STATISTICS OF LEPROSY IN THE KRUTYJE RUTSCHJI LEPROSARIUM, LENINGRAD [1, 2]

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INTRODUCTION

From the archives of Krutyje Rutschji, one of the oldest leprosaria of the union, we have compiled data pertaining to 637 cases of leprosy. This is a number larger than those upon which many statistical analyses have been based. However, it is necessary at the outset to make a brief statement about the institution, especially as regards its archives, to meet objections that may be raised.

This leprosarium—or, more correctly, leper colony— was established on December 5, 1894. At first it was a charitable institution, and until after the Revolution little attention was paid it. Until 1922 there was only one physician; from 1922 to 1926 there were two, and since then three. From this fact it is not surprising that the records are incomplete. For years these were carelessly written on individual sheets; in the second decade individual notebooks for each patient were introduced but there was no regular system of recording. It was not until 1924 that these notes were replaced by an official standard form which gave a good survey of the history of the disease. Unfortunately, one of the most important points, the examination for bacilli was not recorded and we cannot deal with that matter.

LEPROSY AND SEX

Of the 637 patients that were in the leprosarium between 1894 and 1931, 386 were men and 251 women, 60.2 and 39.8 per cent, respectively. This proportion—1.52 to 1—is similar to that in Norway, for example, where of 1678 cases the proportion was 1.8 to 1,

[1] From the Krutyje Rutschji Leprosarium, Leningrad Government, Weimarn, Dr. A. A. Stein, Director. Read before the meeting of the Russian Syphilological and Dermatological Society, at Leningrad, on April 6, 1931.

[2] Translated from the German by Alfred C. Santos, Ph.D.; translation edited and condensed.

64.5 per cent being men and 35.5 per cent women (Sand). The same is true of many other countries, not only in Europe, such as Iceland (Bjarndjedinsson), Finland (Fagerlund), Greece (Miftasis), Spain (Tello), but also elsewhere, as the Dutch East Indies (Haga), Japan (Kitasato), Argentina (Sommer), British Africa and Guiana (Ehlers and Verdier), Cuba (Dieque) and others. The usual explanation of the difference is that since the men are compelled by their work to leave their homes oftener than women, they are more subject to the possibility of infection; also that they more often live under conditions which predispose to illness.

On the other hand, women are in the majority among the lepers in the Baltic provinces. In Oesel the percentages are 39.2 for men, 60.8 for women. In Latvia there were, in 1910 (Erasmus), 47.1 per cent men and 52.9 per cent women, and more recent figures (Etzold) are similar, 46 and 54 per cent. Kupfer's data show percentages of 47.5 and 52.5, respectively, for Esthonia in 1919.

Petersen's data (1895-1897) on morbidity in the Baltic provinces showed a predominance of women, men being only 41.4 per cent to 58.6 women, whereas those for the whole of Russia at that time gave 53.7 per cent men and only 47.2 per cent women. He thought this due to better examination and diagnosis in the Baltic provinces. We believe it is to be explained otherwise. Because the region of the Province of Leningrad is not fertile the men are obliged to go elsewhere to earn a living and therefore are kept away from the endemic focus, while the women remain at home and take care of their sick relatives with consequently greater possibility of infection.

This opinion is strengthened by the change of proportion that has occurred. In the decade 1896-1905, the early period of the leprosarium, the proportion was 54.3 men to 47.5 women. In 1921-1930, however, there were only 39.0 per cent men and 61 per cent women. This fact would seem to confirm our opinion as to the influence of continuous contact with the sick.

FORMS OF THE DISEASE

With regard to the forms of the disease, our cases are divided as follows: *lepra tuberosa,* 57.0 per cent; *lepra maculo-anaesthetica et nervosa,* 21.4 per cent; *lepra mixta,* 21.6 per cent. The proportion of men to women in each of these groups is 1.58 to 1, 1.55 to 1, and 1.28 to 1, respectively.

To compare our figures with those of Sweden, Iceland and other countries we must combine the nodular and the mixed groups, as in Table 1. In both our figures from the leprosarium and Peterson's for the rest of Russia the nodular type is about three times as frequent as the anesthetic. These figures approximate those of the youngest European focus, Memel in Germany, which has existed since the middle of the last century. Smaller proportions of nodular cases are found in older foci, such as Norway, Iceland, Sweden and Greece. Our figures show that leprosy has had a comparatively short existence in our province.

