

中国高校大学生 HPV 疫苗接种意愿现状及其影响因素的 Meta 分析

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摘要:目的 系统评价中国高校大学生 HPV 疫苗接种意愿及其影响因素。方法 计算机检索 PubMed、Web of Science、Embase、The Cochrane Library、PsycINFO、CINAHL、SinoMed、中国知网、维普和万方数据库建库至 2025 年 3 月 12 日的相关研究, 采用 Stata 17.0 和 RevMan 5.4 对大学生 HPV 疫苗接种意愿及其影响因素进行 Meta 分析。结果 纳入 35 项研究, 涉及 62 958 例样本量。Meta 分析数据表明, 中国高校大学生 HPV 疫苗接种意愿为 67.0%。女性 ($OR = 3.47$, 95% $CI: 2.49 \sim 4.85$)、有性行为史 ($OR = 1.91$, 95% $CI: 1.09 \sim 3.35$)、接受婚前性行为 ($OR = 1.36$, 95% $CI: 1.04 \sim 1.78$)、有家族肿瘤史 ($OR = 1.69$, 95% $CI: 1.28 \sim 2.23$)、月消费水平 $\geq 2 000$ 元 ($OR = 1.50$, 95% $CI: 1.22 \sim 1.84$)、知晓 HPV 疫苗 ($OR = 1.75$, 95% $CI: 1.11 \sim 2.77$)、知晓 HPV 疫苗已上市 ($OR = 1.71$, 95% $CI: 1.44 \sim 2.03$)、知晓 HPV 感染与宫颈癌有关 ($OR = 1.44$, 95% $CI: 1.15 \sim 1.81$)、身边有人接种过 HPV 疫苗 ($OR = 2.23$, 95% $CI: 1.66 \sim 3.01$)、对 HPV 及其疫苗的认知评分高 ($OR = 1.86$, 95% $CI: 1.32 \sim 2.62$) 均是中国高校大学生 HPV 疫苗接种意愿的促进因素。结论 中国高校大学生 HPV 疫苗接种意愿率较高, 相关防疫部门及卫生机构应加强高校大学生 HPV 疫苗相关知识的专业普及, 并设法完善 HPV 疫苗接种服务系统和宫颈癌防治服务体系。

关键词: HPV 疫苗; 接种意愿; 影响因素; 大学生; 中国; Meta 分析

中图分类号: R186; R711.74 文献标志码: A 文章编号: 1003-8507(2025)18-3424-08

DOI: 10.20043/j.cnki.MPM.202504095

The current status and influencing factors of HPV vaccination willingness among college students in China: a systematic review and meta-analysis

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Abstract: Objective To systematically evaluate the willingness to receive HPV vaccination and influencing factors among college students in China. **Methods** Relevant studies were retrieved from PubMed, Embase, Web of Science, The Cochrane Library, CINAHL, PsycINFO, China Biomedical Literature Database, CNKI, Wanfang Database, and VIP Database from the establishment of the databases to March 12, 2025. Meta-analysis was conducted using Stata 17.0 and RevMan 5.4 to assess the willingness to receive HPV vaccination and influencing factors among college students. **Results** A total of 35 studies involving 62 958 samples were included. The meta-analysis results showed that the willingness rate of college students in China to receive HPV vaccination was 67.0%. Female ($OR = 3.47$, 95% $CI: 2.49 - 4.85$), having a history of sexual behavior ($OR = 1.91$, 95% $CI: 1.09 - 3.35$), accepting premarital sex ($OR = 1.36$, 95% $CI: 1.04 - 1.78$), having a family history of tumors ($OR = 1.69$, 95% $CI: 1.28 - 2.23$), monthly consumption level $\geq 2 000$ yuan ($OR = 1.50$, 95% $CI: 1.22 - 1.84$), knowing about HPV vaccine ($OR = 1.75$, 95% $CI: 1.11 - 2.77$), knowing that HPV vaccine is on the market ($OR = 1.71$, 95% $CI: 1.44 - 2.03$), knowing that HPV infection is related to cervical cancer ($OR = 1.44$, 95% $CI: 1.15 - 1.81$), having someone around who has received HPV vaccine ($OR = 2.23$, 95% $CI: 1.66 - 3.01$), and having a high score in the cognition of HPV and its vaccine ($OR = 1.86$, 95% $CI: 1.32 - 2.62$) were identified as promoting factors. **Conclusion** The willingness rate of Chinese college students to receive the HPV vaccine is relatively high, relevant epidemic prevention departments and health institutions should strengthen the professional popularization of HPV vaccine-related knowledge among

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college students, and try to improve the HPV vaccine vaccination service system and cervical cancer prevention and control service system.

