

doi: 10.13241/j.cnki.pmb.2018.20.013

血清维生素 D 及微量元素检测对肺炎患儿的临床意义*

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摘要 目的:探讨肺炎患儿血清维生素 D 及微量元素监测的临床意义。**方法:**选取我院 2015 年 1 月-2016 年 1 月收治的 600 例肺炎患儿为观察组及同期来我院体检的健康儿童 400 例为对照组,检测两组受试儿童的维生素 D、铁、锌、钙、铜、镁水平。**结果:**观察组患儿锌、铁缺乏比例均明显高于健康儿童($P<0.05$),两组钙、铜、镁缺乏比例相比差异无统计学意义($P>0.05$)。观察组 1 岁以下(包括 1 岁,婴儿期)、1-3 岁(包括 3 岁,幼儿期)、3-6 岁(包括 6 岁,学龄前)患儿体内锌、铁含量明显低于同年龄段健康儿童($P<0.05$),各组钙、铜、镁含量相比差异无统计学意义($P>0.05$)。两组受试儿童体内 25-羟基维生素 D 含量及其缺乏情况相比差异均无统计学意义($P>0.05$)。**结论:**锌和铁缺乏可能与儿童肺炎的发生发展具有一定的关系,及时补充锌和铁有助于提高患儿免疫力,促进患儿恢复。

关键词:维生素 D;微量元素;肺炎;营养;抗感染

中图分类号:R725.6;R723.2 **文献标识码:**A **文章编号:**1673-6273(2018)20-3862-04

The Clinical Significance of Serum Vitamin D and Trace Element in Detecting Children with Pneumonia*

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ABSTRACT Objective: To investigate the clinical significances of serum vitamin D and trace element monitoring in children with pneumonia. **Methods:** 600 cases of children with pneumonia admitted from January 2015 to January 2016 were selected as the observation group and 400 cases of healthy children admitted in the hospital for physical examination at the same time were selected as the control group, the vitamin D, iron, zinc, calcium, copper, magnesium levels were compared between two groups of children. **Results:** The proportion of zinc and iron deficiency of observation group was significantly higher than that of the control group ($P<0.05$), and the lack of calcium, copper and magnesium showed no significant difference between two groups($P>0.05$). The zinc, iron in the body content of children under 1 years of age (including 1 years old, infancy), 1-3 years old (including 3 years old, early childhood) and 3-6 years old (including 6 years old, preschool children) in the observation group were significantly lower than those of the control group($P<0.05$), the content of calcium, copper, magnesium showed no statistically significant difference between two groups ($P>0.05$). There was no statistically significant difference in the levels of 25-hydroxyl vitamin D between the two groups of children ($P>0.05$). **Conclusion:** Zinc and iron deficiency may have a certain relationship with the development of children's pneumonia. Timely supplementation of zinc and iron can improve the immunity of children and promote recovery of children.

Key words: Vitamin D; Trace element; Pneumonia; Nutrition; Anti-infection

Chinese Library Classification(CLC): R725.6; R723.2 **Document code:** A

Article ID: 1673-6273(2018)20-3862-04

前言

肺炎是儿科常见病之一,其发病率、病死率居儿童疾病之首,临床表现为咳嗽频繁、呼吸困难、胸痛等症状,病情迁延或者反复发作均可导致儿童生长发育受限,严重者出现重要脏器合并症^[1,2],严重影响小儿的生长发育。抗感染仍然是肺炎的首选治疗方案,积极的预防措施和营养元素补充可以减少儿童的痛苦,减轻小儿家庭经济负担^[3-5]。

学龄前儿童免疫系统尚未发育成熟,需要体外营养物质提高机体免疫力。研究表明锌(Zn)、铁(Fe)、维生素 D 等营养素参与机体的生理代谢^[6,7],影响体内免疫系统功能的发挥,与机体抗感染能力密切相关。维生素 D 是一种神经内分泌免疫调节素,其生物效应主要表现为对 T 淋巴细胞、B 淋巴细胞、单核巨噬细胞以及胸腺增殖分化及功能的影响。铁(Fe)是儿童生长发育的必需微量元素且直接参与机体免疫反应,Fe 缺乏会造成淋巴细胞 DNA 合成障碍。锌(Zn)对维持中枢免疫器官(胸腺、

* 基金项目:陕西省社会发展科技攻关项目(2015SF057)

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(收稿日期:2018-01-27 接受日期:2018-02-13)

