Epidemiology of Louse Infestations

Norman G. Gratz, D.Sc.

In reviewing the current extent and epidemiology of louse infestations in human populations and between one host and another, it is accepted that man is infested by two species of lice, one of which consists of two subspecies (Busvine, 1976). The two species are Pthirus pubis, the crab louse, and Pediculus humanus, the human louse, the latter with its two subspecies, P. h. capitis, the head louse, and P. h. humanus, the body louse (or P. h. corporis). This usage follows that of the Entomological Society of America. Since the biology, manner of infestation and public health importance of each differs greatly, they will be considered separately.

THE BODY LOUSE

The main importance of the body louse is as a vector of three epidemic diseases of man. Two of these, louse-borne typhus and louse-borne relapsing fever, are widespread and may give rise to considerable morbidity and mortality, while one, trench fever, is now rare. Until the extensive use of the chlorinated hydrocarbon insecticides, particularly DDT and HCH (lindane), against their vectors, these diseases were among the major scourges of mankind. Historically, there were frequent epidemics of louse-borne typhus and relapsing fever over wide geographical areas. When personal hygiene was poor, infestations were common in every strata of society. As the level of hygiene began to rise, body-lice infestations and epidemics of louse-borne disease became associated with certain segments of society, or with the conditions occurring at time of war or great national disaster. The outbreaks of louse-borne typhus during the Second World War among armies and civilian populations, and in prisons and concentration
camps are graphically described by Snyder.\textsuperscript{[19,20]} In Korea, at the time of their civil war, 32,211 cases of louse-borne typhus were reported in 1951 alone. The pattern of occurrence of typhus and relapsing fever has changed. These diseases are no longer restricted to wars and the rapid disintegration of normal social structure, services and sanitation. They now persist in those parts of the world where people live under conditions in which clothes are rarely changed or washed, and living conditions are crowded, thus facilitating transfer of lice from one person to another.

Table 27-1 shows the distribution of cases of louse-borne typhus reported to the World Health Organization between 1970 and 1974. It, with some exceptions, shows in which countries part of the population is infested with body lice; the actual extent of body lice infestations is much greater than these figures suggest. These data reflect only information officially provided by national health authorities to the WHO. Their quality is variable.\textsuperscript{[21]} It would seem unlikely that there would be no further cases of louse-borne typhus in Ethiopia after those reported for 1970; Wissemann\textsuperscript{[24]} mentions that a serologic survey in Addis Ababa (after 1970) revealed that up to 40 per cent of the fevers of unknown origin were due to typhus.

One of the unpleasant characteristics of louse-borne typhus is its possible recrudescence, as Brill-Zinsser's disease, years after the primary attack. Such recrudescent typhus may be the origin of new epidemics if they occur in an area where body lice infestations are present. Thus, such infestations, whether widespread or limited, represent a threat of renewed disease transmission.

**CURRENT STATUS OF BODY-LOUSE INFESTATIONS**

It is important that the World Health Organization maintain global surveillance\textsuperscript{[23]} of typhus, and of the prevalence of body-lice infestations as well as their insecticide susceptibility. It is important to obtain a better understanding of factors responsible for the waxing and waning of these infestations and the factors enabling them to spread to uninfested populations.

Gratz\textsuperscript{[11]} reviewed the current status of louse infestations on the basis of information available to the WHO, and obtained from the literature up to 1972. In almost every part of the world infestations by body lice had been found and were still being found. Body-lice infestations were common in those parts of Africa where typhus was occurring, especially the higher altitudes of Ethiopia, Burundi, Rwanda and Zaire and in isolated foci elsewhere on the continent. In the Mediterranean area
Table 27-1. Summary of Reported Cases of Louse-Borne Typhus*

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<td>Burundi</td>
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<td>4,291</td>
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*From yearly summaries, WHO Weekly Epidemiological Record

Infestations were known to occur in Algeria, Tunisia, Morocco, Egypt and Jordan, and in several countries in Europe, particularly in Yugoslavia; in Asia, in Afghanistan; and in the Western Hemisphere in Bolivia, Chile, Columbia, Ecuador, Guatemala, Mexico and Peru. Almost no statistical information existed on body lice infestations. An effort has been made to obtain further information since that time from personal communications and from the recent literature, particularly as regards additional reports or new surveys.
Africa

