

Investigation on antibody level of umbilical cord blood measles in 2017 in Ankang city, Shaanxi province, China

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Umbilical cord blood, Measles immunoglobulinG antibody, Seroepidemiology

Abstract

Background Through the examination and analysis of the level of the antibody against the umbilical cord blood measles in maternal newborn in Ankang city, to explore prevention and control measures and strategies of measles.

Methods Using indirect enzyme-linked immunoadsorption test to test the level of Measles IgG antibody in 848 randomly collected neonatal umbilical cord blood samples, and Using descriptive epidemiological methods, Enter relevant data into Microsoft Excel to establish a database, Statistical analysis using SPSS.

Results The positive rate of measles IgG antibody was 84.43 % in 848 neonatal umbilical cord blood samples in Ankang City. There is no statistical difference in the positive rate of neonatal umbilical cord blood measles IgG antibody in different age groups ($P > 0.05$). However, the positive rate of neonatal umbilical cord blood measles IgG showed a decreasing trend with the increase of maternal age; Maternal and newborn umbilical cord blood measles IgG antibody positive rate and different forms of residence, different maternal births has nothing to do with, but it is related to the county and district where it is located and the vaccination service model. In the counties where the quality of vaccination services is good, and in the areas where the township vaccination service model is implemented, the positive rate of maternal newborn umbilical cord blood measles IgG antibodies is higher, and the difference is statistically significant ($P < 0.05$).

Conclusions Vaccination of measles ingredients before pregnancy in women of childbearing age can not only increase the level of measles antibodies in people of childbearing age, but also increase the level of measles antibodies in infants born in August before the birth of Mazhenyimiao, thus effectively reducing the incidence of measles in children over 15 years of age and within the age of 8 months. It is of great significance to strengthen the standardized administration of vaccination, adjust the vaccination service model, and vigorously promote the centralized vaccination service model in townships and towns to reduce the incidence of measles.

Background

Measles is one of the most common acute respiratory infections in children and it is very

contagious. Since 1965, the incidence of measles decreased significantly after the introduction of live measles vaccine in China. In 2005, the World Health Organization (WHO) Western Pacific Region (WPR) Committee passed a resolution to eliminate measles by 2012^[1]. As required by the Ministry of Health's National Action Plan for the Elimination of Measles 2006–2012^[2], since 2006, the city of Ankang has carried out a number of replanting and supplementary immunization campaigns with measles vaccine components. At the same time, it has done a good job in routine immunization, disease surveillance and epidemic treatment. The incidence of measles has dropped significantly. Epidemiological studies have shown that the incidence of measles in the city's large age group has shown an increasing trend^[3]. This phenomenon has also appeared in the process of eliminating measles in some developed countries^[4].

By studying the level of antibodies against umbilical cord blood measles in 848 newborns, this paper analyzes the positive rate of antibodies against measles in newborns, and discusses the relationship between factors such as maternal age, regions, vaccination service forms, and distribution between urban and rural areas and the incidence of measles. It will provide scientific basis for making prevention and control strategies of measles and effectively reducing the incidence of measles.

Methods

1 Research subjects From April to May 2017, 848 newborn umbilical cord blood specimens were randomly collected at the maternity hospitals in ten counties in Ankang City. The minimum age of maternity was 16 years old and the maximum was 45 years old.

2 Detection methods The basic information of 848 mothers was obtained through questionnaires; The umbilical cord blood of each newborn was collected 3–5 ML, and the serum was separated within 24 hours and preserved at -20 °C. The measles IgG antibody was quantitatively detected using an Elisa kit provided by the German Virun/Serun Medical Diagnostic Reagent (China) Co. Ltd.. Decision criteria: The measles IgG antibody ≥ 200 mIU/ml is positive, & < 200 IU/ml is negative.

3 Statistical analysis Create a database by entering relevant data into Microsoft spreadsheet (Microsoft Excel) and using descriptive epidemiology, Using SPSS (Statistical Product and

Service Solutions) for statistical analysis, $P < 0.05$ indicates a statistical difference.