腔上囊)和外周免疫器官(淋巴结、脾脏、扁桃体)的结构和功能起着重要作用。钙(Ca)、铜(Cu)、镁(Mg)为人体必须的微量元素,对机体的代谢发育也起到重要作用^[8-10]。为了明确肺炎患儿与体内缺乏何种营养元素有关,我院自2015年1月-2016年1月选取了600例肺炎患儿进行研究,现将结果报道如下。

1 资料与方法

1.1 临床资料

选取我院2015年1月-2016年1月收治的肺炎患儿600例设为观察组,经临床症状、胸部X线片、肺炎支原体血清学确认,均符合肺炎的诊断标准^[1];诊断前2周内未曾服用可能影响实验结果的维生素D或微量元素药品。此项研究开始之前经我院伦理委员会批准同意及患儿家长知情同意。观察组男385例,女215例,年龄0-6岁,平均年龄(3.86±1.85)岁,病理分型:细菌性肺炎228例,病毒性肺炎162例,支原体肺炎210例。同期选取来我院进行健康体检的400例正常儿童作为对照组,包括男228例,女172例,年龄0-6岁,平均年龄(3.86±1.93)岁。两组一般资料相比差异均无统计学意义,有可比性($P>0.05$)。

1.2 检测方法

标本采集:取受试者空腹静脉血3 mL,1000 r/min离心15 min,分离血清,-20℃冻存。

维生素D测定:采用电化学发光法测定受试儿童体内维生素D水平,所用仪器为全自动电化学发光免疫分析仪(罗氏

公司,型号:Coabs e601E-E及其配套的25-羟基维生素D检测试剂盒。罗氏全自动电化学发光免疫分析仪采用竞争法原理,总检测时间:27 min。

微量元素测定:采用原子吸收光谱仪(北京博晖创新光电技术股份有限公司,型号:BH5300S)测定受试者体内血清锌、铁、钙、铜、镁含量水平,原子吸收光谱仪人体元素专用检测试剂均由北京博晖提供。

1.3 观察指标

①微量元素:对所有受试儿童进行微量元素检测,检测结果根据2006年中华医学会全国儿童学术会议制定的关于正常儿童微量元素正常值范围,判定儿童体内微量元素缺乏情况,并记录微量元素缺乏儿童;②对所有受试儿童进行25-羟基维生素D检测,检测结果根据25-羟基维生素D缺乏判定标准^[4]:缺乏<37.5 nmol/L,不足37.5-50 nmol/L,正常50-250 nmol/L,记录25-羟基维生素D缺乏儿童。

1.4 统计学分析

选择SPSS 20.00软件进行数据分析,计量数据采用表示,组间比较采用t检验,计数数据采用百分比、率表示,组间比较采用 χ^2 分析,以 $P<0.05$ 为差异具有统计学意义。

2 结果

2.1 两组微量元素缺乏情况的对比

观察组患儿锌、铁缺乏比例均明显高于健康儿童($P<0.05$),两组钙、铜、镁缺乏比例相比差异无统计学意义($P>0.05$),见表1。

表1 两组儿童营养缺乏情况的对比[例(%)]

Table 1 Comparison of the lack of nutrition between two groups[n(%)]

Groups	n	Zn(μ mol/L)	Fe(μ mol/L)	Ca(μ mol/L)	Cu(μ mol/L)	Mg(μ mol/L)
Observation group	600	258 (43.0) *	228 (38.0) *	138 (23.0)	36 (6.0)	47(7.8)
Control group	400	65 (16.2)	50 (12.5)	80 (20.0)	20 (5.0)	26(6.5)

Note: compared with the control group, * $P<0.05$.

2.2 两组微量元素含量对比

观察组1岁以下、1-3岁、3-6岁患儿体内锌、铁含量明显低

于同年龄段健康儿童($P<0.05$),两组受试儿童钙、铜、镁含量相比差异无统计学意义($P>0.05$),见表2。

表2 两组不同年龄段受试儿童微量元素含量的对比($\bar{x}\pm s$)

Table 2 Comparison of the trace elements between two groups of children with different ages($\bar{x}\pm s$)

Group	Year	n	Zn(μ mol/L)	Fe (mmol/L)	Ca(mmol/L)	Cu(μ mol/L)	Mg(μ mol/L)
Observation group	<1	200	33.18± 6.14*	5.23± 1.15*	1.88± 0.37	13.12± 3.14	1.39± 0.24
	1-3	200	42.26± 4.73*	6.52± 1.42*	1.89± 0.21	18.13± 4.21	1.51± 0.29
	3-6	200	46.74± 8.32*	6.93± 1.11*	2.09± 0.31	22.78± 5.58	1.61± 0.33
Control group	<1	133	48.58± 15.06	6.74± 1.24	1.86± 0.45	13.31± 4.65	1.42± 0.17
	1-3	133	67.32± 14.25	8.02± 1.63	1.95± 0.42	18.63± 5.46	1.57± 0.31
	3-6	134	85.42± 18.27	8.72± 3.35	2.13± 0.24	23.17± 6.39	1.63± 0.25

Note: compared with the control group, * $P<0.05$.