There is no significant decrease in the extent of body lice infestations from those previously reported and, in fact, additional areas of infestation have become known. Sezi et al. investigated an outbreak of typhus in two villages of the Masaka District of Uganda. The authors assumed that the outbreak in a group of 200 herdsmen of Rwandan origin, (39 had a positive complement fixation test for Rickettsia prowazeki) was due to the occurrence of Brill’s disease. They noted lice on the bodies of 52 out of 56 herdsmen, and that sanitary conditions were poor, water being scarce and rarely used for washing clothes. Subsequently, another outbreak of typhus occurred (1975) in Southern Uganda, 84 out of 250 sera were positive for typhus (communication to WHO, 1976). It thus appears that typhus is endemic in Uganda. No additional observations on the extent of lice infestations were provided other than that the stocking of several thousand kilos of DDT dusting powder was warranted for their control.

Meheus described an epidemic of typhus in the prefecture of Buetare, Rwanda and analyzed cases occurring from January 1972 until June 1973. He concluded that 10 per cent of the nonlethal cases and only 1 death in 586 cases were reported by rural health centers. Actual mortality is probably as high as 15 to 20 per cent. In his field survey four out of ten affected people died. In 1958 a country-wide disinsectization was performed to eradicate body lice infestations. Because of lack of improvement in hygiene and overcrowding, the population rapidly became reinfested. The authors considered that while the combined antibiotic therapy and louse control were effective on a small scale they could not be applied on a large scale due to shortage of funds and trained personnel. They estimated the cost of a country-wide disinsectization program would be 87 million Rwandan francs ($966,000), half the annual budget of the country’s Ministry of Health; therefore louse-borne typhus is likely to remain endemic until large-scale eradication programs are undertaken.

Tarizzo visited Rwanda to investigate louse-borne typhus in 1975 and reported to the WHO (1975). He characterized the reasons for the disease remaining endemic: the relative cold and high humidity of high altitude regions, the poor communications, a dense but dispersed population, a subsistence economy with annual average income of US $60 per person, unequal distribution of health facilities, lack of water and hygiene and an abundance of body lice along with ignorance of their role as vector of the disease. The government is allocating considerable funds to control the disease, but more assistance is necessary.

No data have been provided on cases of typhus in Ethiopia since 1970: Krause et al. estimated that 5 to 10 thousand cases of the disease
occur each year and that typhus accounts for 10 to 15 per cent of patients admitted to hospitals in Addis Ababa with the diagnosis of unexplained fever. While most patients showed relatively mild clinical symptoms, verbal reports suggested that typhus was more severe in the famine regions of the country than in Addis Ababa. Bryceson et al. estimated 10,000 cases per year of louse-borne relapsing fever occur in Ethiopia. Louse-borne diseases account for much morbidity and probably mortality in Ethiopia. Louse infestations are widespread but no statistical survey of their prevalence exists; such a survey is being planned (Sholdt, personal communication, 1976).

By contrast, body-louse infestations in neighboring Somalia do not constitute a problem (A. Ahmed, 1976, report to the WHO). The Somali people consider lice a social stigma; they wear only light clothes which do not cover much of the upper body. When lice are found the people usually treat themselves in order to remove the infestation. No louse-borne typhus or relapsing fever has been reported there.

Although no information could be obtained on louse infestations in Sudan, the WHO was informed (A. M. Haridi, 1976) of 713 cases of relapsing fever between 1 January 1975 and 1 February 1976.

**Mediterranean Area**

Although head lice are common in Libya, no mention is made of body louse infestations nor louse-borne disease. However, Shalaby collected body lice in two widely separated localities.

From the extent of insecticide susceptibility tests on body lice in Egypt, lice infestations are apparently widespread, but no recent reports have been obtained of their prevalence, since earlier extensive surveys.

Body lice in Israel have not been reported since 1971-1972 (R. Lidror, personal communication, 1976), despite the problem of head lice. The absence of body lice is fortunate in that many individuals in that country had contracted louse-borne typhus in Eastern Europe (concentration camps or ghettos) during World War Two and the possibility of Brill's disease is of concern. Klingberg et al. examined, in Israel, the sera of 294 volunteers who had had clinical typhus in Eastern Europe; 88 per cent showed typhus antibodies (some variation in antibody titer occurred during the study but no evidence of "serorelapses" nor Brill-Zinsser's disease).

