Epidemic characteristics of main infectious diseases in Yantai city between 2010 and 2012 and prevention strategy research

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Abstract: To investigate the epidemic characteristics and prevention strategies of main infectious diseases. From 2010 to 2012, 23 notifiable diseases were reported in Yantai with average reported cases of 17,376. The morbidity was the highest in 2012 and the lowest in 2011. The accumulated death toll was 101 with the highest death rate in 2011 and the lowest in 2012. Major class A and B infectious diseases included viral hepatitis, phthisis, syphilis, clap and dysentery. The major class C infectious disease was hand-foot-and-mouth disease every year. The distribution of transmission routes of HIV/AIDS among patients with HIV and AIDS in Yantai were investigated. The overall condition of phthisis in Yantai showed stable with slight decrease. The occurrence rate of phthisis every season had fluctuation with higher rate in middle two seasons and lower rate at the beginning and end. The major type of viral hepatitis was still hepatitis B. Patients with hand-foot-and-mouth disease were children under 5 years old accounting for 90.56%, mainly reported in May, June, July and August. At present, the condition of plague prevention for infectious diseases in Yantai is not optimistic with both new and old infectious diseases.

Keywords: Yantai, infectious diseases, epidemic characteristics, prevention.

INTRODUCTION

Throughout the development history of human-beings, infectious diseases have severe influences on human health, economic development, and social stability. According to the statistics of World Health Organization, more than 17 million people are died from infectious diseases in 2003. Although common multiple infectious diseases have been basically controlled at present with dramatic decrease in prevalence rate, some significant infectious diseases still have great threat to residents' health and life security. Constraining the social stability and economic development, the condition of disease prevention is still urgent. This work analyzed the epidemic characteristics and prevention condition of major infectious diseases in Yantai between 2010 and 2012. Then, solutions were proposed for deficiency in disease prevention to improve the prevention level of infectious disease and avoid the prevalence and spread of infectious diseases in this city. The results are reported as follows.

MATERIALS AND METHODS

Report of epidemic situation in management system of disease monitoring information report and year-end report on notifiable diseases of Shandong Center for Disease Control and Prevention and Yantai Center for Disease Control and Prevention were selected between 2010 and 2012. Relevant statistic materials about infectious diseases were selected from public websites of Shandong Health Department, Shandong Statistical Bureau, Yantai Sanitary Bureau, etc.

Material indexes: Basic demographical indexes, including distribution, morbidity, death rate, and precedence order of morbidity of major infectious diseases. Analysis was conducted for epidemic data by epidemiological description, and statistical analysis was conducted for obtained data by Excel software.

Investigation methods

Description method

General descriptive method is mainly used to do full statistical analysis on collected data in detail. In aspect of infectious disease prevention in this region, the epidemic status of major infectious diseases in Yantai was analyzed according to the influences of population features, medical resource allocation, public sanitary condition, and other factors on infectious disease spread. Moreover, corresponding strategies were proposed for defects in disease prevention.

Literature investigation

Firstly, policy documents and statistics data related to infectious disease on public websites of Shandong Health Department, Shandong Statistical Bureau, and Yantai Sanitary Bureau were collected and understood. Secondly, relevant literatures about infectious diseases were referred to VIP, PubMed, Wanfang, CNKI, and network database and information systems of government. By widely consulting relevant domestic and foreign reports on

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Table 1: Overall morbidity of notifiable diseases in Yantai between 2010 and 2012

Year	Disease type	Patients	Death toll	Death rate	Fatality	Total reported morbidity
2010	23	16561	36	0.53/100 thousand	0.22%	242.37/100 thousand
2011	23	16129	38	0.55/100 thousand	0.24%	231.47/100 thousand
2012	21	19439	27	0.39/100 thousand	0.14%	278.67/100 thousand

Table 2: Morbidity of notifiable diseases in Yantai between 2010 and 2012

Year	Class A and B disease	Patients with Class A and B disease	Morbidity	Class C disease	Patients with Class C disease	Morbidity
2010	15	8406	123.02/100 thousand	8	8155	119.35/100 thousand
2011	16	8861	127.16/100 thousand	7	7268	104.3/100 thousand
2012	14	8876	127.24/100 thousand	7	10563	151.43/100 thousand

infectious prevention systems, the development status of infectious disease control and prevention and research conditions of authoritative authors were fully grasped.