2.3 两组维生素D含量及缺乏情况对比

两组受试儿童体内25-羟基维生素D含量及缺乏情况相比差异均无统计学意义($P>0.05$),见表3。

3 讨论

小儿免疫系统发育受多种因素影响,营养因素起着十分重要的作用,并与小儿感染性疾病关系密切。人体微量元素及维

表 3 两组受试儿童体内维生素 D 含量及缺乏情况对比

Table 3 Comparison of the levels of vitamin D and deficiency of vitamin D between two groups

Group	n	25-OH-D (nmol/L)	25-OH-D level (n)		
			Normal	Deficiency	Lack
Observation group	600	66.36± 13.31	524	50	26
Control group	400	68.17± 15.24	356	34	10

生素 D 是维持人体正常免疫功能和健康的物质基础。一旦营养长期摄入不足,将造成营养缺乏,影响小儿免疫系统的发育^[11,12]。肺炎是小儿常见的呼吸道感染性疾病,除了与细菌感染有关,机体免疫系统低下也是一个重要的发病原因^[13-15]。

维生素 D 为具有生物活性脂溶性类固醇衍生物,是维持骨骼健康的重要元素^[16-18]。有相关研究表明维生素 D 不仅在体内调节钙浓度具有很重要的作用,还参与人体免疫系统的调节^[19,20]。维生素 D 缺乏可能会增加小儿呼吸道感染的发病几率。但本研究中,肺炎患儿维生素 D 水平与健康患儿相比无统计学差异。付姣等研究发现肺炎支原体抗体阴性儿童体内 25-羟基维生素 D 的水平为 (27.08± 13.76) ng/mL,肺炎支原体抗体阳性儿童体内 25-羟基维生素 D 的水平为 (26.64± 12.82) ng/mL,阳性组与阴性组 25-羟基维生素 D 对比无统计学差异,与本研究结果相一致。

本研究中,观察组 1 岁以下、1-3 岁、3-6 岁患儿体内锌、铁含量明显低于同年龄段健康儿童。虽然随着年龄增长,小儿体内锌、铁含量也随之增长,一旦感染肺炎,锌、铁含量依旧低于正常水平。因此,临床治疗肺炎时可通过补锌、补铁来缓解肺炎症状,使患儿早日康复。有关锌可以预防肺炎和治疗腹泻已有报道^[21-23],含有锌成分的制剂甚至能作用于感染的急性期,提高机体的免疫反应^[24,25]。锌为机体多种生物功能所必需,参与 DNA 的合成、细胞分化及细胞免疫等,缺锌可破坏机体微量营养素之间吸收转运和利用的动态平衡,间接影响抗体形成^[26,27]。铁作为血红蛋白的重要元素参与体内多种酶的合成,免疫应答过程需要酶的参与,铁缺乏会引起 T 细胞数量分泌减少而且能抑制 T 淋巴细胞的活化,减弱中性粒细胞的杀菌能力,因此小儿抗感染能力下降^[28-30]。

本研究结果显示与健康儿童相比,肺炎患儿体内铁含量相对较低。肺炎患儿体内锌、铁含量均低于健康儿童,但钙、铜、镁指标与健康儿童相比没有明显区别。因此,在积极预防和治疗肺炎患儿时,除了必要的抗感染类药物治疗外,饮食方面应以补充锌、铁为主,制定科学合理的饮食计划,促进肺炎患儿免疫力的恢复。我们在研究过程中发现部分健康儿童也出现了维生素 D 或微量元素缺乏的现象,家长应在平时注重让小儿摄入维生素 D 和各种微量元素,合理调整膳食种类,方能保持小儿机体免疫力处于正常发育水平,减少感染性疾病的发生。

综上所述,针对肺炎患儿出现的锌、铁含量较低的现象可给予针对性营养素补充,以提高肺炎患儿的免疫力。

参考文献(References)

- [1] Siegel M, Masur H, Kovacs J, et al. Pneumocystis jirovecii Pneumonia in Human Immunodeficiency Virus Infection [J]. Semin Respir Crit Care Med, 2016, 37 (2): 243-256
- [2] Zhou Y, Chen E, Wu X, et al. Rational lung tissue and animal models