Keywords: Human papillomavirus vaccine; Vaccination willingness; College student; China; Influencing factors; Meta-analysis

宫颈癌严重威胁我国女性群体的全生命周期健康,且发病年龄呈年轻化态势,防治形势严峻^[1]。目前普遍认为人乳头瘤病毒(Human papillomavirus, HPV)是宫颈癌的主要致病因素,尤其是高危型 HPV 持续感染将引起宫颈上皮内病变并最终癌变^[2]。现有临床证据表明,接种 HPV 疫苗能有效预防 HPV 感染及相关疾病的发生发展,已成为我国宫颈癌防控工作的重要环节^[3-4]。高校大学生作为 HPV 疫苗接种的重要目标人群,提高其疫苗接种率是保障自身安全、形成校内免疫屏障、推动疾病防治体系建立的重要举措^[5]。本研究采用 Meta 分析方法对 HPV 疫苗接种意愿现状及其影响因素进行系统综述,为形成具有中国特色的高校宫颈癌防治体系提供数据支撑。本研究已在 PROSPERO 平台注册,注册号为 CRD420251013662。

1 资料与方法

1.1 文献检索策略 计算机检索 PubMed、Web of Science、Embase、The Cochrane Library、PsycINFO、CINAHL、SinoMed、中国知网、维普和万方数据库关于 HPV 疫苗接种意愿及其影响因素的研究,检索时限为建库至 2025 年 3 月 12 日。以主题词与自由词相互补充的方式构建检索表达式,检索词包括:中文为 HPV 疫苗、人乳头瘤病毒疫苗、宫颈癌疫苗、接种、接受、认知、大学生、中国等;英文为 HPV、Human Papillomavirus Viruses、Human Papillomavirus、Vaccination、Immunization、Willingness、Acceptability、Students、Undergraduate、China、Chinese 等。

1.2 文献纳入与排除标准 纳入标准:(1)国内外公开发表的与中国高校大学生 HPV 疫苗接种意愿相关的研究;(2)研究对象:高校中国大学生人群,包括在校专科生、本科生和研究生;(3)研究类型:横断面研究;(4)结局指标:HPV 疫苗接种意愿率及其影响因素,其中影响因素有关数据提供完整的多因素 logistic 回归的 OR 值和 95% CI。

排除标准:(1)文献类型为会议论文、学位论文及二次研究文献等;(2)无法获取全文或数据提取不完整;(3)非中英文文献;(4)同一团队重复发表;(5)质量评分较低的文献。

1.3 文献筛选与资料提取 由 2 名研究者将所有文献导入 Endnote X9 中进行独立筛选和资料提取,通过去重、初筛、复筛并交叉核对等步骤,最终确定纳入文

献。如遇分歧,则由第 3 方介入决定。提取关键信息:文献作者及发表年份、研究地区、抽样方法、样本量、接种意愿率及影响因素等。

1.4 文献质量评价 美国医疗保健质量与研究机构(Agency for Healthcare Research and Quality, AHRQ)研发的质量评价工具^[6]是评估横断面研究偏倚风险的常用工具。由 2 名研究者独立评价纳入文献质量,如遇分歧,则由第 3 方介入决定。评分结果为 0-3 分是低质量文献,4-7 分是中质量文献,8-11 分是高质量文献。

1.5 统计学方法 采用 Stata 17.0 对单组率进行 Meta 分析,采用 RevMan 5.4 对纳入的影响因素进行 Meta 分析,以 OR 值及其 95% CI 作为效应量评价指标。运用 Q 检验和 I^2 对研究间异质性进行量化判断,当 $P > 0.1$ 且 $I^2 \leq 50\%$ 时,选用固定效应模型;反之,则选用随机效应模型。针对存在显著异质性的研究,通过亚组分析探究潜在异质性来源,并通过文献逐一剔除及效应模型转换两种方式进行敏感性分析。同时,对纳入研究 ≥ 10 篇的影响因素,采用 Egger 检验判断发表偏倚。