RESULTS

General population characteristics in Yantai

Located in the north of Shandong Peninsula, Yantai has moist air, mild climate, developed economy, multiple scenic spots and historic sites, and large population mobility. As an area of developed tourism, people of tourist reception is continuously increasing, and by 2013, the population has been up to 50 million. With the constant development of city, the permanent resident population and external population are continuously increasing with potential risk of infectious disease prevalence.

Morbidity of notifiable diseases in Yantai

There are 23 notifiable diseases reported in Yantai between 2010 and 2012 with average reported patients of 17,376. The morbidity in 2012 is the highest (278.67/100 thousand), and the morbidity in 2011 is the lowest (231.47/100 thousand). From 2010 to 2012, the accumulated death toll is 101 with the highest death rate in 2011 (0.55/100 thousand) and the lowest death rate in 2012 (0.39/100 thousand) (table 1).

Morbidity of Class A and B infectious diseases in Yantai

From 2010 to 2012, there is no report on Class A infectious disease in the whole city (4 municipal districts, 5 functional areas, and 7 county-level cities). All the reported diseases are Class B infectious diseases with annual average types of 15. There are 7 types of Class C infectious diseases in report (table 2).

In 2010, among Class A and B infectious diseases (including HIV infection),the top five diseases with the highest morbidity are viral hepatitis with 3270 patients, phthisis with 2542 patients, dysentery with 1145 patients, syphilis with 864 patients, and gonorrhea with 281 patients. In 2011, among Class A and B infectious diseases, the top five diseases with the highest morbidity are viral hepatitis with 3307 patients, phthisis with 2386 patients, dysentery with 1592 patients, syphilis with 864 patients, and scarlatina with 308 patients. In 2012, among Class A and B infectious diseases, the top five diseases with the highest morbidity are viral hepatitis with 3543 patients, phthisis with 2374 patients, syphilis with 1197 patients, dysentery with 1036 patients, and gonorrhea with 262 patients. Fig. 1 shows the distribution of top five Class A and B infectious diseases between 2010 and 2012.

Morbidity of Class C infectious diseases in Yantai

In 2010, it is reported 8155 patients with 8 Class C infectious diseases with morbidity of 119.35/100 thousand, including the highest morbidity in hand-foot-and-mouth disease, accounting for 73.66% (6007/8155). In 2011, it is reported 7268 patients with 7 infectious diseases with morbidity of 104.3/100 thousand, including the highest morbidity in hand-foot-and-mouth disease, accounting for 56.99% (4070/7268). In 2012, it is reported 10563 patients with 7 Class C infectious diseases with morbidity of 151.43/100 thousand, including the highest morbidity in hand-foot-and-mouth disease, accounting for 62.28% (6579/10563). Fig. 2 shows the types of Class C infectious diseases and patient distribution between 2010 and 2012.

