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血脂代谢指标及血清维生素 A、E 水平与子痫前期的相关性分析 *

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摘要 目的:探讨血脂代谢指标及血清维生素 A、E 水平与子痫前期的相关性。**方法:**选取 2016 年 12 月至 2017 年 12 月期间来我院产检及住院分娩的 722 例妊娠妇女,选取 94 例子痫前期的妊娠妇女作为 A 组,其中轻度子痫前期 32 例作为 A1 组,重度子痫前期 62 例作为 A2 组,并从剩余的 628 例正常妊娠者中选取 126 例自愿参与本研究的妊娠妇女作为 B 组。收集并记录妊娠妇女的临床指标,包括入院时的孕周、孕次、产次、流产次数、血脂代谢指标、血清维生素 A、E 水平,分析血脂代谢指标、血清维生素 A、E 水平与子痫前期的相关性。**结果:**三组孕妇总胆固醇(TC)、甘油三酯(TG)、低密度脂蛋白(LDL)、高密度脂蛋白(HDL)、载脂蛋白 A(ApoA)、载脂蛋白 B(ApoB)、维生素 A、维生素 E 水平整体比较差异均具有统计学意义(均 $P < 0.05$);A1 组、A2 组的 TC、TG、LDL、HDL、ApoA、ApoB、维生素 A、维生素 E 水平与 B 组比较,差异均有统计学意义(均 $P < 0.05$),A2 组 TG、LDL 高于 A1 组,而维生素 A、维生素 E 水平低于 A1 组,差异均有统计学意义(均 $P < 0.05$),Spearman 秩相关分析结果显示,TC、TG、LDL、ApoB 水平与子痫前期呈正相关($r=0.214, 0.432, 0.517, 0.226, P=0.012, 0.008, 0.005, 0.012$),HDL、ApoA、维生素 A、维生素 E 水平与子痫前期呈负相关($r=-0.282, -0.357, -0.539, -1.217, P=0.010, 0.009, 0.003, 0.000$)。**结论:**血脂代谢指标、维生素 A、维生素 E 水平在子痫前期孕妇中表达异常,且这些指标与子痫前期密切相关,应重视妊娠期孕妇的血脂代谢指标、维生素 A、维生素 E 水平的监测,并控制其水平,从而有效防治子痫前期。

关键词:子痫前期;血脂代谢指标;维生素 A;维生素 E;相关性

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Correlation Analysis of Serum Lipids and Serum Vitamin A, E Levels with Preeclampsia during Pregnancy*

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ABSTRACT Objective: To investigate the correlation of serum lipids metabolism and serum vitamin A, E levels with preeclampsia during pregnancy. **Methods:** 722 pregnant women who came to our hospital for childbirth and hospitalization from December 2016 to December 2017 were selected. 94 pregnant women with preeclampsia were enrolled as group A, among them, 32 cases of mild preeclampsia was group A1, 62 cases of severe preeclampsia was group A2, 126 pregnant women who volunteered for the study were selected as the group B from the remaining 628 normal pregnant women. The clinical indexes of pregnant women, including gestational weeks, pregnancy times, production times, abortion times, blood lipid metabolism index, serum vitamin A and E levels on admission were collected and recorded, the correlation of lipid metabolism indicators, serum vitamins A and E between levels and preeclampsia were analyzed. **Results:** The differences of total cholesterol (TC), triglyceride (TG), low density lipoprotein (LDL), high density lipoprotein (HDL), apolipoprotein A (ApoA), apolipoprotein B (ApoB), vitamin A and vitamin E among the three groups were statistically significant (all $P < 0.05$); The levels of TC, TG, LDL, HDL, ApoA, ApoB, vitamin A and vitamin E in group A1 and group A2 were significantly different from those in group B (all $P < 0.05$). TG and LDL levels in group A2 were higher than those in group A1, but the levels of vitamin A and vitamin E were lower than group A1 (all $P < 0.05$). Spearman rank correlation analysis showed that TC, TG, LDL and ApoB levels were positively correlated with preeclampsia ($r=0.214, 0.432, 0.517, 0.226, P=0.012, 0.008, 0.005, 0.012$). HDL, ApoA, vitamin A, and vitamin E levels were negatively correlated with preeclampsia ($r=-0.282, -0.357, -0.539, -1.217, P=0.010, 0.009, 0.003, 0.000$). **Conclusion:** The levels of indexes of blood lipid metabolism, vitamin A and vitamin E of preeclampsia pregnant women are abnormal, and these indicators are closely related to preeclampsia, the indicators of blood lipid metabolism, vitamin A and vitamin E in pregnant women should be emphasized, and the levels of these indicators should be effectively controlled, so as to effectively prevent the occurrence of preeclampsia.