TABLE 1.—*Comparing the type-distribution of leprosy cases in Leningrad (Krutyje Rutschji) and elsewhere.*

Country	Type of case	
	Tuberosa et mixta	*Maculo-anaesthetica*
Iceland, 1895 (Ehlers)	63.9	36.1
Iceland, 1907 (Bjarn.)	45.9	54.1
Sweden (Sederholm)	42.7	53.3
Russia, 1897 (Paterson)	73.5	26.5
Leningrad (Our data)	76.0	24.0
Memel	89.6	10.4

On comparing the type figures of our cases in the first and last decades of the institution a remarkable increase of the anesthetic form is seen. From 1896 to 1905 the nodular cases were 93.4 per cent, the maculo-anesthetic 4.2 per cent; from 1921 to 1930 the percentages were 43.8 and 36.5, respectively. This change can be explained on one hand by better medical care of the population, or on the other hand by decline of the endemic and decrease of serious cases.

A similar increase in the neural form is observed in long existing foci elsewhere, and is a sign of declining endemic and increasing immunity of the population. Many have commented on the prevalence of neural forms in old foci (Arnold, Koch, Glück, Ziemann, etc.). One of the oldest leprous areas, China, has relatively few nodular cases (15 per cent), and Abyssinia has two-thirds neural and one-third nodular (Nägelsback). In places where leprosy has appeared only recently one finds almost exclusively the nodular form (as Togoland, according to Kirschner).

Many have believed (among them Ehlers, Dohi, Engel, Neel, Arning, and von Dühring) that in hot countries the neural form

would prevail, in northerly countries the nodular form. Muir states the supposition that the sun's rays weaken the bacilli and check their multiplication. This is contrary to the fact that in tropical countries, for example Mexico, Madeira, the Hawaiian Islands and the Philippines, the nodular form prevails (citation from Klingmüller), whereas in Sweden the neural form is common. The data of different countries with different climatic conditions give an extraordinarily varied picture in this respect.

On the basis of our material and personal observations we agree with various authors (Leloir, Weisser, Fox, Angier, Samgin, Bjarndjedinsson, etc.), that nodular leprosy can change over into a maculo-anesthetic form. This often occurs in the terminal stage (Dehio, Klingmüller).

It should be mentioned that all cases of neural leprosy in our material showed either spots or blisters. We cannot agree with the opinion of Zamabeo-Pascha, von Dühring, and others who recognize a form, purely neural from the beginning, without any changes in the skin. We must, to the contrary, agree with the opposite opinion of Looft, Dehio, Unna and others.

Four employees of the leprosarium who developed the disease showed the anesthetic form, apparently because of their resistance. This is in keeping with the theory of Jadassohn and Lewandowsky that the body tissues become strongly resistant to the infection. This is manifested clearly by the round-cell reaction which is clearly observed in maculo-anesthetic leprosy but is absent in the nodular form.

AGE AND LEPROSY

The age limits in our material are 1 and 76 years. The distribution by decades is shown in Table 2. There are two equally high points, the second and the fifth and higher decades. These figures, as well as Talwik's, are contrary to those of others—Lie, for Norway, gives 15 to 25 years as the age group most affected; Sand, 20 to 30 years; Rogers, Muir, Cochrane, up to 20 years.

Apparently the human body has a lesser force of resistance in the second decade, when it is rapidly developing, though it is necessary to take into consideration a correction for the incubation period. Later again, with the effects of approaching age, there is a lowering of resistance.

Though Lie, Wade and Rodriguez, Hoffmann, Hillis and Veendam, These and Lobernadie, and many others have pointed out that

children are very susceptible to leprosy, this is not seen in our data. Here the number of children with leprosy is very small. Without disputing the opinions of others we may cite an observation which is similar to those of d'Monte. In the leprosarium is a man who was born of leprous parents and lived with them in a room, in close contact, for 19 years, but he has not shown any symptoms of leprosy. It is of interest that when tested for the allergic condition of the skin he gave an unusually sharp and very persistent reaction.