2 结果

2.1 文献检索 经过初步检索,共获取中文文献 982 篇、英文文献 1 746 篇,共计 2 728 篇文献。经筛选后,最终纳入 35 篇文献^[7-41],且均属于横断面研究。具体文献筛选流程见图 1。

2.2 文献基本特征及偏倚评价 35 篇文献均为中高质量文献,研究对象涉及 62 958 名中国大学生,提取出 15 个 HPV 疫苗接种意愿的影响因素。纳入文献的基本特征及质量评价结果见表 1。

2.3 大学生 HPV 疫苗接种意愿的 Meta 分析结果 34 项研究报道了高校大学生 HPV 疫苗的接种意愿率,纳入研究间存在显著异质性($I^2 = 99.8\%$, $P < 0.001$),随机效应模型分析显示,中国大学生 HPV 疫苗接种意愿的合并率为 67.0% (95% CI:0.61~0.74, $Z = 20.59$, $P < 0.001$),见图 2。

以研究地区、抽样方法及研究时间分别对接种意愿率纳入的研究进行亚组分析,未见异质性明显降低。亚组分析结果显示,南方地区及 2020 年后的中国高校大学生接种意愿率更高,具体结果见表 2。

2.4 大学生对 HPV 疫苗接种意愿影响因素的 Meta 分析结果 27 项研究报道了高校大学生 HPV 疫苗接

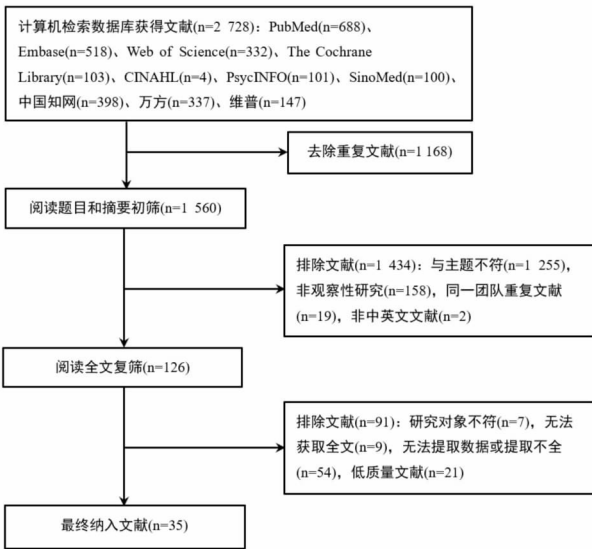


图 1 文献筛选流程图

Fig. 1 Literature screening flow chart

种意愿的 15 个影响因素,对其进行 Meta 分析。结果显示,女性、有性行为史、接受婚前性行为、有家族肿瘤史、月消费水平 ≥ 2000 元、知晓 HPV 疫苗、知晓

HPV 疫苗已上市、知晓 HPV 感染与宫颈癌有关、身边有人接种过 HPV 疫苗、对 HPV 及其疫苗的认知评分高是中国大学生 HPV 疫苗接种意愿的影响因素。结果见表 3。

2.5 敏感性分析 通过效应模型转换策略,对各影响因素进行敏感性分析,结果显示,转换前后各影响因素的 OR 值及其 95% CI 无显著方向性改变,提示结果的一致性和稳定性较好。逐一剔除各项研究进行敏感性分析,Dai 等^[41]的研究是接受婚前性行为的异质性来源 (OR = 1.58, 95% CI: 1.25 ~ 1.99, P < 0.001);王丹等^[21]和 Dai 等^[41]的研究是有家族肿瘤史的异质性来源 (OR = 1.79, 95% CI: 1.46 ~ 2.20, P < 0.001)。

2.6 发表偏倚检验 本研究对接种意愿率进行 Egger 检验 (P < 0.001),提示存在发表偏倚的可能 (P < 0.05)。女性、知晓 HPV 疫苗、对 HPV 及其疫苗的认知评分高这 3 个影响因素的漏斗图未见明显不对称,且经 Egger 检验提示发生偏倚风险的可能性较小,见表 3。

