Significance of retinol binding protein and prealbumin in neonatal nutritional evaluation

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Abstract: Neonatal nutritional status means great significance for health, safety and thriving growth of neonates. Therefore, clinical evaluation of neonatal nutritional status is of great significance. In order to find effective judgment basis and curative effect evaluation index that reflect nutritional status of neonate. In this study randomly selected 2400 cases of premature infants from neonates born during June 2014 - June 2015 as study group, and selected 2000 normal neonates born in the same period as reference group. A comparative study was done on basic situation of the two indexes of retinol binding protein and prealbumin of the two groups of neonates. Results showed that retinol binding protein index of observation group infants was relatively low, when compared to reference group neonates, differences between the two groups $P<0.05$, with statistical significance. Medical personnel timely provided intravenous nutrition therapy for observation group infants and measure their index of retinol binding protein and prealbumin after 7 days of treatment, finding obvious improvement compared to the previous one. Neonatal nutritional status improved significantly, with difference between the two groups $P<0.05$, with statistical value. Hence, it is not difficult to conclude that timely index detection of retinol binding protein and prealbumin of neonates means important significance for neonatal nutrition evaluation, improvement in quality level of neonatal life, and thus is recommended to be promoted in clinical application.

Keywords: Retinol binding protein, prealbumin, neonatal nutrition, clinical detection.

INTRODUCTION

With continuous improvement in people's living standard, neonatal nutrition level also significantly improves. However, due to complicated reasons such as physical condition and mental emotion of pregnant women, premature birth is frequent. Clinical studies indicate that there is a widespread problem of malnutrition in premature infants, which causes extremely disadvantageous impact on their normal growth and development. Therefore, to timely conduct nutritional status detection of neonates is of great importance for development of reasonable nutritional supplement program and improvement of neonatal health level. Recent years see gradually confirmed clinical effect in judgment of neonatal nutritional status with biochemical indexes such as retinol binding protein (RBP), prealbumin (PA), whose actual effect has also been widely recognized (Ye, Jie, Long, Lin, 2015; Xu, Xie, Zhao, Xiao, 2015; Afzal *et al*., 2017). This study applies index detection of retinol binding protein and prealbumin in standard clinical process of premature infants, with a view to making a comprehensive analysis of important significance of the two biochemical indexes for research of clinical nutritional status of premature infants, timely and accurately providing judgment basis that directly reflect neonatal nutritional status for clinical medical staff and ensuring thriving growth of neonates.

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Neonatal malnutrition mainly refers to neonatal energy deficiency and inability to maintain normal metabolism, too large body consumption caused by inadequate ingestion or inability to fully absorb food, which leads to weight loss or no increase, growth stagnation, muscle atrophy (Zheng, *et al*., 2015; Chen *et al*., 2018). In clinical practice, neonatal malnutrition is also referred to as protein energy deficiency malnutrition. Research shows that neonatal malnutrition is mainly due to inadequate nutrient intake, imperfect body digestion, absorption and utilization function. To complete the digestive process, neonates normally need resort to glycogen in the body, then continue fat consumption (Long, *et al*., 2010; D'Souza, 2018). In this way, protein in the body and nitrogen content will lose balance, with plasma protein, blood sugar, cholesterol decreased. Therefore, basic metabolic capacity of malnourished neonates is only seventy percent of normal children and even lower. Neonatal malnutrition is a common phenomenon in the whole, but this problem is more likely to occur in premature infants. Neonatal malnutrition is divided into three degrees (Yung, *et al*., 2015; Ali *et al*., 2017). Wherein, basic performance of first degree malnutrition demonstrates as 15~25% of weight loss, thinning fat layer and not solid muscles; second degree malnutrition demonstrates as 25 ~ 40% of weight loss, weak cry, poor appetite; third degree malnutrition mainly demonstrates as over 40% of weight loss, weak vital signs with nausea, vomiting and other symptoms. As first degree and second degree malnutrition have not very obvious clinical

manifestation, without timely treatment, symptoms may undergo rapid progression, which poses serious threat for life health, growth and development of neonates. Therefore, it is necessary to determine nutritional status of neonates with appropriate detection methods.

