设计。问卷内容包括家庭基本情况、有无胃肠道疾病及过敏性疾病家族史、出生史、喂养史、胃肠不适症状的类型及频率等。问卷由婴幼儿主要看护人进行填写,调查员经过统一培训后负责向看护人进行问卷讲解、答疑以及审阅,所有看护人在现场完成填写。同时医生对每例婴儿常规进行病史询问、体格检查,必要时行相关实验室检查,并依据前述诊断标准作出是否为FGIDs的诊断。

1.5 统计学方法

计量资料用 $\bar{x} \pm s$ 进行统计描述,采用 t 检验进行组间比较;计数资料采用构成比进行统计描述,组间比较采用 χ^2 检验。针对功能性胃肠病的影响因素分析,将上述单因素分析中 $P < 0.1$ 的因素,纳入多因素二分类logistic回归分析模型中,其中因变量为是否有FGIDs, $P < 0.05$ 为差异有统计学意义,数据分析采用R软件(4.1.2版本)。

2 结果

2.1 调查对象基本情况

本次调查共回收问卷2601份,经数据清理后将符合要求的问卷2528份纳入最终分析。

受试者平均日龄为(119.39±72.62) d, 其中男婴 1 315 例(52.02%), 女婴 1 213 例(47.98%), 受试者父母平均年龄分别为(32.19±4.91)岁(父)、(30.46±4.24)岁(母)。

2.2 婴儿功能性胃肠病的患病率

2.2.1 总患病率

受调查的 2 528 例婴儿中, 诊断为功能性胃肠病者 1 834

例(72.55%), 其中男婴 944 例(51.47%), 女婴 890 例(48.53%), 男女患病率差异无统计学意义($P=0.397$)。

1 834 例罹患功能性胃肠病的婴儿中, 最常见的是婴儿反流(图 1)。按照症状重叠数量进行统计, 大多数婴儿(57.48%)表现为一种症状, 表现为两种或两种以上症状者约占 15%(表 1)。

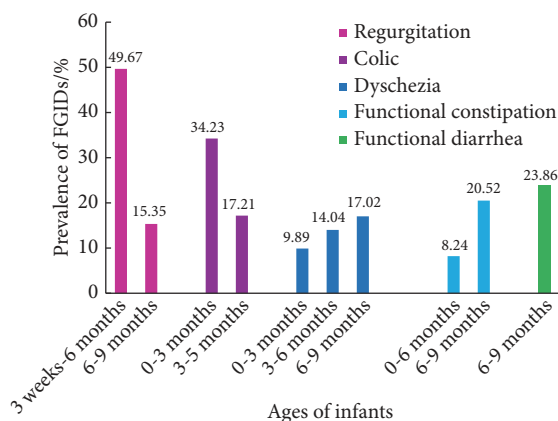
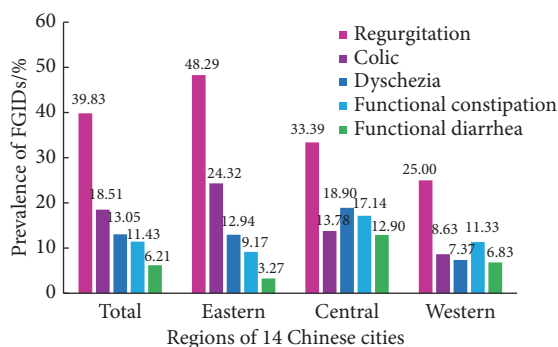


图 1 中国 14 城市 0~9 月龄胃肠不适婴儿 FGIDs 的发病情况

Fig 1 Prevalence of FGIDs in infants aged 0-9 months with gastrointestinal symptoms in 14 Chinese cities

Total $n=2\ 528$; Eastern region $n=1\ 406$; Central region $n=566$; Western region $n=556$; 3 weeks-6 months $n=1\ 824$; 6-9 months $n=658$; 0-3 months $n=1\ 072$; 3-5 months $n=587$; 3-6 months $n=798$; 0-6 months $n=1\ 870$.