表 1 纳入文献的基本特征及质量评价结果

Table 1 The basic characteristics and quality scores of the included studies

纳入研究	研究地区	抽样方法	样本量 (例)	接种意愿率 (%)	影响因素	AHQ 评分
郑浩等 2021 ^[7]	浙江 5 市	A	1 092	81.60	②⑤⑭⑮	7
赵晨宇等 2020 ^[8]	内蒙古呼和浩特	B	1 665	33.50	③⑧	6
张肖肖等 2021 ^[9]	浙江、河南、四川、黑龙江	A	3 007	56.60	③⑩	6
杨雪帆等 2021 ^[10]	重庆市	D	427	46.40	②⑦⑧	6
张希等 2021 ^[11]	山西太原、四川成都	F	975	34.56	④⑥⑩	7
张其其等 2021 ^[12]	新疆乌鲁木齐	E	590	78.14	①⑧⑨⑩	6
张洁等 2018 ^[13]	广东广州	C	1 244	49.40	①②⑥⑩⑪⑮	7
杨敏敏等 2022 ^[14]	甘肃兰州	D	772	22.40	-	6
徐宇歌等 2022 ^[15]	广西桂林	F	443	70.20	①④	6
徐婷珊等 2024 ^[16]	福建	D	1 755	95.44	①⑭	8
徐霖等 2021 ^[17]	广东	D	765	88.10	①⑫	6
王文娟等 2020 ^[18]	湖北咸宁	C	159	89.90	①⑨⑩⑮	6
肖玲等 2022 ^[19]	湖北襄阳	B	6 459	92.79	-	6
王龙飞等 2024 ^[20]	山东德州	D	1 327	47.70	①④⑥⑦⑨⑩	7
王丹等 2024 ^[21]	安徽黄山	D	536	67.50	①④⑥⑮	8
石晶等 2024 ^[22]	北京市	G	1 760	45.51	⑪⑮	8
陈慧等 2021 ^[23]	四川成都	F	881	65.70	③④⑤⑮	7
任俊红等 2022 ^[24]	江苏南京	C	1 009	85.30	⑨⑩⑫	6
李静等 2022 ^[25]	四川泸州	B	995	78.60	①⑪⑮	6
赖江宜等 2019 ^[26]	浙江杭州	B	220	73.20	-	6
贾鑫华等 2019 ^[27]	江西赣州	D	2 091	56.90	⑧⑮	7
胡峰等 2023 ^[28]	黑龙江齐齐哈尔	D	312	79.49	⑮	6
冯澜等 2021 ^[29]	广西南宁	D	337	66.17	-	6
范伟超等 2022 ^[30]	广东深圳	D	838	66.80	②④⑤⑥⑨⑩⑭	8
段凡等 2020 ^[31]	山东	E	2 285	83.30	①⑮	6
潘丹等 2020 ^[32]	浙江台州	C	11 236	75.41	⑩⑫⑬	5
You 等 2020 ^[33]	全国	D	4 220	58.60	-	7

(续表)

纳入研究	研究地区	抽样方法	样本量(例)	接种意愿率(%)	影响因素	AHRQ评分
Xu 等 2021 ^[34]	山东青岛	D	343	75.50	①⑤	8
Song 等 2025 ^[35]	全国少数民族地区	D	1 388	50.40	①⑦	8
Deng 等 2021 ^[36]	全国	D	1 022	33.76	-	6
Chen 等 2024 ^[37]	上海、武汉、广州、南宁	G	1 438	89.71	-	6
Hu 等 2024 ^[38]	贵州	D	2 360	96.00	①②⑧⑨⑩	7
Li 等 2024 ^[39]	河南郑州	E	650	63.20	-	6
Liu 等 2018 ^[40]	香港	D	1 022	92.10	④⑫⑬	6
Dai 等 2022 ^[41]	全国 7 省	D	7 335	-	③④⑤⑥⑦⑨⑩⑫⑬⑮	8

注:①女性;②医学专业;③父母文化程度高;④有性行为史;⑤接受婚前性行为;⑥有家族肿瘤史;⑦月消费水平≥2 000 元;⑧居住地为城镇;⑨知晓 HPV;⑩知晓 HPV 疫苗;⑪知晓 HPV 疫苗已上市;⑫知晓 HPV 感染与宫颈癌有关;⑬知晓接种预防性 HPV 疫苗能预防宫颈癌;⑭身边有人接种过 HPV 疫苗;⑮对 HPV 及其疫苗的认知评分高。A: 多阶段抽样;B: 分层抽样;C: 整群抽样;D: 便利抽样;E: 分层+整群抽样;F: 便利+分层+整群抽样;G: 多阶段+分层+整群抽样。