- for rapid breath tests to determine pneumonia and pathogens[J]. Am J Transl Res, 2017, 9(11): 5116-5126
- [3] Kamata Y, Fujiwara Y, Mizuhara K, et al. Acute myeloid leukemia complicated by pneumonia and vertebral osteomyelitis during induction chemotherapy[J]. Rinsho Ketsueki, 2017, 58(11): 2256-2260
- [4] Boltey E, Yakusheva O, Costa DK, et al. 5 Nursing strategies to prevent ventilator-associated pneumonia [J]. Am Nurse Today, 2017, 12(6): 42-43
- [5] Wang SH, Tang SE, Li YH, et al. Pneumocystis jirovecii pneumonia induced by low-dose methotrexate in a patient with chronic urticaria [J]. An Bras Dermatol, 2017, 92(3): 401-403
- [6] Kara GT, Kara M, Bayram A, et al. Assessment of seasonal and spatial variations of physicochemical parameters and trace elements along a heavily polluted effluent-dominated stream[J]. Environ Monit Assess, 2017, 189(11): 585
- [7] Demenko V, Linetskiy I, Linetska L, et al. Prognosis of implant longevity in terms of annual bone loss: a methodological finite element study[J]. Comput Methods Biomech Biomed Engin, 2016, 19 (2): 180-187
- [8] Qamar Z, Haji Abdul Rahim ZB, Chew HP, et al. Influence of trace elements on dental enamel properties: A review[J]. J Pak Med Assoc, 2017, 67(1): 116-120
- [9] Çetin S, Yur F. Levels of Trace Elements in Muscle and Kidney Tissues of Sheep with Fluorosis [J]. Biol Trace Elem Res, 2016, 174 (1): 82-84
- [10] Stehle P, Stoffel-Wagner B, Kuhn KS. et al. Parenteral trace element provision: recent clinical research and practical conclusions [J]. Eur J Clin Nutr, 2016, 70(8): 886-893
- [11] Hurwitz JL, Penkert RR, Xu B, et al. Hotspots for Vitamin-Steroid-Thyroid Hormone Response Elements Within Switch Regions of Immunoglobulin Heavy Chain Loci Predict a Direct Influence of Vitamins and Hormones on B Cell Class Switch Recombination. Viral Immunol[J]. Viral Immunol, 2016, 29(2): 132-136
- [12] Levine AJ, Ting DT, Greenbaum BD, et al. P53 and the defenses against genome instability caused by transposons and repetitive elements[J]. Bioessays, 2016, 38(6): 508-513
- [13] Zhu L, Chen X, Kong X, et al. Investigation of the roles of trace elements during hepatitis C virus infection using protein-protein interactions and a shortest path algorithm [J]. Biochim Biophys Acta, 2016, 1860(11 Pt B): 2756-2768
- [14] Rebmann V, König L, Nardi Fda S, et al. The Potential of HLA-G-Bearing Extracellular Vesicles as a Future Element in HLA-G Immune Biology[J]. Front Immunol, 2016, 4(7): 173
- [15] Domschke C, Schneeweiss A, Stefanovic S, et al. Cellular Immune Responses and Immune Escape Mechanisms in Breast Cancer:

- Determinants of Immunotherapy[J]. Breast Care (Basel), 2016 ,11(2): 102-107
- [16] Pincikova T, Paquin-Proulx D, Sandberg JK, et al. Clinical impact of vitamin D treatment in cystic fibrosis: a pilot randomized, controlled trial[J]. Eur J Clin Nutr, 2017, 71(2): 203-205
- [17] Manson JE, Brannon PM, Rosen CJ, et al. Vitamin D Deficiency - Is There Really a Pandemic?[J]. N Engl J Med, 2016, 375 (19): 1817-1820
- [18] Kotlarczyk MP, Perera S, Ferchak MA, et al. Vitamin D deficiency is associated with functional decline and falls in frail elderly women despite supplementation[J]. Osteoporos Int, 2017, 28(4): 1347-1353
- [19] Ma K, Xu W, Wang C, et al. Vitamin D deficiency is associated with a poor prognosis in advanced non-small cell lung cancer patients treated with platinum-based first-line chemotherapy [J]. Cancer Biomark, 2017, 18(3): 297-303
- [20] Kim HT, Kim JM, Kim JH, et al. The Relationship between Vitamin D and Glaucoma: A Kangbuk Samsung Health Study [J]. Korean J Ophthalmol, 2016, 30(6): 426-433
- [21] Skalny AV, Simashkova NV, Klyushnik TP, et al. Hair toxic and essential trace elements in children with autism spectrum disorder[J]. Metab Brain Dis, 2017, 32(1): 195-202
- [22] Zhou W, Zuo X, Li J, et al. Effects of nutrition intervention on the nutritional status and outcomes of pediatric patients with pneumonia [J]. Minerva Pediatr, 2016, 68(1): 5-10
- [23] Wang Y, Gao Y, Liu Q1, et al. Effect of vitamin A and Zn supplementation on indices of vitamin A status, haemoglobin level and defecation of children with persistent diarrhea[J]. J Clin Biochem Nutr, 2016, 59(1): 58-64
- [24] Becquey E, Ouédraogo CT, Hess SY, et al. Hess SY Comparison of Preventive and Therapeutic Zinc Supplementation in Young Children in Burkina Faso: A Cluster-Randomized, Community-Based Trial[J]. J Nutr, 2016, 146(10): 2058-2066
- [25] Fedor M, Socha K, Urban B, et al. Serum Concentration of Zinc, Copper, Selenium, Manganese, and Cu/Zn Ratio in Children and Adolescents with Myopia[J]. Biol Trace Elem Res, 2017, 176(1): 1-9
- [26] Liu Y, Zhang ZX. Effect of single nucleotide polymorphisms on CDK4 and Zn supplementation in children with growth hormone deficiency[J]. Eur Rev Med Pharmacol Sci, 2016, 20(19): 4078-4081
- [27] Llorente Ballesteros MT, Navarro Serrano I, Izquierdo Ivarez S, et al. Reference levels of trace elements in hair samples from children and adolescents in Madrid, Spain[J]. J Trace Elem Med Biol, 2017, 43(1): 113-120
- [28] Zheng S, Wang B, Li Y, et al. Electrochemically active iron (III) -reducing bacteria in coastal riverine sediments[J]. J Basic Microbiol, 2017, 57(12): 1045-1054
- [29] Nguyen LT, Buse JD, Baskin L, et al. Influence of diurnal variation and fasting on serum iron concentrations in a community-based population[J]. Clin Biochem, 2017, 50(18): 1237-1242
- [30] Nehra P, Chauhan RP, Garg N, et al. Antibacterial and antifungal activity of chitosan coated iron oxide nanoparticles [J]. Br J Biomed Sci, 2017, 25(1): 1-6

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- [23] Tug A, Hanci A, Turk H S, et al. Comparison of two different intranasal doses of dexmedetomidine in children for magnetic resonance imaging sedation[J]. Paediatric Drugs, 2015, 17(6): 479-485
- [24] Chen Y, Huang J, Shen W, et al. Application of LMA Classic for anesthetized, paralyzed children weighing 20 kg: comparison between size 2 and size 2.5 [J]. American Journal of Emergency Medicine, 2016, 34(8): 1697-1698
- [25] Yao Y, Qian B, Lin Y, et al. Intranasal dexmedetomidine premedication reduces minimum alveolar concentration of sevoflurane for laryngeal mask airway insertion and emergence delirium in children: a prospective, randomized, double-blind, placebo-controlled trial[J]. Paediatric Anaesthesia, 2015, 25(5): 492-498
- [26] Baier N M, Mendez S S, Kimm D, et al. Intranasal dexmedetomidine: an effective sedative agent for electroencephalogram and auditory brain response testing[J]. Pediatric Anesthesia, 2016, 26(3): 280-285
- [27] Mukherjee A, Das A, Basunia S R, et al. Emergence agitation prevention in paediatric ambulatory surgery: A comparison between intranasal Dexmedetomidine and Clonidine [J]. Journal of Pharmacy Practice & Research, 2015, 4(1): 24-30
- [28] Yoo H, Iirola T, Vilo S, et al. Mechanism-based population pharmacokinetic and pharmacodynamic modeling of intravenous and intranasal dexmedetomidine in healthy subjects [J]. European Journal of Clinical Pharmacology, 2015, 71(10): 1197-1207
- [29] Kumar L, Kumar A, Panikaveetil R, et al. Efficacy of intranasal dexmedetomidine versus oral midazolam for paediatric premedication [J]. Indian Journal of Anaesthesia, 2017, 61(2): 125-130
- [30] Neville D N W, Hayes K R, Ivan Y, et al. Double-blind randomized controlled trial of intranasal dexmedetomidine versus intranasal midazolam as anxiolysis prior to pediatric laceration repair in the emergency department [J]. Academic Emergency Medicine Official Journal of the Society for Academic Emergency Medicine, 2016, 23 (8): 910-917