



ERADICATION OF TYPHUS EXANTHEMATICUS IN BOSNIA AND HERZEGOVINA

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ABSTRACT

Typhus exanthematicus in Bosnia and Herzegovina held in endemic areas from which especially quickly began spread after 1945. That year, in 1945, one hundred epidemics of typhus fever appeared, with the highest incidence rate in Europe of 215.04 per 1,000. Directions of unique program in the world were to eradicate lice of the body, but also establish monitoring of the recidivism, Brill-Zinsser disease. Since 1971, typhus exanthematicus (classical typhus) hasn't appeared in Bosnia and Herzegovina, so epidemic typhus can considered as an eradicated communicable disease.

KEY WORDS: Typhus exanthematicus, transmission, eradication

INTRODUCTION

Typhus exanthematicus, or epidemic typhus results from infection by *Rickettsia prowazekii*, gram-negative obligate intracellular bacterium (1). *Rickettsia prowazekii* has been found worldwide. Foci of disease currently exist in many countries in Asia, Central and East Africa, and the mountainous regions of Mexico, Central and South America. War and famine can result in explosive outbreaks of the disease. Epidemic typhus is prototypical infection of the typhus group of disease. The pathology of this illness is representative of the entire category. The primary vector in person to person transmission is human body louse (*Pediculus humanus corporis*). Lice become infected when they feed on a new host, excreting *R. prowazekii* in the faeces. Transmission occurs when organisms in the louse discharge faeces or bite wound or other breaks in the skin (2). The *Rickettsia* are also infectious by inhalation or contact with

the mucous membranes of the mouth and eyes (3). Epidemic typhus has the most severe clinical presentation of the typhi infections. In severe disease cases, gangrene may occur and lead to loss of digits, limbs or other vasculitic process may also lead to CNS dysfunction. Second World War arrives to Bosnia and Herzegovina at a period of epidemic of classical typhus. Worsened living conditions due to war, result in rare epidemic outbreaks of classical typhus. However, with the end of the WW II, certain endemic hot-spots of classical typhus remain in Bosnia and Herzegovina, presenting a primary social and health problem. Elimination process of the disease was conducted in two directions. The first concentrated on fast eradication of hot-spots with the aim of reducing the reservoir of the typhus cause, with the second process monitoring and fighting the louse infection of humans.

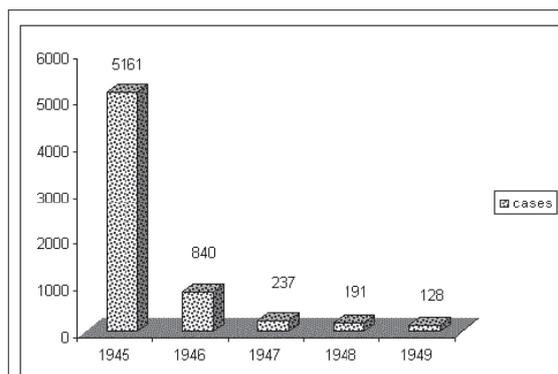
SUBJECTS AND METHODS

This research represents an epidemiological-clinical study of the trends of classical typhus cases in Bosnia and Herzegovina since 1945. The study aims to answer whether classical typhus has been eradicated in full in Bosnia and Herzegovina, i.e. whether all hot-spots have been eradicated, and louse infection in humans eliminated - the latter being the most important factor in transmission of this disease. With the aim of bringing scientific proof whether full eradication of classical typhus has been achieved in Bosnia and Herzegovina, extensive epidemiological and clinical data has been used, covering trends in numbers of cases of this severe infectious disease since 1945.