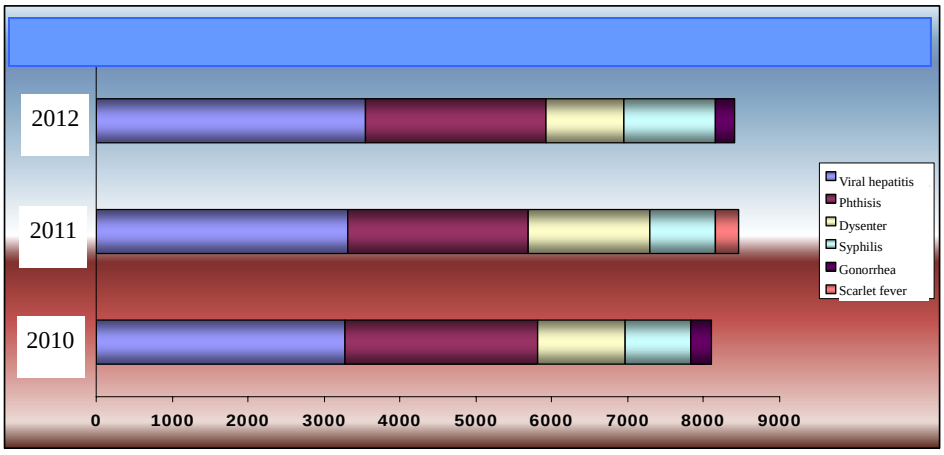

Fig. 1: Distribution of top five Class A and B infectious diseases between 2010 and 2012.

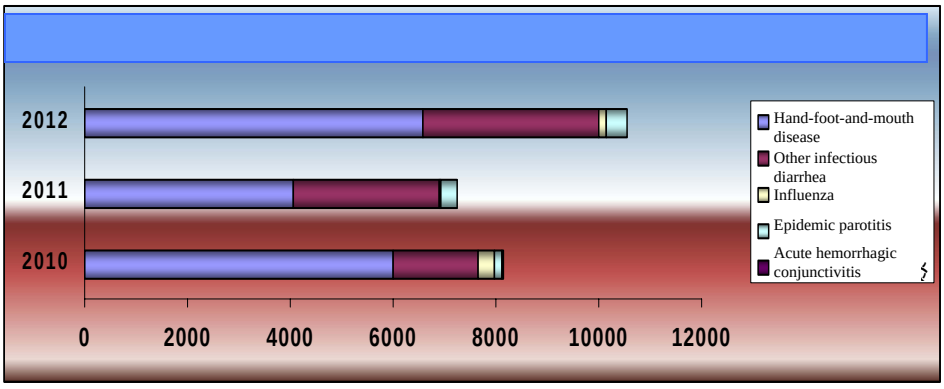

Fig. 2: Types of Class C infectious diseases and patient distribution between 2010 and 2012

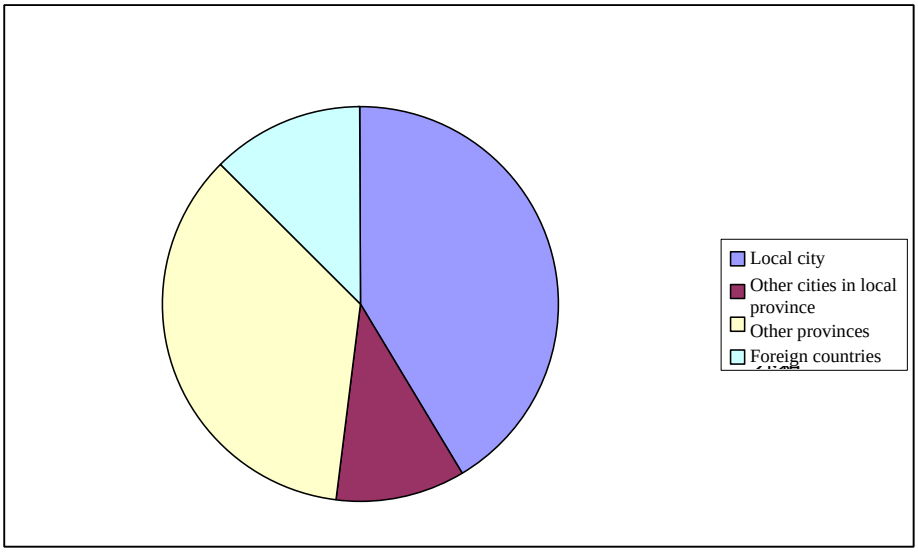

Fig. 3: Constitution of family registers of patients with HIV/AIDS in Yantai

Epidemiological characteristics of major infectious diseases

AIDS

Family register of HIV/AIDS in Yantai

Since the first HIV carrier was discovered in Yantai, there are 81.9% male patients and 18.1% female patients. It is reported that the family registers in local city, other cities of local province, other provinces, and foreign countries among HIV carriers and patients account for 41.48%, 10.51%, 35.42%, and 12.59% (fig. 3).