表 1 中国 14 城市 0~9 月龄胃肠不适婴儿 FGIDs 不同症状重叠发生情况
Table 1 Prevalence of overlapping symptoms of FGIDs in infants aged 0-9 months with gastrointestinal symptoms in 14 Chinese cities

Factor	n	1 symptom/ case (%)	2 symptom/ case (%)	3 symptom/ case (%)
Total	2 528	1 453 (57.48)	345 (13.65)	36 (1.42)
Region				
Eastern	1 406	826 (58.75)	240 (17.07)	24 (1.71)
Central	566	363 (64.13)	74 (13.07)	11 (1.94)
Western	556	264 (47.48)	31 (5.58)	1 (0.18)
Age				
0-3 months (0-90 d)	1 072	609 (56.81)	216 (20.15)	20 (1.87)
3-6 months (91-180 d)	798	410 (51.38)	78 (9.77)	11 (1.38)
6-9 months (181-270 d)	658	434 (65.96)	51 (7.75)	5 (0.76)

2.2.2 地区患病率

地区分析显示, 在罹患功能性胃肠病的婴儿中, 东部反流与腹绞痛检出率最高(分别为 48.29% 和 24.32%), 中部地区在排便困难和功能性便秘的患病率较高(分别为 18.90% 和 17.14%), 西部各症状检出率整体低于东部和中部, 但功能性便秘(11.33%)和功能性腹泻(6.83%)在西部相对高于东部(图 1)。

按照症状重叠数量地区分析显示, 中部单一症状患

病率最高(64.13%), 而西部地区两种症状患病率最低(5.76%), 三种及三种以上症状在各地区均较低, 症状重叠数量呈现“东高西低”趋势(表 1)。

2.2.3 年龄分组患病率

按年龄分组分析表明, 在罹患功能性胃肠病的婴儿中, 反流在 3 周~6 月龄婴儿中患病率最高(49.67%), 而在 6~9 月龄中显著降低(15.35%)。腹绞痛、排便困难、功能性便秘和功能性腹泻在不同月龄段中也呈现明显差异, 提示婴儿罹患功能性胃肠病的症状分布具有年龄特异性(图 1)。

症状重叠数量年龄分组分析显示, 0~3 月龄婴儿有两种及以上症状的比例最高(22.02%), 而 6~9 月龄婴儿以单一症状为主(65.96%), 多重症状患病率随月龄增长呈下降趋势(表 1)。

2.3 婴儿功能性胃肠病的影响因素分析

2.3.1 单因素分析

结果显示, 患儿功能性胃肠病的发生与不同地区、父母学历、家庭人均月收入、患儿日龄、出生胎龄、纯母乳喂养时间以及是否使用益生菌相关(均 $P<0.05$)(表 2)。

2.3.2 多因素分析

对单因素分析中有统计学意义的 8 个因素进行二分类 logistic 回归分析, 结果显示: 西部地区[比值比(odds

表2 中国14城市0~9月龄胃肠不适婴儿FGIDs影响因素的单因素分析
Table 2 Univariate analysis of factors influencing FGIDs in infants aged 0-9 months in 14 Chinese cities

Factor	Total (n = 2 528)	Non-FGIDs (n = 694)	FGIDs (n = 1 834)	χ^2/t	P
Region				133.983	< 0.001
Eastern	1 406	316	1 090		
Central	566	118	448		
Western	556	260	296		
Father's educational attainment				8.693	0.034
High school or below	381	106	275		
Associate degree	634	198	436		
Bachelor's degree	1 248	331	917		
Master's degree or higher	265	59	206		
Mother's educational attainment				7.991	0.046
High school or below	402	115	287		
Associate degree	692	215	477		
Bachelor's degree	1 174	300	874		
Master's degree or higher	260	64	196		
Average monthly household per capita income				26.180	< 0.001
0-2000 yuan	16	4	12		
2001-5000 yuan	156	40	116		
5001-8000 yuan	721	222	499		
8001-10 000 yuan	602	197	405		
> 10 000 yuan	1 033	231	802		
Age/d	119.39 ± 72.62	128.51 ± 68.87	115.94 ± 73.72	4.015	< 0.001
Gestational age/d	38.85 ± 1.03	38.93 ± 1.05	38.82 ± 1.02	2.395	0.016
Breastfeeding				9.031	0.011
0	1 371	361	1 010		
-4 months	602	153	449		
> 4 months	555	180	375		
Probiotics				36.266	< 0.001
No	885	178	707		
Yes	1 643	516	1 127		

ratio, OR)= 0.407, 95%置信区间(confidence interval, CI): 0.324 ~ 0.510)、使用益生菌(OR= 0.69, 95%CI: 0.560 ~ 0.847)、出生胎龄(OR= 0.914, 95%CI: 0.837 ~ 0.998)以及纯母乳喂养时间> 4个月(OR= 0.75, 95%CI: 0.595 ~ 0.946)与婴儿功能性胃肠病的发生相关(均 $P < 0.05$)(表3)。