Results

1 Results of positive rate analysis of neonatal umbilical cord blood measles IgG antibody in different age groups

A statistical analysis of 824 of the 848 women with clear age information was carried out, and 824 women aged 16-45 were divided into 5 age groups. The results showed that the positive rate of neonatal umbilical cord blood measles IgG antibody was 81.69% -86.40%, and the positive rate of neonatal umbilical cord blood measles IgG antibody was not statistically significant in all age groups ($\chi^2 = 2.03$, $P > 0.05$). However, the positive rate of neonatal umbilical cord blood measles IgG showed a decreasing trend with the increase of maternal age. ()

Table 1 Distribution of positive rate of female neonatal umbilical cord blood measles IgG in different age groups in Ankang City

age	Number of specimens	Measles IgG antibody			
		Number of positive	Positive rate%	Number of negative	Negative rate%
≤20year	44	38	86.36	6	13.64
21-25year	228	197	86.40	31	13.60
26-30year	327	277	84.71	50	15.29
31-35year	154	126	81.82	28	18.18
≥36year	71	58	81.69	13	18.31
total	824	696	84.47	128	15.53

2 Results of positive rate analysis of neonatal umbilical cord blood measles IgG antibody in different areas of Ankang City

The study investigated a total of 848 maternal patients and collected 848 newborn umbilical cord blood. Through the laboratory, 716 positive specimens of measles IgG were detected, and the positive rate was 84.43%. The positive rate of neonatal umbilical cord blood measles IgG was statistically different in different counties ($\chi^2 = 79.59$, $P < 0.05$), of which Ziyang County has the highest positive rate of samples and Pingli County has the lowest. (Table 2)

Table 2 Positive distribution of neonatal umbilical cord blood measles IgG antibody in different counties of Ankang

County	Number of specimens	Number of positive	Positive rate%
Hanbin	97	81	83.51
Hanyin	98	90	91.84
Shiquan	99	91	91.92
Ningshan	40	33	82.50
Ziyang	96	92	95.83
Langao	54	49	90.74
Pingling	99	56	56.57
Zhenping	68	54	79.41
Xunyang	97	83	85.57
Baihe	100	86	86.00
Ankang City	848	716	84.43

The positive rate of umbilical cord blood measles in urban, rural, and peri-urban areas was 85.71 %, 85.14 %, and 77.78 %, respectively, with no statistical significance($\chi^2 = 2.56$, $P > 0.05$).

3 Results of Positive Rate Analysis of IgG Antibody of Neonatal Cord Blood Measles in Different Vaccination Service Mode in Ankang City

Ankang City implements a preventive vaccination service model that focuses on concentrated inoculation in townships and supplemented by village-level inoculation. The results of the survey showed that the positive rate of maternal neonatal umbilical cord blood measles IgG antibody was higher than that of village vaccination areas($\chi^2 = 5.24$, $P < 0.05$). (Table 3)

Table 3 Distribution of positive rate of IgG antibody for umbilical cord blood measles among pregnant women with different vaccination service modes in Ankang City

Vaccination service model	Number of specimens	Measles IgG antibody			
		Number of positive	Positive rate%	Number of negative	Negative rate%
Village level vaccination	400	327	81.75	73	18.25
Township intensive vaccination	438	383	87.44	55	12.56
total	838	710	84.73	128	15.27

4 Results of positive rate analysis of female neonatal umbilical cord blood measles IgG antibody in different residence forms in Ankang City

According to the survey, 836 mothers with clear information on their residence time were grouped according to their local residence, their length of residence was less than 3 months and their length of residence was 3 months. The results showed that there was no significant difference in positive rate between the groups of maternal and newborn umbilical cord blood measles IgG antibody($\chi^2 = 1.91$, $P > 0.05$). (Table 4)

Table 4 Distribution of positive rate of neonatal umbilical cord blood measles IgG antibody in different living forms in Ankang City

Form of residence	Number of specimens	Measles IgG antibody			
		Number of positive	Positive rate%	Number of negative	Negative rate%
Local resident	765	649	84.84	116	15.16
Persons living outside the country for at least 3 months	61	53	86.89	8	13.11
Foreigners live less than 3 months	10	7	70.00	3	30.00
total	836	709	84.81	127	15.19