Key words: Preeclampsia; Lipid metabolism; Vitamin A; Vitamin E; Correlation

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前言

子痫前期是妊娠期的特发疾病,是基础血压正常的孕妇在妊娠 20 周后出现高血压、蛋白尿等症状,全身小血管痉挛以及局部缺血等是其基本的生理变化,我国子痫前期发病率高达 9.4%^[12]。子痫前期的发病程度有轻重之分,重度子痫前期孕妇大部分会出现蛋白尿和水肿,是孕产妇围产期死亡的主要原因。重度子痫前期会对母婴健康造成严重威胁,严重情况下会导致母婴死亡^[3,4]。子痫前期的发病原因尚未明确,但其发病的关键环节为内皮细胞激活及功能障碍,已有研究表明,脂代谢异常能够诱发内皮损伤,且子痫前期孕妇比正常孕妇具有显著的高血脂症^[5,6]。子痫前期孕妇的血脂异常主要有总胆固醇(total cholesterol, TC)、甘油三酯(triglyceride, TG)、低密度脂蛋白(low density lipoprotein, LDL)等指标水平降低及 HDL 升高等,同时,血清维生素水平也会出现异常^[7,8]。本研究通过选取 94 例子痫前期孕妇及 126 例正常孕妇作为研究对象,旨在探讨血脂代谢指标及血清维生素 A、E 水平与孕期子痫前期的相关性,

进而为防治子痫前期提供理论依据。

1 资料与方法

1.1 一般资料

选取 2016 年 12 月至 2017 年 12 月间来我院产检及住院分娩的 722 例妊娠妇女,选取 94 例子痫前期的妊娠妇女作为 A 组,并从剩余的 628 例正常妊娠者中选取 126 例自愿参与本研究的妊娠妇女作为 B 组,本研究通过我院伦理委员会的批准。A 组孕妇纳入标准:(1)均符合《妇产科学》第 8 版中关于子痫前期的诊断标准^[9];(2)单胎妊娠;(3)年龄不超过 40 岁;(4)孕妇产检较规律;(5)孕妇均同意本次研究,并签署知情同意书。排除标准:(1)自身免疫性疾病;(2)伴全身感染性疾病;(3)伴心、肝、肾等脏器疾病;(4)依从性较差的孕妇。按照病情严重程度,将 A 组孕妇分为轻度子痫前期组(A1 组)32 例和重度子痫前期组(A2 组)62 例。三组孕妇的年龄、孕周、孕次、产次及流产次数等一般资料的差异均无统计学意义(均 $P>0.05$),具备可比性。见表 1。

表 1 三组孕产妇一般资料的比较($\bar{x} \pm s$)

Table 1 Comparison of general maternal data in the three groups($\bar{x} \pm s$)

Groups	n	Age (years)	Pregnancy week (weeks)	Pregnancy number (times)	Parity (times)	Abortions number (times)
Group A1	32	26.57 $\pm$ 3.24	32.80 $\pm$ 2.96	2.41 $\pm$ 1.40	1.65 $\pm$ 0.93	0.76 $\pm$ 0.22
Group A2	62	26.67 $\pm$ 3.35	32.98 $\pm$ 2.84	2.45 $\pm$ 1.45	1.70 $\pm$ 0.83	0.78 $\pm$ 0.25
Group B	126	26.62 $\pm$ 3.12	33.16 $\pm$ 3.03	2.50 $\pm$ 1.48	1.68 $\pm$ 0.85	0.79 $\pm$ 0.24
F		-0.167	-0.814	-0.524	-0.268	-0.578
P		0.821	0.436	0.602	0.751	0.584

1.2 方法

所有研究对象均在禁食 8 h 后的清晨采取空腹静脉血 3 mL,立即测定 TC、TG、LDL、HDL、载脂蛋白 A(Apolipoprotein A, ApoA)、载脂蛋白 B(Apolipoprotein B, ApoB)等血脂代谢指标的水平;另外收集 3 mL 空腹静脉血,静置 0.5 h 后,以 3000 r/min 的速度离心 15 min,取上清液并置于 -80℃ 冰箱中,测定血清维生素 A 及维生素 E 的水平。