Body lice are a problem in schools, barracks and rural areas in Yemen, but no information was made available on their prevalence.

While body lice occur in certain other countries in the Mediterranean basin, no new information on prevalence has been received since 1972.
Europe
There have been no new cases of typhus in Yugoslavia since 1971. An active program of case detection and dusting against body lice continues (J. Gaon, personal communication, 1976); there is an active program of surveillance and control to eradicate both lice and typhus in Bosnia and Herzegovina (B. Pokrajcic, personal communication, 1976).

Asia
No recent information is available from southeastern Asia or the Western Pacific. Body lice remain a problem in Afghanistan. Control measures are haphazard. (A. Djelantik, personal communication, 1976). There is probably little change from earlier reports; however, no cases of typhus have been reported for some years. Body lice infestations occur in Hong Kong, observed in carrying out susceptibility tests. During a visit to the People’s Republic of China in 1973, the author enquired about body lice infestations; these are virtually unheard of.

Americas
As has been noted in Table 27-1, louse-borne typhus remains endemic in several countries in the Americas, especially in the mountainous areas of Bolivia, Peru and Ecuador. Body lice infestations are widespread. During discussions at the Symposium on Lice (Washington, 1973) it was stated that there were areas on the Bolivian-Peruvian border where in the mid-1950’s the prevalence of body-lice infestations was about 95 per cent.

Body-lice infestations occur in the mountainous area of Mexico and poor quarters of Mexico City. In the U.S.A and Canada body lice infestations are rare, as is the case in most of northern Europe. It is curious that the lice are able to persist at all.

In conclusion one is struck by the sparsity of information on body louse prevalence. Part of the reason for this lack of information and, for the persistence of louse-borne typhus, is the relative inaccessibility of most of the geographic areas where body-lice infestations are common, and the ignorance of the role of lice in these same areas in the transmission of disease.

HEAD LICE
While head lice are at least as common and equally unreported in the same geographic areas where body lice infestations persist, they are also common in many countries where body lice are rare. One gains the
impression that head louse infestations are on the increase. Part of this may be due to their presence in countries where data on most conditions of public health importance are quickly accumulated and made available. But as Gratz observed many of the reports are from countries, such as the U.K., where surveys are available over a period of years. In the U.K., after a recorded drop in prevalence until the mid-1960's, head lice began to increase. Data on the U.K. has been documented in my earlier paper, up to 1972. Since then a survey by Donaldson (1975) covered a sample of 22,945 children, 15,654 in primary schools and 7,291 in secondary schools: 675 children were infested. The author concluded that the national infestation rate was 2.4 per cent with an estimated 193,806 children infested. This figure, while substantial, is lower than the 1 million figure estimated earlier; it appears that rates of infestations of head lice may have fallen in the U.K. High rates of head lice infestation are reported from Canada, the U.S.A. and in many other countries. Surveys by the U.S. Center for Disease Control in three cities in the U.S.A. showed rates of infestation that ranged from 3 per cent to 20 per cent of the children surveyed. White children were more commonly infested than black.

At a symposium on head lice transmission and treatment held in 1976, it was speculated that there may be 6 million infestations of head lice in the U.S.A. ; this estimate is based on purchases of pediculicides.

In a large-scale survey in Chile in 1971, 53,556 persons (most were schoolchildren) were examined for the presence of head lice. The general rate of infestation was 20 per cent (17.3 per cent for males and 22.5 per cent for females). The rates of infestation were higher in older people and in women, rather than in men. Among persons over 20 years of age there were twice as many women as men infested (women, 14.7 per cent and men 7.1 per cent).

Head-lice infestations remain high in Israel. Over 30 per cent infestation may be found in some neighborhoods of lower socioeconomic status; infestations at lower percentages occur to some extent, in almost all schools.

In Libya, 3,000 cases of head lice infestations were seen in the Central Hospital of Tripoli in 1975, and 19,000 attended the hospital for such complications of head-lice infestation as impetigo, out of a total of 203,932 outpatients (A. Krewi, communication to the WHO, 1976). It was estimated that 10 per cent of the outpatients and 2 per cent of the children attending a school health center were infested, and that the probable overall rate of head lice infestation for the entire country was 10 to 15 per cent.