Retinol binding protein (RBP) (fig. 1) belongs to transport protein in blood vitamin. The protein substance is mainly synthesized with the liver, belonging to synthetic material of retinol and transport protein specifically as shown in fig. 2, and widely distributed in human blood, cerebrospinal fluid, urine, and other body fluids (Wen, 2013; Alvi *et al*., 2017a). Over a long period of time, detection of retinol binding protein is applied in diagnosis of early renal tubular function impairment in clinics, as the protein substance can clearly reflect extent of the damage of patients' renal proximal convoluted tubules. In addition, it is used as indicator of liver function early damage and monitoring treatment in clinics. Moreover, relevant medical researchers found that half-life period of retinol binding protein is 12 hours, which leads to easy proneness to human protein nutritional status. The obvious changes may occur in early period malnutrition, resulting in index level much lower than that of normal people. In addition, molecular weight of prealbumin (PA) (fig. 3) in human body is about 54 thousand, which is generated by liver cells the same as RBP. During index detection, its status in electrophoretic separation is shown in front of albumin. PA has a short half-life of only 1.9 days. Therefore, in clinics, medical personnel analyze and evaluate conditions such as protein malnutrition, hypohepatia mainly through determination of PA concentration in human blood.

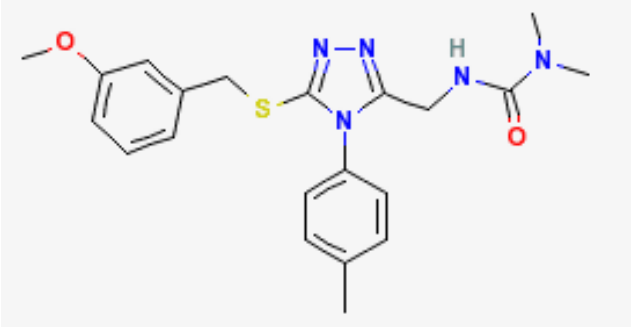

Fig. 1: Retinol binding protein structure (Xie, 2015).

MATERIALS AND METHODS

The 2400 premature infants and 2000 normal neonates born during June 2014 - June 2015 were randomly selected, respectively observation group and reference group. This paper has a rigorous structure, and the conclusion has been approved by relevant ethics and relevant departments. Wherein, observation group was comprised on 1390 males and 1010 females; the group of neonates are premature, with gestational age between 28-35 weeks; weight between 1.9~ 2.4kg; reference group consists were 1213 males and 787 females, with gestational age between 37-41 weeks, average weight between 2.5~4.0kg. It can be seen that in basic data of the two groups of neonates, there was exist obvious difference existed in gestational age and weight. Preliminary speculation concludes that low weight is caused by malnutrition due to premature birth, with result validation in detection (Yin, 2012; Alvi *et al*., 2017b).

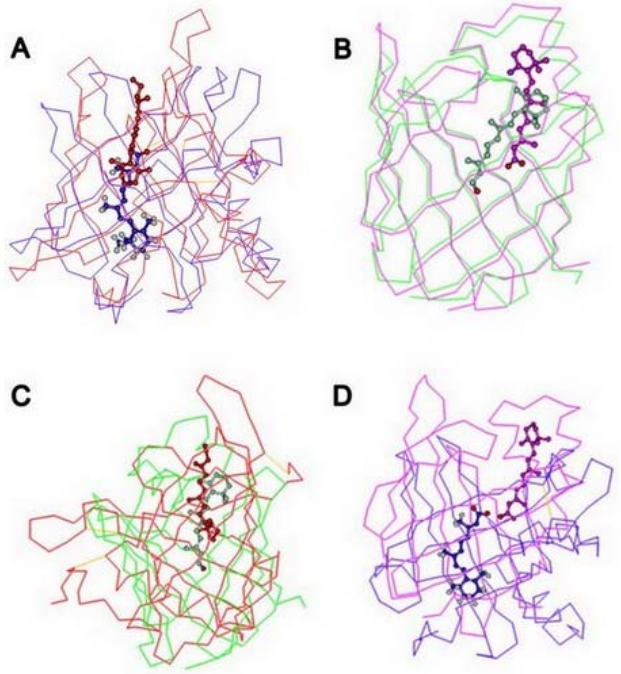

Fig. 2: Four states of retinol binding protein (Wen, 2013)