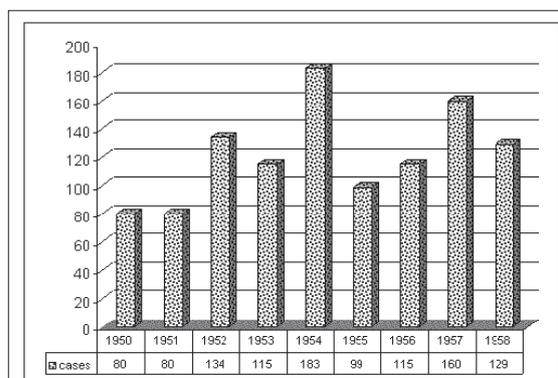
RESULTS

TRENDS IN CLASSICAL TYPHUS CASES IN BOSNIA AND HERZEGOVINA

In year 1945 there were 5,161 cases of typhus exanthematicus registered in Bosnia and Herzegovina, with 214 deceased. The rate of incidence was 215,04 per 1,000 and was the highest at that time in Europe. Even in 1946, there were 840 cases of infection, with 60 deceased, a rate of incidence of 35 per 1000. In spite of all efforts to get the classical typhus under control, this disease still represented a serious health problem in Bosnia and Herzegovina. Distribution of classical typhus cases between 1945-1948, in topographical terms, was present in all regions. Only in 1945, in Bosnia and Herzegovina there were over 100 registered epidemics of classical typhus with 50 to 250 cases each. In 1948, epidemic of classical typhus occurred only in



GRAPH 1. Cumulative number of confirmed Typhus exanthematicus cases in Bosnia and Herzegovina 1945-1949

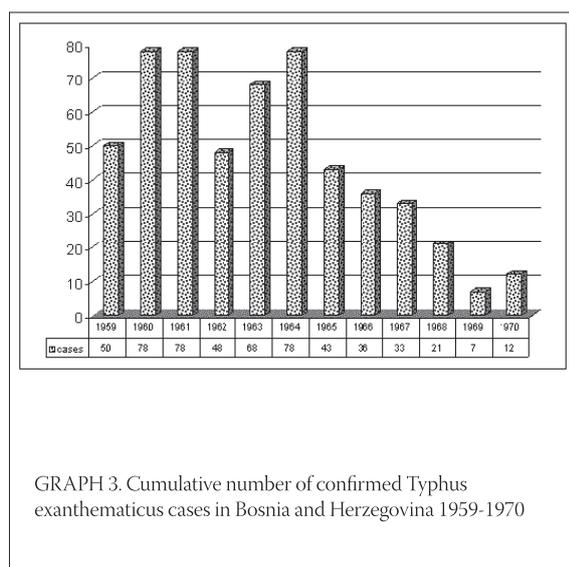


GRAPH 2. Cumulative number of confirmed Typhus exanthematicus cases in Bosnia and Herzegovina 1950-1958

endemic areas, with smaller epidemic spots of at most 45 infected. Although in 1949 there were 128 classical typhus cases registered in Bosnia and Herzegovina, the real figure was suspected to be higher (Graph 1). After 1950, with a mild fall in the number of cases of classical typhus (80 cases) which remained same in 1951 (80 cases), there is a rise in the number of infected in 1952 (134), 1953 (115) and 1958 (129). (Graph 2) Thanks to extensive efforts of health services in Bosnia and Herzegovina, there was a significant fall in the number of cases of classical typhus only in 1959 (Graph 3). Although there was a fall in the number of cases of classical typhus in this period, the overall total number of cases in Bosnia and Herzegovina formed 84% of all cases in Former Yugoslavia. The last clinically and diagnostically proven case of classical typhus infection was found in 1971, in the village of Trabeusa, Travnik municipality (Puvačić).

Research	Brill-Zinsser disease	Typhus Exanthematicus
Had classical typhus	YES	NO
Mode of transmission	No body louse	Some cases of body louse
Increased body temperature duration	7-10 days	14-16 days
CF- complement fixation antigen reaction titre	8 days higher than 1:1000 max titre 9-12 days	titre up to 1:256 max titre after 14 days
Weil-Felix reaction	Most often 1:100	Typical > 1:500

TABLE 1. Criteria for differential diagnosis of primary versus recrudescence classical typhus



GRAPH 3. Cumulative number of confirmed Typhus exanthematicus cases in Bosnia and Herzegovina 1959-1970