表 2 高校大学生 HPV 疫苗接种意愿现状的亚组分析

Table 2 Analysis results of HPV vaccination willingness among college students in subgroups

指标/亚组	纳入研究(篇)	异质性检验结果		效应模型	合并效应量			
		P 值	I ² 值(%)		率	95% CI	Z 值	P 值
接种意愿率	34	<0.001	99.8	随机	0.67	0.61 ~ 0.74	20.59	<0.001
研究地区								
北方	9	<0.001	99.7	随机	0.59	0.43 ~ 0.75	7.20	<0.001
南方	20	<0.001	99.6	随机	0.76	0.71 ~ 0.82	27.88	<0.001
全国	5	<0.001	99.0	随机	0.47	0.37 ~ 0.56	9.56	<0.001
抽样方法								
便利抽样	16	<0.001	99.8	随机	0.65	0.54 ~ 0.76	11.35	<0.001
分层抽样	4	<0.001	99.9	随机	0.70	0.39 ~ 1.00	4.49	<0.001
整群抽样	4	<0.001	99.3	随机	0.75	0.62 ~ 0.88	11.22	<0.001
多阶段抽样	2	<0.001	99.6	随机	0.69	0.45 ~ 0.94	5.53	<0.001
分层+整群抽样	3	<0.001	98.0	随机	0.75	0.64 ~ 0.86	13.04	<0.001
便利+分层+整群抽样	3	<0.001	99.3	随机	0.57	0.34 ~ 0.80	4.86	<0.001
多阶段+分层+整群抽样	2	<0.001	99.9	随机	0.68	0.24 ~ 1.11	3.06	0.002
研究时间								
2020 年及以前	24	<0.001	99.6	随机	0.65	0.58 ~ 0.72	18.68	<0.001
2020 年后	10	<0.001	99.8	随机	0.72	0.63 ~ 0.82	14.42	<0.001

表 3 高校大学生 HPV 疫苗接种意愿影响因素的 Meta 分析

Table 3 Meta-analysis of factors influencing the HPV vaccination willingness of college students

影响因素	纳入研究(篇)	异质性检验结果		效应模型	合并效应量				Egger P
		P 值	I ² 值(%)		OR 值	95% CI	Z 值	P 值	
女性	13	<0.001	89	随机	3.47	2.49 ~ 4.85	7.32	<0.001	0.394
医学专业	5	0.005	73	随机	1.26	0.88 ~ 1.80	1.26	0.210	
父母文化程度高	4	0.020	71	随机	1.29	0.94 ~ 1.76	1.58	0.110	
有性行为史	8	<0.001	87	随机	1.91	1.09 ~ 3.35	2.27	0.020	
接受婚前性行为	5	0.060	56	随机	1.36	1.04 ~ 1.78	2.27	0.020	
有家族肿瘤史	6	0.030	60	随机	1.69	1.28 ~ 2.23	3.67	<0.001	
月消费水平≥2000 元	4	0.660	0	固定	1.50	1.22 ~ 1.84	3.89	<0.001	
居住地为城镇	5	<0.001	88	随机	0.98	0.64 ~ 1.52	0.07	0.940	
知晓 HPV	7	<0.001	89	随机	0.90	0.58 ~ 1.41	0.44	0.660	
知晓 HPV 疫苗	11	<0.001	95	随机	1.75	1.11 ~ 2.77	2.40	0.020	
知晓 HPV 疫苗已上市	3	0.580	0	固定	1.71	1.44 ~ 2.03	6.05	<0.001	
知晓 HPV 感染与宫颈癌有关	5	<0.001	83	随机	1.44	1.15 ~ 1.81	3.14	0.002	
知晓接种预防性 HPV 疫苗能预防宫颈癌	3	<0.001	98	随机	1.93	0.74 ~ 5.01	1.34	0.180	
身边有人接种过 HPV 疫苗	3	0.310	15	固定	2.23	1.66 ~ 3.01	5.28	<0.001	
对 HPV 及其疫苗的认知评分高	11	<0.001	96	随机	1.86	1.32 ~ 2.62	3.54	<0.001	