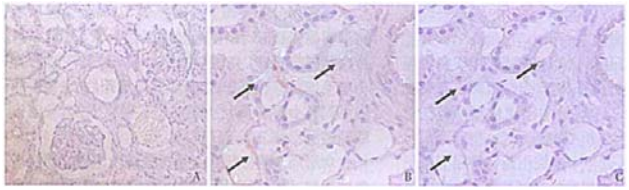

Fig. 3: Prealbumin map of hepatocyte (Yin, 2012)

Detection method

In the course of this study, specific detection of the two biochemical indexes of retinol binding protein and prealbumin were analyzed with automatic biochemical analyzer equipped in the hospital (Ge, 2007). The first was to carry out index specimen collection. The collection method was as follows: After neonates have nutritional status examination, immediately extracted 2 ml of vein blood, completed centrifugal separation, leave the serum to be tested. For the 2400 premature infants in observation group, provided a week of intravenous nutrition therapy. After completion of treatment, conducted index detection in the same method; after specimen collection ended, retinol binding protein and prealbumin indexes of neonates with immunoturbidimetry were detected (Lee, *et al*., 2015; Xie, Xu, Huang, 2015). Moreover, the albumin level of new newborns was measured. All process and

sequence of detection was carried out strictly in accordance with test standards of detecting instrument and reagents.

STATISTICAL ANALYSIS

In this clinical index research of retinol binding protein, prealbumin for neonatal nutritional status assessment, SPSS19.0 statistical software was adopted for input and calculation of all recorded data, with $\bar{x}\pm s$ to denote corresponding measurement index value, test with t value. When differences between the two groups $P<0.05$, significant difference value is indicated.

RESULTS

Comparison of RBP and prealbumin level between two groups

As shown in table 1, the average index of retinol binding protein and prealbumin of 2400 premature neonates in observation group is (12.3±4.5) mg/L, (69.6±15.7) mg/L respectively, while that of 200 normal neonates in reference group is (19.8±8.2) mg/L, (90.1±19.3) mg/L respectively. Thus, difference between the two groups $P<0.05$, with obvious statistical significance.

Improvement of RBP and prealbumin level after treatment for observation group

As shown in table 2, the 2400 premature infants in observation group were treated with intravenous nutrition support therapy for one week of 7 days. After completion, conduct index detection was conducted in the same way outlined in 2.2. The results showed that after intravenous nutrition, average index of neonatal retinol binding protein and prealbumin of observation group neonates is (20.7±6.4) mg/L, (85.9±19.2) mg/L. Hence, compared with situation before intravenous nutrition support therapy, index level has obvious hints, difference between the two groups $P<0.05$, with obvious statistical significance.

Comparison of albumin level of newborns in observation group before and after treatment

As shown in table 3, before implementing intravenous nutrition therapy the albumin level of newborns in observation group is (31.9±6.8)g/L; after intravenous nutrition therapy, the albumin level is (32.0±7.2)g/L. Therefore, there is no significant difference and no statistical significance, $P>0.05$.

DISCUSSION

Therefore, in recent years, successive medical researchers mutually combined the two indicators, make unified measurement, in order to assess neonatal nutritional status. In the course of this study, biochemical index detector was adopted to detect these two indexes of the selected 4400 neonates in total. Results showed that index level of the 2400 premature infants in observation group is significantly lower than that of the 2000 normal infants. Therefore, index detection results are very effective and reliable and thus can serve as effective sensitive index to judge neonatal nutrition level of neonates.

CONCLUSION

In this study, 2400 premature infants were randomly selected from newborns born from June 2014 to June 2015 as the study group and 2,000 normal infants in the same period were selected as the reference group. Comparative study was made on the basic status of the two indicators of the two groups: Retinol conjugated protein and prealbumin. The results showed that retinol conjugated protein index was lower in the observation group than the reference group, with difference between the groups<0.05, which was statistically significant. The medical staff immediately provided intravenous nutrition therapy to the observation group. Retinol conjugated protein and prealbumin levels were measured after 7 days of treatment, and a significant increase was found. The infants had significantly improved nutritional status, with difference between the groups $P<0.05$, which was statistically significant. Hence, it fully showed that timely detection of etinol conjugated protein and prealbumin index for newborns is of great significance in evaluating neonatal nutritional status and improving their quality of life. Its strengthened clinical application is thus recommended.

In a word, RBP and PA index detection play an important role in judgment of neonatal nutritional status, can timely find malnutrition problems of premature infants, help doctors in early nutrition support treatment, and provide a strong guarantee for normal growth and health of premature infants.

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