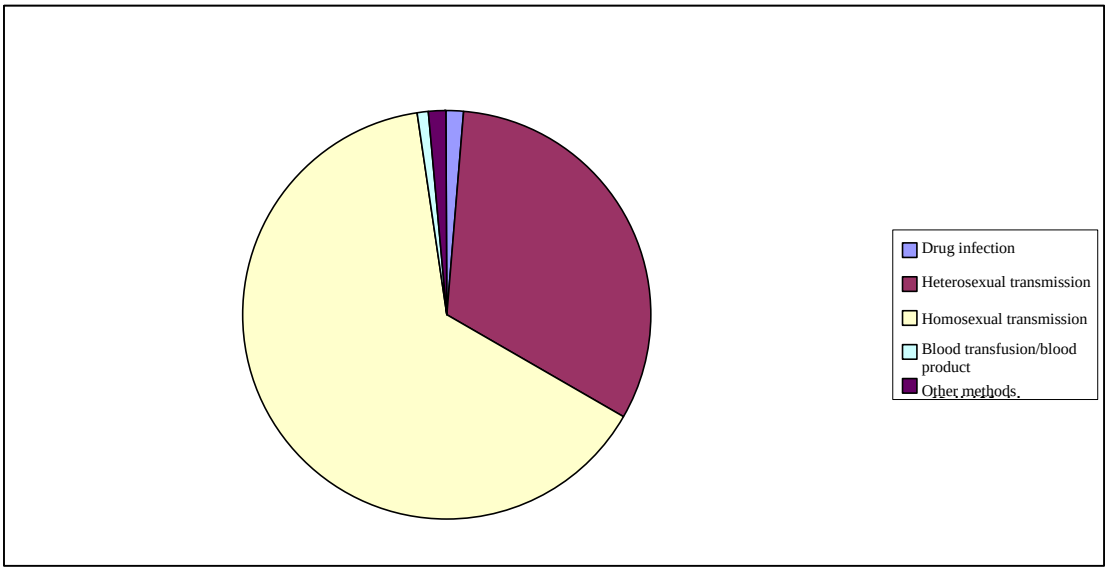

Fig. 4: Major transmission routs of AIDS between 2010 and 2012.

Table 3: Morbidity of AIDS in Yantai between 2010 and 2012

Year	Patients	Dead patients	Death rate
2010	6	3	50%
2011	3	2	66.67%
2012	10	1	10%