Although there are comparatively few studies on the extent of head lice infestation, these show that the prevalence is high in most countries
that report, and presumably is at least as high in many that have not been surveyed. While head lice are not commonly thought to be vectors of disease, the secondary infections associated with severe and long-standing infestations show that effective control of this pest warrants more effort than it has received.

### CRAB LICE

Understandably, even less data are available on the prevalence of crab lice than on the extent of body or head lice. While not vectors of disease, infestation is usually by sexual contact. Epstein emphasized that the patient who has acquired crab lice may also have acquired other venereal diseases simultaneously and should be observed for syphilis and gonorrhea. Indeed, the prevalence of *P. pubis* in any given population would probably be similar to that of the venereal diseases in that same population. The only information remains the study by Fisher and Morton who showed a decided increase in the incidence of *P. pubis* in patients attending clinics in Sheffield, U.K., the percentage rising from 0.8 per cent in 1954 to 3.2 per cent in 1966. Among the 225 patients infested with *P. pubis*, 105 (or 46 per cent) had cases of other sexually transmissible conditions.

### THE EPIDEMIOLOGY OF LICE INFESTATIONS

A voluminous literature exists on factors influencing how lice are transmitted from one individual to another, and on factors which increase or decrease their prevalence in a population. Although there are differences from one area to another, e.g. from Europe to an Andean village, there are common factors, the most common of which is crowding. In a temperate zone slum the crowding may be a large number of people in a small geographical area and many people in an individual room, but the "crowding" is different in Africa and the Americas. One characteristic of the distribution of the population in Rwanda or Burundi is the absence of village groupings, huts being scattered over the hillsides at some distance from one another. Crowding does occur, however, within the individual family hut and transmission from family to family probably occurs at markets.

May examined the ecologic factors common to all places where transmission of louse-borne typhus and louse-borne relapsing fever occurred; most significant were the need to wear heavy clothing, and the crowding that occurs consequent to isolation and dire poverty. He
depicts the similarities in typhus-potential of the endemic areas of Bolivia, Ecuador, Ethiopia, Burundi and North Africa—all places where sleeping conditions are crowded and, because of cold nights, heavy clothing is worn. To this should be added: a very low economic level often associated with shortage of water, infrequent washing of clothes and, ignorance of the role of the louse in the transmission of disease (resulting in little effort by most to rid themselves of lice).

One of the main factors facilitating transmission of body lice in highly infested human populations obtains in the spread of head lice, i.e., close contact, such as many children sleeping in the same bed. This would seem less likely to be the factor responsible for rapid spread of head lice in a school in mid-England or New York, yet, studies of the strata of children infested in some U.S.A. schools have shown that children in families where more than one child sleep in a bed (the most crowded) are those with the highest infestation rates, and the least concern over their infestation.7

At one time infestation by P. pubis seemed to mainly involve certain social groups, but just as the boundaries of sexual freedom have blurred and venereal disease increased, so has the incidence of pubic lice.1 When sociologists and epidemiologists find a way of reducing the incidence of venereal diseases, the incidence of infestation with this species of louse will also dwindle.

CONCLUSION

Comparatively little new information is available on body louse infestations since a previous review.11 While the prevalence of infestations does not seem to be spreading or rising, it is not contracting, especially in those parts of the world where the risk of transmission of louse-borne typhus or louse-borne relapsing fever remains the greatest. Head louse infestations have in many areas returned to pre-DDT levels, partly because of a lack of concern or awareness about them, and partly because of spread of head-louse resistance to the chlorinated hydrocarbon insecticides. The undoubted, poorly documented, increase in crab louse infestations is linked to the same factors that permitted the considerable increase in the incidence of other venereal diseases. The prevalence of infestation by body lice is likely to remain stable (if it does not increase in parallel with increase of the world population) until there is a decided improvement in the socioeconomic position of the infested peoples. Head lice and crab lice infestations will fall when there is increased awareness of them on the part of the individual (or family) and a rising desire of the infested person to be rid of these pests.
REFERENCES