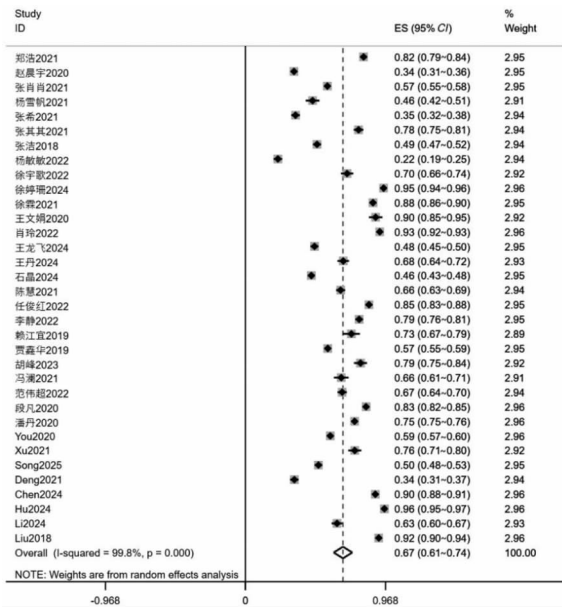


图 2 中国高校大学生 HPV 疫苗接种意愿率 Meta 分析森林图

Fig. 2 Meta - analysis forest plot of HPV vaccination willingness rate among college students in China

3 讨论

Meta 分析结果显示,中国高校大学生对 HPV 疫苗呈现高接种意愿率的形势,虽然 2020 年后女大学生接种 HPV 疫苗的意愿强烈,整体上呈现良好态势,但与发达国家相比仍存在较大差距^[42]。为响应 WHO《加速消除宫颈癌全球战略》的全面号召,我国以《加速消除宫颈癌行动计划(2023 - 2030 年)》为方针,加强以高校大学生人群为首的公众对 HPV 及其疫苗的正确认识,为实现我国 2030 年消除宫颈癌的目标构筑免疫防线^[43]。

研究表明,虽然大学生整体接种意愿较高,但不同地区对 HPV 疫苗的接种意愿及认知水平存在差异。高校应充分发挥网络新媒体在大学生群体了解 HPV 疫苗相关健康知识的主导作用,进一步提升大学生正确疫苗认知^[7,14]。另外,当前中国部分城市试点开展适龄女性 HPV 疫苗免费接种,但针对我国大学生群体而言,HPV 疫苗仍是自费接种疫苗即费用负担较重^[16,44]。且国外 HPV 疫苗占领市场主体地位,造成 HPV 疫苗中国市场供不应求、普通大学生难以预约的状态^[30],这都是难以将接种 HPV 疫苗的意愿付诸实践的原因。

本研究结果显示,由于宫颈癌是女性特有的妇科恶性肿瘤,因此女性更愿意接种 HPV 疫苗以维护自身健康^[25]。作为 HPV 性传播感染的高危人群,大学生人群性观念较为开放,接受婚前性行为者越来越

多,高校需加强大学生性健康知识教育,提高其预防性传播疾病意识及 HPV 疫苗接种意愿^[23,41]。另外,目前我国 HPV 疫苗仍为自费接种且价格昂贵,只有月消费水平较高的大学生能够负担疫苗费用,建议加快研发国产疫苗制剂,考虑将 HPV 疫苗纳入国家计划免疫规划或医保报销,给予大学生疫苗接种补贴,实现提高疫苗可及性和覆盖率的目的^[16,21]。对 HPV 和 HPV 疫苗相关知识认知程度高的大学生更愿意主动接种 HPV 疫苗,一方面该部分大学生知晓 HPV 疫苗经过严格质量控制和安全检验已上市,另一方面其充分了解 HPV 相关疾病的严重危害,相信接种 HPV 疫苗预防宫颈癌的良好功效^[22]。本研究表明,有家族肿瘤史或身边有人接种过 HPV 疫苗的高校大学生往往更加关注宫颈癌防治知识且疫苗接种意愿较强,与徐婷珊等^[16]和 Alshamlan 等^[45]的研究结果一致。

本研究的局限性:(1)研究间样本量差异大,部分研究样本代表性不足;(2)率及影响因素纳入研究间异质性较高,亚组分析未能找出异质性来源;(3)大部分研究均在单一城市开展且多采用自制调查问卷,增加发表偏倚的可能。

利益冲突声明 本研究不存在任何利益冲突

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收稿日期: 2025-04-06

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收稿日期: 2025-06-06