TABLE 2.—*Age distribution of cases in the Krutyje Rutschji leprosarium and in Leningrad Province.*

Age group	Percentage of cases	
	Leprosarium cases	Leningrad Province
0—10	7.4	3.1
11—20	28.4	7.9
21—30	20.3	17.3
31—40	15.7	13.0
Beyond 40	28.2	56.7

The age-group figures for the Province of Leningrad differ markedly from those for the leprosarium, as is seen in Table 2. There more than half of the cases fall in the fifth and later decades. Factors are the nursing of the sick by the adults, other contacts by persons of mature age, delayed appearance at medical institutions.

GEOGRAPHICAL DISTRIBUTION

Since the leprosarium has served Leningrad and the neighboring provinces, its records cannot give a picture of the geographical distribution of lepra in the Union but only indicate the leprosy areas therein, which Rajewsky has already pointed out.

The sources of the cases were: Governments[3] of Leningrad 24.5 per cent, Cherson 5.8 per cent, Moscow 5.3 per cent, Plescau 5.2 per cent, Smolensk 4.1 per cent and Kathrinoslav 3.0 per cent. The cities of these Governments furnished 10.2 per cent. Over a third (37.2 per cent) came from miscellaneous sources, one or two cases from a place. From Latvia came 4.7 per cent.

The bulk of the patients belonged to the poorer classes—farmers and laborers, who had lived under relatively poor conditions. In the

[3] The bulk of the material refers to the time when the administrative division into Governments existed.

whole period there were only occasional individuals of intelligence, persons who had lived under more or less proper hygienic conditions and had done intellectual work.

CONTACT WITH LEPERS

Of the material studied 53.3 per cent admitted contact with lepers. This is, of course, less than the reality; the early leprous manifestations may be inconspicuous, and there are abortive forms that are very difficult even for the physician to recognize, so it is entirely comprehensible that no larger a proportion recalled contact with cases recognizable to them.

As for the nature of the contact (see Table 3), 13.0 per cent did not have especially close contact, whereas 40.3 per cent had contact in the family circle. Similar figures on family contact are given by others, as Bargehr (38.0 per cent), Denney (29.0 per cent), Eubanas (44.0 per cent), Gregory (35.0 per cent), Sugai and Mabuchi (27.5 per cent). Here is illustrated the danger of such contact under village conditions and the importance of isolation.

TABLE 3.—*Nature of contact of the Krutyje Rutschji cases.*

Nature of contact	Percentage of cases
Contact with relatives	21.2
Contact with family	19.1
Contact with neighbors	13.0
Total admitting contact	53.3

In the 36 years of existence of the leprosarium four minor employees (1 female nurse, 1 house boy and 2 washwomen) developed the disease.[4] However, they came from villages where leprosy exists. The husband of one had the disease. Another, who had a lesion in the nose, not only had contact with a leper neighbor in her village but had sexual relations with one in the institution. In this connection it is of interest that another employee who had sexual relations with a leper with marked and neglected nodular leprosy has not shown, in six years, any sign of the disease.

Attention has been paid the question of leprosy in villages in the neighborhood of the leprosarium. Not a single case was found

[4] Only in recent years has there been strict separation of the lepers from the personnel—a separate club-like building for the employees, with kitchen, laundry, bath, and separate supply office. Similar facilities are provided for the sick, but their area is separated from that of the healthy portion by a canal.

between 1894 and 1930 in the quite rich village of Poleschi, which is only two kilometers away, in spite of the fact that persons of this village are workers in the leprosarium. On the other hand another village, Domaschowo, which is the same distance away but is populated by poor people who are in closer family relationships to each other, turned in four lepers in the same period. The cases referred to were farmers, not employees of the leprosarium or members of their families. It is to be remarked that the sanitary and hygienic conditions of these villages are extraordinarily different. In the first one are quite well-lighted, clean, roomy farmers' houses; in the other the rooms are dirty and quite dark. A third village, Turka, which is four kilometers away on the road from the leprosarium to the station, and from which a number of employees also come, has had only one case. Our material, like those of Balina, Hillis, McCoy and Goodhue, von Wahl, shows several cases of infection in the region of the leprosarium.