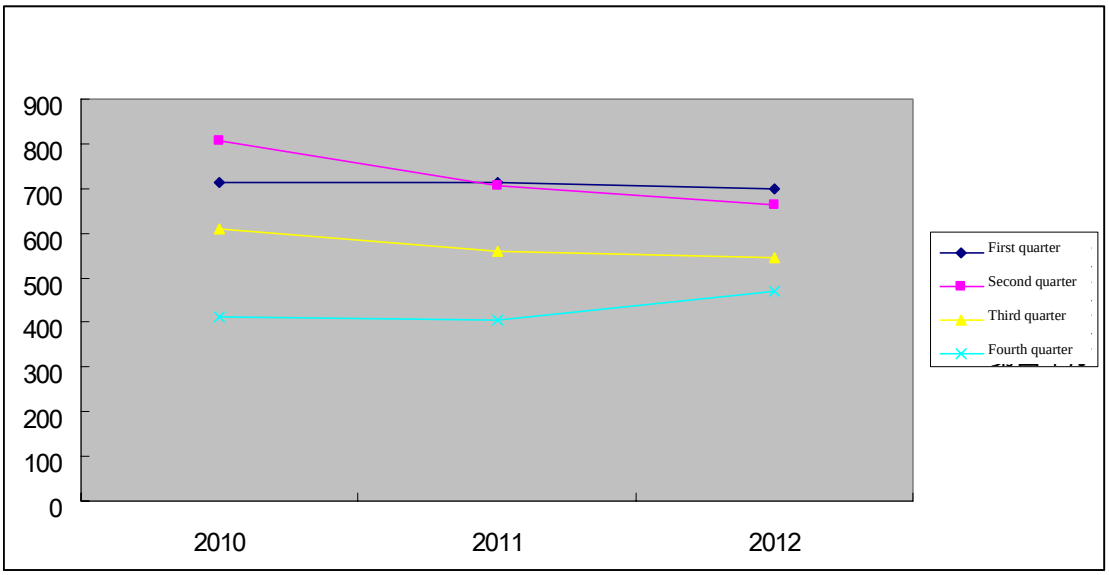

Fig. 5: Occurrence rate of phthisis in every season in Yantai between 2010 and 2012 (%)

Transmission routes

It is reported that the distribution of HIV/AIDS transmission routes among patients with HIV infection and AIDS in Yantai between 2010 and 2012 is as follows: 64.50% by homosexual spread, 31.90% by heterosexual spread, 1.40% by drug infection, 0.70% by transfusion/blood product, and 1.50% by others. Fig. 4 shows specific distribution.

Morbidity of AIDS

In 2010, it is reported 6 patients with AIDS, including 3 dead with death rate of 50%. In 2011, it is reported 3

Table 4: Distribution of viral hepatitis types between 2010 and 2012

Year	Hepatitis A	Hepatitis B	Hepatitis C	Hepatitis D	Undifferentiated
2010	40	2317	118	472	323
2011	61	2454	148	377	267
2012	66	2754	177	321	225

Table 5: Morbidity of hand-foot-and-mouth disease in Yantai between 2010 and 2012

Year	Morbidity	Death	Severe	EV71	Cox A 16	Other enterovirus
2010	6007	0	14	112	54	195
2011	4070	1	24	221	42	78
2012	6579	0	24	31	410	79