3 讨论

0~9月龄婴儿胃肠道功能尚未发育成熟,易受到内外因素影响而发生FGIDs^[8,19-20]。虽然FGIDs多为生理性,

但其症状可能影响婴儿喂养、睡眠及生长发育,并增加家庭焦虑与就诊负担,加之部分婴儿存在多种症状共存,提示FGIDs表现具有复杂性和多样性。因此,对FGIDs的早期识别与干预具有重要意义。

本研究显示,婴儿FGIDs的患病率与月龄显著相关。具体表现为:腹绞痛与反流患病率分别在3月龄和6月龄后逐步下降,而排便困难及功能性便秘患病率随月龄增长逐渐升高。低月龄(0~3月龄)婴儿常表现为多症状共存,而6月龄后症状趋于单一化。这一趋势反映了婴儿胃肠道与神经系统的发育进程:早期因肠道菌群、肠神经功

表 3 中国 14 城市 0~9 月龄胃肠不适婴儿 FGIDs 影响因素的多因素分析
Table 3 Multivariate analysis of factors influencing FGIDs in infants aged 0-9 months in 14 Chinese cities

Factor	OR	95% CI	P
Region			
Eastern	1		
Central	1.232	0.962-1.584	0.101
Western	0.407	0.324-0.510	< 0.001
Father's educational attainment			
High school or below	1		
Associate degree	0.889	0.619-1.274	0.524
Bachelor's degree	0.906	0.613-1.334	0.618
Master's degree or higher	0.998	0.589-1.699	0.995
Mother's educational attainment			
High school or below	1		
Associate degree	1.067	0.751-1.513	0.716
Bachelor's degree	1.271	0.868-1.855	0.216
Master's degree or higher	1.139	0.686-1.897	0.616
Average monthly household per capita income			
0-2000 yuan	1		
2001-5000 yuan	0.800	0.207-2.562	0.723
5001-8000 yuan	0.721	0.193-2.194	0.588
8001-10000 yuan	0.649	0.173-1.989	0.477
> 10000 yuan	0.872	0.232-2.676	0.822
Age	0.999	0.998-1.001	0.200
Gestational age	0.914	0.837-0.998	0.046
Breastfeeding			
0	1		
-4 months	0.898	0.704-1.147	0.388
> 4 months	0.750	0.595-0.946	0.015
Probiotics			
No	1		
Yes	0.690	0.560-0.847	< 0.001

能等尚未稳定,症状复杂多样,随着发育成熟相关症状,如反流、腹绞痛逐渐缓解。值得注意的是,同为发育性问题的排便困难,其患病率在6~9月龄不降反升,推测与辅食添加后排便任务难度增加,相应肌群与神经协调尚未完全成熟有关。这一现象提示,该阶段出现的排便困难多为发育性过程,应通过合理喂养与活动指导平稳过渡,避免过度干预。

本研究覆盖中国东、中、西部14座城市的17家医院,

样本具有地域代表性。结果显示,婴儿FGIDs的患病率存在地域差异:从症状分布看,东部地区以反流和腹绞痛常见,中部地区便秘及排便困难突出,西部地区整体患病率较低,但功能性便秘与功能性腹泻的相对比例较高;从症状重叠率看,呈现“东高西低”趋势。这种差异可能与经济水平、喂养文化、医疗可及性、环境及城市化程度等因素相关。例如东部经济发达,医疗资源相对集中,家庭健康意识普遍较高,使得“反流”“腹绞痛”这类需依赖家长主观观察和多次就医的症状更易被识别和报告,而西部受限于医疗资源与就诊意识,整体症状报告率偏低,但环境因素如饮食结构、水质等可能使便秘与腹泻的表现更为典型和持续,也更容易引起就医行为。此外,城市化带来的生活节奏、父母压力与居住环境变化,也可能通过影响母婴情绪与睡眠,进而加剧腹绞痛等与神经调节相关的功能性症状。这些发现提示,制定FGIDs防治策略时需考虑地区差异,在医疗资源薄弱地区应加强基层医疗服务能力建设与家长健康教育,以提升早期识别与干预效果。