As for infection of the leprosarium personnel we, like Anderson, Balina, Bemiss, Cayley and others, do not have even one incontestable case in which it could be said whether or not the person in his youth might have been infected in his family or his village. Our 5 cases in 36 years cannot be compared with the 9 per cent yearly infection of the personnel in the Islands of Hawaii (Varigny). On the other hand they do not confirm the observations of Besnier, and Hopkins, who did not observe any case of infection of personnel.

TABLE 4.—*Predisposing factors in the Krutyje Rutschji cases.*

Condition	Percentage of cases
Thermal trauma	78.3
Physical trauma	7.0
Chemical trauma	1.3
Psychical trauma	0.6
Total, traumatic factors	87.2
Infectious diseases	5.7
Pregnancy	3.9
Poor living conditions	3.2
Total, other factors	12.8

PREDISPOSING FACTORS

As predisposing factors traumata hold the principal role in our material. Thermal trauma, referring to effects of low temperatures, occupies the first place; physical, chemical and psychical traumata are relatively unimportant.

Our figures differ from those of Rogers and Muir as regards the part played by other diseases; this was not very important in our material (see Table 4) whereas in theirs it played the greatest role.

In connection with our climatic conditions, cold apparently causes a decrease in resistance to the infection (see also Braul). As regards physical trauma with injury of the skin, because of climatic conditions the population is so dressed throughout most of the year that they are more or less protected from such injury.

PRODROMAL SYMPTOMS

More than one-half of the patients (54.6 per cent) reported prodromal symptoms, which are listed in Table 5. Grippal manifestations predominate greatly, as do thermal traumata among the predisposing factors.

TABLE 5.—*Prodromal symptoms in the Krutyje Rutschji cases.*

Nature of disturbance	Percentage of the cases for which recorded
Grippal manifestations	57.7
Swelling of extremities	16.3
Swelling of face	4.0
Affections of nose	10.3
Affections of eyes	0.9
Changes of sensibility	7.4
Changes of color of skin	1.7
Eruptions	0.5
Miscellaneous	1.2

It is possible that these changes did not appear as prodromata but as the first manifestations of leprosy; it has not been possible for us to determine this. These findings do not agree with those of Bjarnjedinsson, who in 199 cases did not observe prodromal symptoms. Grippal symptoms as prodroma have also been mentioned by other authors, as Jeanselme, Marchoux, Guillen; their presence is apparently related to climatic conditions.

PRIMARY LESIONS

The difficulty of discovering the primary lesion in leprosy is well known. The onset is usually insidious and without subjective symptoms, so the patient does not notice the earliest change. It is difficult for the physician to determine such changes, which have often taken place long before the examination. In our material the primary lesion is recorded in 88.3 per cent of the cases (Table 6).

Macules are the most common lesions, as found by many other authors (compare also Rogers and Muir, Bergmann, Reissner, Schilling, Pellizarri, Talwik and others). The spots are rose colored, not raised, and usually have not lost their sensitiveness; this only happens after they have existed for some time. After a time spots may disappear, and long afterwards—in most cases approximately one year—a generalized eruption appears. This is usually nodular, this form of leprosy predominating in our material. Nodules as a primary lesion occupy second place. In comparison with those of other authors our figures for blisters and ulcers are very small.

TABLE 6.—*Primary lesions in the Krutyje Rutschji cases.*

Nature of lesion	Percentage of the case for which recorded
Macules	48.2
Nodules	31.1
Ulcers (?)	9.5
Blisters	6.1
Eruptions	5.1

As regards the localization of the primary lesion the lower extremities are first (30.5 per cent), as with many others (Rogers and Muir, Callender and Bitterman, Bwyther, Krikliwy and others). Rogers' view that this predominance is caused by going barefooted cannot apply to our material, nor is their opinion on frequence of the primary lesion in the nose in cold countries borne out in our material.

Next in frequency is the face (28.5 per cent), our data agreeing in this only with those of Rodriguez. Third are the upper extremities (26.9 per cent), this being contrary to the findings of Cognac and Maugeot, Sakurane, and Callender and Bittermann, with whom these have second place. The body has last place (14.1 per cent), as with most authors.