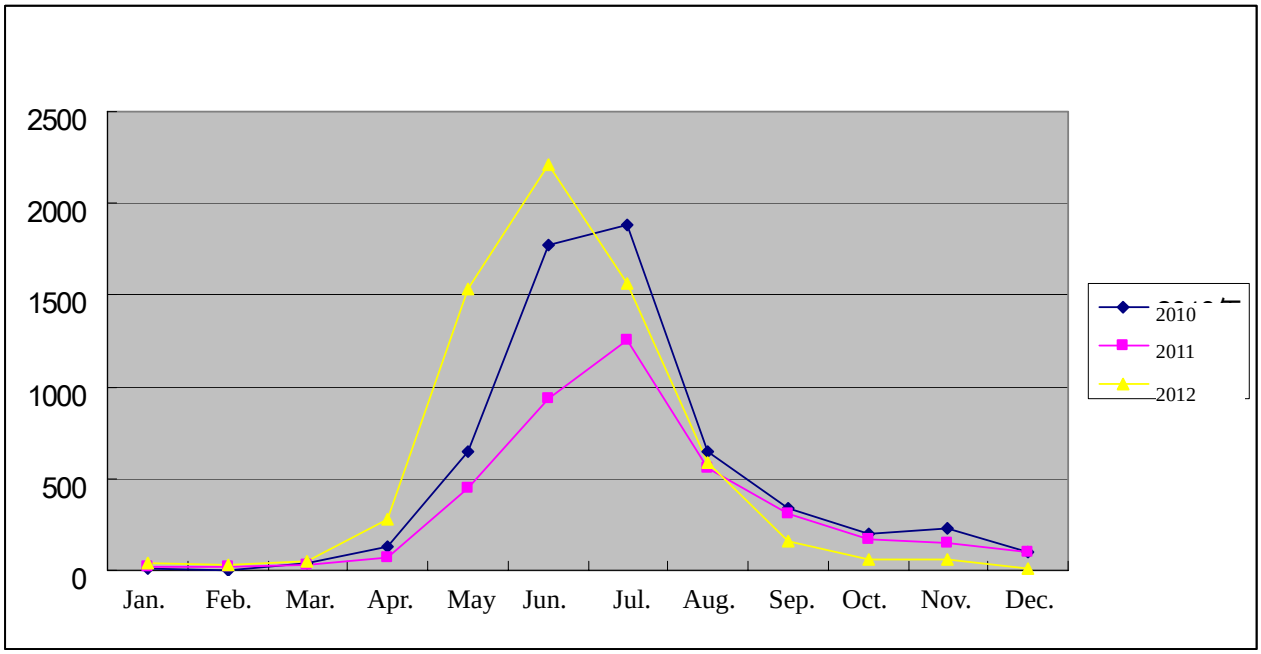

Fig. 6: Distribution of morbidity time of hand-foot-and-mouth disease in Yantai between 2010.

patients with AIDS, including 2 dead with death rate of 66.67%. Compared with 2010, the death rate in 2011 increases by 33.34%. In 2012, it is reported 10 patients with AIDS, including 1 dead with death rate of 10%. Compared with 2010, the death rate in 2012 decreases by 80% (table 3).

Phthisis

The overall condition of phthisis in Yantai between 2010 and 2012 is stable with slight decrease. The occurrence rate of phthisis in every season shows relative fluctuation (fig. 5).

Viral hepatitis

There are 3270, 3307, and 3543 patients with viral hepatitis in Yantai between 2010 and 2012. The major type of viral hepatitis is still hepatitis B, accounting for 70.86%, 74.21%, and 77.73% in 2010, 2011, and 2012, respectively (table 4).

Hand-foot-and-mouth disease

In 2010, there are 6007 patients with hand-foot-and-mouth disease in Yantai with 14 severe patients, but without death. Among these patients, there are 361 having laboratory diagnosis, including 112 patients with EV71, 54 patients with CoxA16, and 195 patients with other enterovirus. In 2011, there are 4070 patients with hand-foot-and-mouth disease with 1 dead and 24 severe patients. Among these patients, there are 341 having laboratory diagnosis, including 221 patients with EV71, 42 patients with CoxA16, and 78 patients with other enterovirus. In 2012, there are 6579 patients with hand-foot-and-mouth disease, including 24 severe patients, but without death. Among these patients, there are 520 having laboratory diagnosis, including 31 patients with EV71, 410 patients with CoxA16, and 79 patients with other enterovirus (table 5).

In 2010, the reported patients with hand-foot-and-mouth

disease in Yantai are concentrated in May, June, July, and August, including 654, 1773, 1886, and 645 patients in each month, accounting for 10.84%, 29.52%, 31.40%, and 10.74% in total annual reported patients, respectively. The morbidity peak is in July. In 2011, the reported patients with hand-foot-and-mouth disease in Yantai are concentrated in May, June, July, and August, including 453, 937, 1528, and 558 patients in each month, accounting for 1.13%, 23.02%, 30.91%, and 13.71% in total annual reported patients, respectively. The morbidity peak is in July. In 2012, the reported patients with hand-foot-and-mouth disease in Yantai are concentrated in May, June, July, and August, including 1530, 2213, 1561, and 584 patients in each month, accounting for 23.26%, 35.64%, 23.73%, and 8.88%, respectively. The morbidity peak is in June (fig. 6).

DISCUSSION

Overall evaluation of Class A and B notifiable diseases in Yantai

In 2012, it is reported 31 Class A and B infectious diseases in total with 276,251 patients, including 282 dead. The morbidity is 286.65/100 thousand, and the death rate is 0.35/100 thousand. Relatively, with population ranking the 6th in Shandong province, Yantai is a city with a large amount of floating population. Between 2010 and 2012, the reported types of notifiable infectious diseases decrease from 23 to 21 for the improved prevention measures. In 2012, the morbidity in Yantai is 278.67/100 thousand, slightly lower than that of Shandong province, 286.65/100 thousand. Among Class A and B infectious diseases in Yantai in 2012, the top five diseases with the highest morbidity are viral hepatitis with 3543 patients, phthisis with 2374 patients, syphilis with 1197 patients, dysentery with 1036 patients, and gonorrhea with 262 patients. AIDS with the highest death rate and hand-foot-and-mouth disease accounting for the most in Class C infectious disease will be the focus in future disease control and prevention in Yantai.