血脂代谢指标水平的测定采用美国 Beckman Coulter(贝克曼库尔特)AU860 生化分析仪;维生素 A 和维生素 E 水平的测定采用酶联免疫吸附法,试剂盒购自上海生工生物工程技术有限公司。

1.3 统计学方法

数据处理应用统计学软件 SPSS22.0 完成。孕妇一般资料

指标、血脂代谢指标以及维生素水平均为计量资料,且符合正态分布,数据用($\bar{x} \pm s$)来表示,两样本的比较采用独立样本 t 检验,三样本的比较采用单因素方差分析;血脂代谢指标、维生素水平同子痫前期的相关性采用 Spearman 秩相关进行分析。 $P<0.05$ 认为差异存在统计学意义。

2 结果

2.1 各组孕妇血脂代谢指标水平的比较

三组孕妇 TC、TG、LDL、HDL、ApoA、ApoB 水平整体比较差异均具有统计学意义(均 $P<0.05$);A1 组、A2 组的 TC、TG、LDL、HDL、ApoA、ApoB 水平与 B 组比较,差异均具有统计学意义(均 $P<0.05$),A2 组 TG、LDL 水平均高于 A1 组,差异均具有统计学意义(均 $P<0.05$)。见表 2。

表 2 各组孕妇血脂代谢指标水平的比较($\bar{x} \pm s$)

Table 2 Comparison of blood lipid metabolism index in each group($\bar{x} \pm s$)

Groups	n	TC (mmol/L)	TG (mmol/L)	LDL (mmol/L)	HDL (mmol/L)	ApoA (g/L)	ApoB (g/L)
Group B	126	5.15 $\pm$ 1.08	1.88 $\pm$ 0.77	2.21 $\pm$ 1.14	1.79 $\pm$ 0.36	1.91 $\pm$ 0.14	1.02 $\pm$ 0.10
Group A1	32	5.67 $\pm$ 1.78*	2.68 $\pm$ 1.13*	3.18 $\pm$ 1.09*	1.53 $\pm$ 0.62*	1.56 $\pm$ 0.16*	1.21 $\pm$ 0.11*
Group A2	62	5.82 $\pm$ 1.85*	3.43 $\pm$ 1.48**	3.87 $\pm$ 1.16**	1.59 $\pm$ 0.74*	1.59 $\pm$ 0.19*	1.23 $\pm$ 0.12*
F		6.551	6.761	6.539	4.565	3.889	3.570
P		0.000	0.000	0.000	0.004	0.011	0.014

Note: Compared with group B, * $P<0.05$; compared with group A1, ** $P<0.05$.

2.2 各组孕妇血清维生素 A、E 水平的比较

三组孕妇血清维生素 A、E 水平整体比较差异均具有统计意义(均 $P<0.05$);A1 组、A2 组的维生素 A、E 水平均低于 B

组,差异均具有统计学意义(均 $P<0.05$),A2 组维生素 A、E 水平均低于 A1 组,差异均具有统计学意义(均 $P<0.05$)。见表 3。

表 3 各组孕妇血清维生素 A、E 水平的比较(mg/L, $\bar{x} \pm s$)
Table 3 Comparison of serum vitamin A, E levels in each group[mg/L, ($\bar{x} \pm s$)]

Groups	n	Vitamin A	Vitamin E
Group B	126	0.40 $\pm$ 0.10	18.13 $\pm$ 4.48
Group A1	32	0.32 $\pm$ 0.12*	16.68 $\pm$ 4.13*
Group A2	62	0.25 $\pm$ 0.08*#	13.02 $\pm$ 3.76*#
F		4.431	7.366
P		0.004	0.000

Note: Compared with group B, * $P<0.05$; compared with group A1, # $P<0.05$.