既往研究多聚焦于早产儿FGIDs,将其归因于胃肠道发育不成熟^[10, 21-22]。而本研究针对足月儿的分析进一步发现,即使在足月分娩的婴儿中,胎龄越小,FGIDs患病风险也越高。较小胎龄婴儿早期感染及抗生素使用风险更高,易导致免疫失调、肠道微生态及运动功能异常^[23-25];反之,胎龄较大者胃肠道结构和功能(如食管下括约肌、胃排空及菌群建立)更成熟^[26-27],从而降低了胃肠不适症状发生的风险。该结果提示,足月儿中较小胎龄婴儿也应被视为FGIDs潜在高危人群,需加强喂养指导与胃肠健康管理,如合理控制喂养间隔、谨慎添加辅食及科学使用益生菌。未来研究应进一步关注足月儿胎龄差异对胃肠健康的长期影响,从而为制定更精准的干预策略提供科学依据。

本研究进一步证实了母乳喂养与益生菌使用对降低婴儿FGIDs风险具有积极作用。母乳喂养的保护作用与其所含免疫因子、益生元^[28-30]及促进胃排空^[31]、减少过度喂养等机制相关^[32]。值得注意的是,母乳喂养率呈下降趋势,尤其在经济发达地区^[33-35],因此需加强社会支持与指导以促进母乳喂养,延长纯母乳喂养时间或可成为防控FGIDs的有效策略。益生菌可能通过调节肠道菌群、增强屏障功能及免疫调节等途径改善胃肠功能^[36],但不同菌株效果差异较大,目前仍缺乏高质量临床证据和统一应用规范^[37]。未来需进一步明确其适用人群、剂量及长期安全性,以指导临床合理使用。

本研究存在一定局限性。首先,样本主要来自就诊

婴儿,可能存在选择偏倚,未能完全反映普通人群的患病情况。其次,横断面研究无法确认因果关系,未来需通过前瞻性队列研究验证关联性。

本研究通过横断面调查,分析了0~9月龄因胃肠不适就诊婴儿的FGIDs患病率及相关因素。结果显示,足月儿中胎龄较大婴儿FGIDs患病率显著降低,地区分布、喂养方式及益生菌使用等因素也与FGIDs显著相关,提示需关注多元影响因素的评估与早期干预。本研究为足月婴儿FGIDs的防控提供了初步依据,未来需开展前瞻性研究深入探索包括胎龄在内的多种因素与胃肠功能发育之间的作用机制,以支持精准干预策略的制定。

* * *

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Author Contribution WANG Zhiling is responsible for conceptualization, formal analysis, funding acquisition, project administration, and writing--original draft. JIA Xintong is responsible for conceptualization, data curation, formal analysis, and writing--original draft. HU Chijun, WU Jieling, HU Dandan, ZHONG Yan, CHEN Jinjin, HU Yan, LI Xiaoqin, LI Nan, LI Yan, NI Jia, XIE Xiaoli, ZHANG Lan, WANG Xiaoyan, ZHANG Jie, GUO Jingmin, HU Zehua, YU Wen, and YANG Fan are responsible for investigation and resources. YANG Chunsong is responsible for data curation, formal analysis, and methodology. WANG Haiying is responsible for methodology and project administration. MAO Meng is responsible for funding acquisition, project administration, supervision, and writing--review and editing. All authors consented to the submission of the article to the Journal. All authors approved the final version to be published and agreed to take responsibility for all aspects of the work.

利益冲突 所有作者均声明不存在利益冲突

Declaration of Conflicting Interests All authors declare no competing interests.

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(2025-07-14收稿, 2025-10-22修回)

编辑 汤洁



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Editorial Office of *Journal of Sichuan University (Medical Sciences)*