Enhancing the prevention of diseases with high morbidity and death rate, and reducing the occurrence rate of death

AIDS

The death rate of AIDS is the highest, so it is crucial to prevent AIDS by publicity and education. Organs, public institutions, and individual economic organizations should include AIDS prevention knowledge in training content before employees take post. Departments of railway, exit-entry, and health can set public advertising board for propagation materials in striking areas, including stations, entry and exit ports, and park. Neighborhood committee can propagate comprehensive prevention knowledge of AIDS in primary-level cultural undertakings. Junior high schools and schools of higher education should develop AIDS prevention education. When new students are admitted to colleges and universities, AIDS health education booklets should be issued, and attention should be paid to the education of safe sex for undergraduates. Aids health education should be conducted to women with infection or facing infection to reduce spouse transmission and mother-fetus transmission. Condoms should be equipped in hotels and other public places to enhance the accessibility of condoms. Sexual transmission of AIDS can be interrupted by comprehensive intervention. More attention should be paid to male with homosexual behavior, people taking intravenous drug abuse, and other population with high risk of AIDS in intervention. AIDS detection should be the key in the physical examination for workers in public areas, and treatment should be provided to patients with AIDS in times. Methods to avoid male homosexual transmission and spouse transmission with anti-viral drug should be explored positively. Health education to population aking drugs should be enhanced to reduce the hazard of AIDS and drugs. Hall medical service units of maternal care and delivery should be provide AIDS consultation, detection, diagnosis, treatment and other services with help of health care services in pregnancy. For pregnant women and their neonates with AIDS infection, free preventive drug, follow-up, treatment and other interventions should be provided. Work of detection, early diagnosis of infants, and prevention of opportunistic infections should be enhanced to reduce the occurrence rate of mother-to-fetus transmission. Blood safe management should be further intensified by developing blood screening and detection in the whole city, comprehensive supervision in blood products and blood collecting and supplying, and continuous perfection of quality control systems in blood collecting institutions and laboratories. Activities, including blood selling, illegal plasma collecting and supply, and blood product manufacturing and sales should be strictly prohibited (Sun *et al*., 2014; Xu *et al*., 2013; Liu and Song, 2013).

Phthisis

In 2012, phthisis replacing hepatitis B, ranked the first among Class A and B infectious diseases with the most patients for the first time. In 2011 and 2012, it ranked the second among Class A and B infectious diseases. Disease prevention should be implemented in principle of combining treatment with prevention. Tuberculosis prevention strategy of “inspection, treatment, and control” planned and managed by disease control and prevention centers, accepted by assigned hospitals, reported and transferred by medical institutions, followed by community health agency should be developed according to the mode of social participation, responsible government, and department cooperation to discover and treat patients with infectious phthisis in time. In addition, the centralized management, supervision and treatment of patients with phthisis should be conducted by specialized departments positively. Fixed-point hospitals should be

set for phthisis diagnosis and treatment in Yantai to implement free inspection, free treatment, and other relevant policies by carrying out fixed-point treatment of phthisis and free DOTS policy. Key population, including people in schools and prisons, should be screened and managed in strict accordance with relevant systems and regulations. The screening rate for tuberculosis in school should be up to 100% to prevent aggregated tuberculosis condition (Tao *et al*., 2012; Che *et al*., 2013; Liu and Huang, 2014).