ERADICATION OF CLASSICAL TYPHUS IN BOSNIA AND HERZEGOVINA

The health service had a priority role in conducting the classical typhus eradication strategy in Bosnia and Herzegovina (4). Occurrence and spread of classical typhus cases in Bosnia and Herzegovina depended on three epidemiological factors: the number of reservoirs of classical typhus, the percentage of louse among the population, and the number of cases vulnerable to this infectious disease (5). Despite a rise in the standard of hygiene, body louse among population wasn't decreasing below the epidemiological threshold, which is an important factor for prevention of risk of classical typhus spread. Because of this, and for the reason of eradication of louse in Bosnia and Herzegovina, 2.185.555 people were checked for body and head louse in 1971 - a unique preventative measure in prevention of classical typhus spread. Such preventative measure, aimed at preventing the spread of classical typhus through body louse, was not undertaken by any other country. Some 797 462 households were checked for louse infection, to find that 8,67% of households were infected with head lice, and 3,39% of households with body lice. Along with a widespread use of insecticides in all rural, as well as those urban areas where cases were found, the actual

body louse infection was eradicated among 99% of the population. This affected the fact that - besides recurring cases of classical typhus in Bosnia and Herzegovina - the actual classical typhus transmission modes were interrupted. Since 1964, when an active monitoring of Brill-Zinsser disease was established, until 1979, there were 798 registered cases, representing every area with a higher percentage of classical typhus louse infection risk (5,6). At the time, an expert from USA, Murray, stationed in Bosnia and Herzegovina to help the health services differentiate cases of classical typhus from the Brill-Zinsser disease (7,8). On the basis of research, Murray and Gaon determined the world-recognised differential diagnosis of primary versus recrudescence typhus, the Brill-Zinsser disease, therefore significantly helping this severe infectious disease be put under diagnostical and thereby epidemiological supervision (9,10) (Table 1). In 1950, Murray found 26 cases of Brill-Zinsser infection, whilst until end of 1977, Gaon found 780. With the mentioned approach methods, widespread experience and operability, especially that of epidemiological services in Bosnia and Herzegovina, full eradication of classical typhus was achieved. Gaon introduced IFA (microimmunofluorescence) diagnostic method, which prescribes a classical typhus diagnosis for an antibody test result of < 1:128 (Ig) and > 1:64 (IgM), whilst in Brill Zinsser cases, the test result for IgG antibodies is normal.

DISCUSSION

Last epidemic of classical typhus in Bosnia and Herzegovina was registered in 1967, in the village of Podzvzd, municipality of Velika Kladuša. Unapparent and sub-clinical cases, especially in conditions of low louse infection, did not present an important factor in the transmission of this disease due to low and short-lasting recurrence. Occurrence of Brill-Zinsser disease during the most recent troubles in Bosnia and Herzegovina, did not result in occurrence of typhus among refugees. Those cases were most often older persons who had healed a classical typhus infection during childhood in WW II (11).

Classical typhus infection represents a serious health hazard in many countries, especially those in Asia and Africa (12). Epidemics of this severe infectious disease still occur (13). Every occurrence of body louse infection increases the risk of emergence of classical typhus

in areas where this disease developed. If the disease is diagnosed on time and proper treatment is not administered, mortality rate can be quite high - over 20% (16). In areas with low standards of general hygiene, there are risks of occurrence of classical typhus cases (1).

CONCLUSION

Acute polyradiculoneuritis is the illness which during the war years, was frequently registered in or community. The number of patients increased during the years, and the highest number is noted during the 1995, most difficult and last year of war. Mortality was quite high, in 58,8% cases. Permanent stress, difficult social and economic conditions of life which was dictated by the general war state, and the lack of hope for salvation, was the leading factors for the more frequent occurrence of polyradiculoneuritis, and especially inadequate and insufficient pharmacological therapy, as well as improper rehabilitation are the cause of poor outcome of the illness and high percentage of mortality in this period of time.

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