2.3 血脂代谢指标及血清维生素 A、E 与子痫前期相关性的分析

经 Spearman 秩相关分析得到,TC、TG、LDL、ApoB 水平与子痫前期呈正相关($r=0.214, 0.432, 0.517, 0.226, P=0.012, 0.008, 0.005, 0.012$),HDL、ApoA、维生素 A、维生素 E 水平与子痫前期呈负相关($r=-0.282, -0.357, -0.539, -1.217, P=0.010, 0.009, 0.003, 0.000$)。

3 讨论

子痫前期是妊娠期妇女的特有疾病,对母婴健康均存在严重威胁,尽管关于子痫前期的研究较多,但是其具体的病因仍未明确,多认为其发生与遗传、环境、氧化应激等多种因素有关,而内皮细胞激活以及功能障碍是该病的关键所在,内皮细胞激活及损伤的原因之一即为血脂代谢异常^[10-12]。血脂代谢指标主要有 TC、TG、LDL、HDL, 这些指标不仅能为胎儿提供能量代谢的来源,还可以合成类固醇类激素等^[13-15]。TC 是生物膜的重要组成成分,是合成生理活性物质的前体^[16];TG 是机体储存能量的一种重要形式;LDL 是一种富含胆固醇较多的脂蛋白,可致动脉发生粥样硬化^[17];HDL 作为一种富含丰富蛋白质的脂蛋白,具有清除血脂、保护血管的功能^[18];ApoA 主要存在于高密度脂蛋白中,具有血管保护作用^[19];ApoB 主要存在于低密度脂蛋白中,若水平过高会引起胆固醇在血管中沉积,引发血管硬化^[20]。

妊娠期孕妇会发生脂肪组织堆积,而脂肪组织堆积可满足胎儿的营养需求,但是当脂肪组织堆积过度,或者脂代谢出现异常均会呈现出病理现象^[22,23]。研究发现,由于 TC、TG 均为血管损伤物质,子痫前期孕妇中其水平显著升高,而使血管内皮细胞通透性增加,促使血小板发生黏附和聚集,最终引发内皮血管的损伤,还会引发血管痉挛等病理变化^[24,25];而 HDL、ApoA 作为血管保护性因子,在子痫前期孕妇中水平显著下降,使血管壁的胆固醇转运发生功能性障碍,进而引发血管粥样硬化^[26]。本研究结果显示,子痫前期孕妇的 TC、TG、LDL、ApoB 等指标水平均高于正常妊娠妇女,且随着子痫前期的加重,上述指标水平增高($P<0.05$),且相关性分析显示,上述指标与子痫前期均呈正相关($P<0.05$);而 HDL、ApoA 水平随着子痫前期的加重而降低,与子痫前期均呈负相关($P<0.05$),这与上述研究结论一致。

维生素 A、E 均为脂溶性抗氧化剂,其作为人体物质代谢的必须成分,可改善机体的氧化应激状态,但是其水平过高或过低均会对人体不利。维生素 A、E 通过诸多途径均可减轻血管内皮损伤及功能障碍,而当其处于缺乏状态时,会直接促进子痫前期的发生及发展^[27,28]。有研究认为,子痫前期孕妇体内维生素 A、E 低于正常妊娠妇女^[29]。国外相关研究发现^[30],孕 16~22 周补充维生素 E 可有效预防子痫前期的发生,因为维生素 E 缺乏会直接导致子痫前期患者发生氧化应激细胞凋亡,因此及时补充维生素 E 对预防子痫前期是有益的。本研究结果显示,子痫前期孕妇的维生素 A、E 水平均低于正常妊娠妇女,且随着子痫前期的加重,上述指标水平降低($P<0.05$),且相关性分析显示,维生素 A、E 水平与子痫前期均负相关($P<0.05$)。本研究结果综合提示,血脂代谢指标、维生素 A、E 均会促进子痫前期的发生与发展。

综上所述,TC、TG、LDL、HDL、ApoA、ApoB、维生素 A、维生素 E 均会在不同程度上影响子痫前期的发生,针对各个指标的变化规律,及时检测其水平变化,将其控制在正常范围内,从而有效防治子痫前期。

参考文献(References)