Viral hepatitis

Children should positively accept the inoculation of hepatitis B vaccine. Except traditional work in immunization program and increase of inoculation rate of hepatitis B vaccine for children in school age, other measures should be taken, including increasing the times of institutional delivery of permanent women, and increasing the first inoculation rate of neonates in time as much as possible. Medical and health organization should continuously enhance the supervision and management to strictly restrain the blood transmission of hepatitis virus. In practical accordance with *Blood Donation Law*, *Infectious Disease Control Law*, and other laws and regulations, the management and supervision for institutions of blood product manufacturing and units collecting and supplying blood should be further enhanced. Health education of hepatitis prevention among all the people should be implemented to propagate the hazard and prevention strategies of hepatitis, make people familiar with methods to prevent transmission routs of hepatitis B and C, and improve people's self-protection awareness (Tang *et al*., 2014; Jing *et al*., 2013).

Hand-foot-and-mouth disease

Leadership responsibility system should be constructed for prevention work to realize timely discovery, report, and treatment. In strict accordance with prevention and diagnosis guidance of hand-foot-and-mouth disease, the storage of technology, personnel, and materials should be implemented to enhance the ability to discover severe patients early and make emergency treatment of outbreak. Monitoring strength should be enlarged for key areas, including schools, kindergarten organizations, counties, etc. For aggregated patients and severe patients, individual inspection, sample selection, site processing and other works should be conducted as early as possible. Guidance and training about prevention technology of hand-foot-and-mouth disease should be developed in schools, kindergarten and nursery organizations, medical institutions, and community. Morning inspection system should be implemented to practically complete routine hygiene sterilization. Standard guidance should be conducted to medical units in jurisdiction to complete the inspection, diagnosis, disinfection, isolation, etc. of hand-foot-and-mouth disease. Activities of patriotic health are carried out to propagate prevention knowledge of hand-foot-and-mouth disease. Therefore, children and their parents can be familiar with relevant information and prevention methods of hand-foot-and-mouth diseases, and children can develop good health habit (Wu *et al*., 2012).

Protecting susceptible population and cutting off major transmission routes

Standardization of immunoprophlaxis

In Yantai, outpatients for preventive inoculation are set as county as unit. All the departments for preventive inoculation should be approved by certification from health administrative departments above county level, and staff for preventive inoculation should have relevant professional knowledge with certificate. Floating population should be registered with card, and floating children registration, immunity card in entrance profile, and school inspection card are created with management department of floating population. Reaction monitoring, report, analysis, processing, follow-up and other work for preventive inoculation should be implemented. Moreover, comprehensive preventive control over infectious diseases in kindergarten and nursery institutions and schools should be completed, inspection system for preventive inoculation certificate in the entry to kindergarten and school should be strictly implemented, and relevant guidance and training should be given to teachers involving inspection (Wang, 2012).

Enhancement of prevention and control of infectious diseases among floating population

With social and economic development, population mobility has become necessary trend, so increasing floating is one of important characteristics in modern society. Playing an important role in the occurrence and transmission of infectious diseases, floating population affects the occurrence and development of local infectious disease condition when making significant contribution to economic improvement of Yantai. Rational recruitment can be conducted by different levels of institutions responsible for disease prevention and control according to workload and service population. In daily work, the control and prevention of floating population should be effectively implemented by including it in examination scale. For patients with infectious diseases among floating population, timey discovery, treatment, and transmission route cutting should be conducted as much as possible to strictly avoid the second generation of patients (Tao *et al*., 2012; Che *et al*., 2013; Liu and Huang 2014).

Implementation of health education

Health educational propaganda should be prepared according to seasonal change, epidemiological characteristics, and current epidemic status of infectious disease. A new theme should be given every month. Health system should report and process emerging infectious diseases and sudden public health events and organize systematical study and training of infectious

prevention knowledge in Law on the Prevention and Control of Infectious Diseases among medical staff in forms of training class, lectures, written tests, etc. regularly. Therefore, medical staff can improve their ability to process sudden public health events and enhance their legal concept. In addition, health communication is always used to improve patients' health awareness and health knowledge level and help them develop good lifestyle and habits and ensure their organism with good immunologic functions (Wu *et al*., 2012).

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