5 Results of positive rate analysis of umbilical cord blood measles IgG antibody in different maternal births in Ankang

The 843 mothers with clear birth information were grouped according to different birth times. The results showed that there was no significant difference in the positive rate of IgG antibody of umbilical cord blood in different births($\chi^2 = 1.20$, $P > 0.05$). (Table 5)

Table 5 Distribution of positive rate of Measles IgG antibody in neonatal umbilical cord blood in different births in Ankang City

Number of births	Number of specimens	Measles IgG antibody			
		Number of positive	Positive rate%	Number of negative	Negative rate%
1time	351	291	82.91	60	17.09
2times	450	383	85.11	67	14.89
≥ 3 times	42	37	88.10	5	11.90
total	843	696	82.56	128	17.44

Discussion

The study confirmed that the detection results of neonatal umbilical cord blood measles IgG antibody and maternal venous blood detection results are basically the same^[6], The level of Measles antibody can reflect the level of Measles antibody. According to relevant research reports, the positive rate of measles antibodies is more than 90% to effectively block measles transmission. The results of this study showed that the positive rate of IgG antibodies for neonatal umbilical cord blood in Ankang was 84.43%, indicating that at least 15% of pregnant women are still at risk of contracting measles virus. The positive rate of neonatal umbilical cord blood measles IgG antibody was not statistically significant in all age groups, but the positive rate of neonatal umbilical cord blood measles IgG

antibody showed a decreasing trend with the increase of maternal age, which is consistent with the domestic research results^[7]. Epidemiological studies have found that measles incidence in Ankang has appeared in recent years. The "bidirectional shift" in the incidence of August age and ≥ 15 years of age, which is the transfer of measles to older and unvaccinated populations, is closely related to the decline of adult measles antibodies^[8-10]. Vaccination of measles ingredients before pregnancy in women of childbearing age can not only increase the level of measles antibodies in people of childbearing age, but also increase the level of measles antibodies in infants born in August before the birth of Mazhenyimiao, thus effectively reducing the incidence of measles in children over 15 years of age and within the age of 8. Achieving the effect of "one generation immunity, two generations benefit" is of great significance for blocking "biphase shift"^[11].

The positive rate of female neonatal umbilical cord blood measles IgG had nothing to do with different residence forms and maternal birth times, but it was related to different county districts and vaccination service modes. The development of vaccination in each county and district of Ankang City is uneven, and the positive rate of measles IgG antibody in counties with high quality of vaccination services is also relatively high. The preservation conditions of cold chain of rural outpatient vaccination, the operational quality of inoculation personnel and the inoculation technology are all superior to those of village inoculation points, which may be the main reason why the positive rate of measles IgG antibody is higher than that of village inoculation in the area where the township concentrated inoculation service is implemented. Although there was no significant difference in reported vaccination rate between different vaccination service modes, the quality of vaccination outpatient service was significantly higher than that of village vaccination sites^[12].

Conclusions

Therefore, we will strengthen the standardized administration of vaccination, adjust the vaccination service model, and vigorously promote the centralized vaccination service model in townships. This will have a positive role in improving the effectiveness of vaccination and reducing the incidence of infectious diseases in immunization programs such as measles.

Abbreviations

ELISA- indirect enzyme-linked immunoadsorption testto; SPSS-Statistical Product and Service Solutions; IgG-Immunoglobulin G antibody; WHO-World Health Organization;WPR-Western Pacific Region.

Declarations

Ethics approval and consent to participate:This research meets the requirements of Declaration of Helsinki on moral ethics. This study was submitted to and approved by Ankang City Center for for Disease Control and Prevention ethics committee. All participants agreed to participate in the study and signed a written informed consent form. **Statement:** The ethical issues related to this research of"Investigation on antibody level of umbilical cord blood measles in 2017 in ankang city, Shaanxi province,China"have been examined and approved by Ankang City Center for for Disease Control and Prevention Ethics Committee.

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