- [1] McNally R, Alqudah A, Obradovic D, et al. Elucidating the Pathogenesis of Pre-eclampsia Using In Vitro Models of Spiral Uterine Artery Remodelling[J]. Curr Hypertens Rep, 2017, 19(11): 93
- [2] 赵慧娜, 古航, 张瑜, 等. 血清血管生成素相关生长因子水平与子痫前期发病的关系[J]. 现代生物医学进展, 2015, 15(23): 4484-4486
Zhao Hui-na, Gu Hang, Zhang Yu, et al. Relationship between Serum Angiopoietin-related Growth Factor Level and Preeclampsia Incidence [J]. Modern Development in Biomedicine, 2015, 15 (23): 4484-4486
- [3] Yuan T, Wang W, Li XL, et al. Clinical characteristics of fetal and neonatal outcomes in twin pregnancy with preeclampsia in a retrospective case-control study: A STROBE-compliant article [J]. Medicine (Baltimore), 2016, 95(43): e5199
- [4] 张荣, 金伟华. 子痫前期孕妇血脂水平的变化及临床意义[J]. 中国现代医生, 2010, 48(31): 17-18
Zhang Rong, Jin Wei-hua. The changes of blood lipid levels in preeclampsia pregnant women and its clinical significance [J]. Chinese modern doctor, 2010, 48(31): 17-18

- [5] El Khouly N I, Sanad Z F, Saleh S A, et al. Value of first-trimester serum lipid profile in early prediction of preeclampsia and its severity: A prospective cohort study[J]. Hypertension Pregnancy, 2016, 35(1): 1
- [6] 谢幸, 苟文丽. 妇产科学. 第8版[M]. 人民卫生出版社, 2013: 68-70
Xie Xing, Gou Wen-li. Obstetrics and Gynecology. 8th Edition [M]. People's Medical Publishing House, 2013: 68-70
- [7] Wibowo N, Kurniawan R H, Irwinda R, et al. Maternal and cord blood cyclophilin A in severe preeclampsia and normal pregnancy and its correlation with vitamin D and zinc[J]. Hypertension Pregnancy, 2017 (2): 1
- [8] 都晋红, 刘永红, 刘文萃, 等. 联合检测妊娠早期血清维生素 A、E 水平对子痫前期的预测价值[J]. 中国妇幼保健, 2017, 32(24): 6098-6101
Du Jin-hong, Liu Yong-hong, Liu Wen-cui, et al. Combined detection of serum vitamin A and E levels in early pregnancy for predicting preeclampsia [J]. Maternal and Child Health of China, 2017, 32(24): 6098-6101
- [9] Keshavarz P, Bf N M G, Mirhafez S R, et al. Alterations in Lipid Profile, Zinc and Copper Levels and Superoxide Dismutase Activities in Normal Pregnancy and Preeclampsia[J]. Am J Med Sci, 2017, 353(6): 552
- [10] 郭君君, 史丹丹, 王勇, 等. 子痫孕妇血清 TC、TG、LDL-C 和 HDL-C 水平的变化及临床研究[J]. 中国医药导刊, 2017, 19(8): 776-779
Guo Jun-jun, Shi Dan-dan, Wang Yong, et al. Changes and Clinical Study of Serum TC, TG, LDL-C and HDL-C Levels in Pregnant Women with Eclampsia [J]. China Medical Journal, 2017, 19(8): 776-779
- [11] Shi DD, Wang Y, Guo JJ, et al. Vitamin D Enhances Efficacy of Oral Nifedipine in Treating Preeclampsia with Severe Features: A Double Blinded, Placebo-Controlled and Randomized Clinical Trial[J]. Front Pharmacol, 2017, 8(10): 865
- [12] Figuera-Losada M, Stathis M, Dorskind JM, et al. Cambinol, a novel inhibitor of neutral sphingomyelinase 2 shows neuroprotective properties[J]. Plos One, 2015, 10(5): e0124481
- [13] Wang Y, Shi D, Chen L. Lipid profile and cytokines in hypertension of pregnancy: A comparison of preeclampsia therapies [J]. J Clin Hypertens (Greenwich), 20(2): 394-399
- [14] Keshavarz P, Nobakht M Gh BF, Mirhafez SR, et al. Alterations in Lipid Profile, Zinc and Copper Levels and Superoxide Dismutase Activities in Normal Pregnancy and Preeclampsia [J]. Am J Med Sci, 2017, 353(6): 552
- [15] 吴晶晶, 颜建英. 子痫前期孕妇血清内脂素水平与血脂代谢及胰岛素抵抗的相关性[J]. 国际妇产科学杂志, 2013, 40(6): 510-513
Wu Jing-jing, Yan Jian-ying. Correlation of serum visfatin levels with lipid metabolism and insulin resistance in preeclampsia pregnant women [J]. International Journal of Obstetrics and Gynecology, 2013, 40(6): 510-513
- [16] Soobryan N, Murugesan S, Phoswa W, et al. The effects of sildenafil citrate on uterine angiogenic status and serum inflammatory markers in an L-NAME rat model of pre-eclampsia[J]. Eur J Pharmacol, 2016, 795(8): 101-107
- [17] 郭冰杰, 杨彩梅. 子痫前期孕妇的血脂、血糖与维生素 A、E 的水平及其临床意义[J]. 广西医学, 2017, 39(10): 1474-1476
- Guo Bing-jie, Yang Cai-mei. Serum lipids, blood glucose and vitamin A, E levels in preeclampsia pregnant women and their clinical significance[J]. Guangxi Medicine, 2017, 39(10): 1474-1476
- [18] Anand S, Young S, Esplin M S, et al. Detection and confirmation of serum lipid biomarkers for preeclampsia using direct infusion mass spectrometry[J]. J Lipid Res, 2016, 57(4): 687-696
- [19] Brown SH, Eather SR, Freeman DJ, et al. A Lipidomic Analysis of Placenta in Preeclampsia: Evidence for Lipid Storage [J]. Plos One, 2016, 11(9): e0163972
- [20] Zhou X, Han TL, Chen H, et al. Impaired mitochondrial fusion, autophagy, biogenesis and dysregulated lipid metabolism is associated with preeclampsia[J]. Exp Cell Res, 2017, 359(1): 195
- [21] Veerbeek JH, Hermes W, Breimer AY, et al. Cardiovascular disease risk factors after early-onset preeclampsia, late-onset preeclampsia, and pregnancy-induced hypertension [J]. Hypertension, 2015, 65(3): 600-606
- [22] Park HJ, Shim SS, Dong HC. Combined Screening for Early Detection of Pre-Eclampsia[J]. Int J Mol Sci, 2015, 16(8): 17952-17974
- [23] 颜建英, 张东妹. 子痫前期孕妇血清脂联素表达水平与血脂代谢及胰岛素抵抗的相关性[J]. 国际妇产科学杂志, 2012, 39(1): 88-91
Yan Jian-ying, Zhang Dong-mei. Relationship between serum adiponectin expression and lipid metabolism and insulin resistance in preeclampsia pregnant women [J]. International Journal of Obstetrics and Gynecology, 2012, 39(1): 88-91
- [24] Y Wright D, Poon L C, Rolnik D L, et al. Aspirin for Evidence-Based Preeclampsia Prevention trial: influence of compliance on beneficial effect of aspirin in prevention of preterm preeclampsia[J]. Am J Obstet Gynecol, 2017, 217(6): 685
- [25] Procopciuc LM, Caracostea G, Zaharie G, et al. Newborn APOE genotype influences maternal lipid profile and the severity of high-risk pregnancy- preeclampsia: Interaction with maternal genotypes as a modulating risk factor in preeclampsia [J]. Hypertension Pregnancy, 2015, 34(3): 271
- [26] 胡玉红, 吴阿莉, 侯世慧. 妊娠中晚期正常孕妇及子痫前期孕妇血清维生素 A 的水平及其意义[J]. 黑龙江医药科学, 2017, 40(1): 9-10
Hu Yu-hong, Wu A-li, Hou Shi-hui. Serum vitamin A level and its significance in normal pregnant women and preeclampsia during the third trimester of pregnancy [J]. Heilongjiang Medical Journal, 2017, 40(1): 9-10
- [27] Staff AC, Johnsen GM, Dechend R, et al. Preeclampsia and uteroplacental acute atherosclerosis: immune and inflammatory factors[J]. J Reprod Immunol, 2014, 101-102(1): 120-126
- [28] Torjusen H, Brantsæter AL, Haugen M, et al. Reduced risk of pre-eclampsia with organic vegetable consumption: results from the prospective Norwegian Mother and Child Cohort Study [J]. BMJ Open, 2014, 4(9): e006143
- [29] Doridot L, Châtre L, Ducat A, et al. Nitroso-redox balance and mitochondrial homeostasis are regulated by STOX1, a pre-eclampsia-associated gene[J]. Antioxid Redox Signal, 2014, 21(6): 819-834
- [30] Mistry HD, Kurlak LO, Mansour YT, et al. Increased maternal and fetal cholesterol efflux capacity and placental CYP27A1 expression in preeclampsia[J]. J Lipid Res, 2017, 58(6): 1186