In our patients the parts most exposed to trauma are the arms and especially the hands, but these are not the main sites of primary lesions. There are, apparently, factors to be considered like the peculiarities of the vascular system, stasis in the lower extremities, greater number of vessels and thinner skin on the face.

DURATION OF THE DISEASE

The length of hospitalization of lepers is of interest in respect to both the duration of the disease and the expense of their main-

tenance. Our data show that the nodular and mixed cases were in hospital from 5 to 6 years, and the maculo-anesthetic from 9 to 10 years. The differences by sex were unimportant.

As to the duration of the disease the figures given in Table 7 are only indicative, for it is very seldom that the duration of a case can be established precisely. The figures for the nodular and nervous types are close to those of Talwik, and especially those of Bjarnjedinsson—11.5 and 17.2 years, respectively. Those for all types are greater than those recorded by Impey and Glück, which are: nodular 5.5 years, mixed 9.25 years, and maculo-anesthetic 11.5 to 12 years. These are from the appearance of the usual manifestations until death; Glück's calculated figures for the duration from the primary lesion to death are nodular 8, mixed 11 to 12, and maculo-anesthetic 15 years. These are somewhat higher than ours. Conditions of local nature like the sanitary and hygienic conditions (e. g., the large number of streptococcal infections) influence the duration.

TABLE 7.—*Duration of the disease in Krutyje Rutschji cases.*

Type of disease	Duration	
	Men	Women
Lepra tuberosa	11,2 years	12.0 years
Lepra mixta	11.1 years	15.5 years
Lepra maculo-anaesthetic	16.2 years	15.2 years
Lepra nervorum	16.2 years	...

It is of much interest to us that the figures for duration of the disease are almost twice as large as those for hospitalization. There are several reasons for this, one of recent years being the release of patients discharged as clinically cured. However, the principal reason is that patients do not enter the leprosarium until two, three, or four years after the first appearance of symptoms. Many do not have symptoms which induce them to consult a physician, and of those who do some are not diagnosed until the condition becomes conspicuous. Others, who have seen members of their families or acquaintances acquire the disease and who know the necessity of entering the leprosarium, try to hide their condition as long as possible. These facts are of importance in relation to epidemiology, since most patients are already bacillus-carriers when they enter the institution.

MORTALITY AMONG LEPERS

During the existence of the leprosarium there were 167 deaths. The causes of death are extensively discussed by us in another paper.[5]

[5] On the causes of death among lepers. *Acta Dermatologica-venerologica*, in press.

Here it can only be mentioned that among them we have the same causes of death that affect the healthy population. Leprosy as such has been responsible for death in only 1.5 per cent, a very small proportion.

Mortality and sex.—Practically no relation is seen. As shown by the figures in Table 8, the proportion of the sexes in the total number of patients and in those who have died is almost the same. This is contrary to the statement of Mitsuda that leprosy causes more deaths among men.

TABLE 8.—*Relation of sex, type of disease and age to the mortality among Krutyje Rutschji cases.*

Factor	All patients of institution (Percentage)	Patients dead in institution (Percentage)
Sex		
Male	60.2	57.4
Female	39.8	42.6
Type of disease		
Nodular	57.0	57.4
Mixed	21.6	30.5
Neural	21.4	12.1
Age		
0—10 years	7.4	0.
11—20 years	28.4	7.3
21—30 years	20.3	20.8
31—40 years	15.7	15.3
Above 40 years	28.2	56.3

Mortality and type of disease.—The serious nodular form is represented (Table 8) equally among the total population and the deaths, also contrary to the experience of Mitsuda who finds a relatively high mortality in this form. The neural form has a relatively low death rate, the mortality figure being about one-half that for the proportion of this type of case. On the other hand the mixed form to which the designation "*lepra completa*" might be applied, gives a mortality figure 50 per cent higher than the proportion of this form in the institution.

Mortality and age.—As is also shown in Table 8, there were no deaths in the first decade. Each decade thereafter has a figure that is roughly similar to that of the preceding decade in the general population column, the third and second decades, respectively, having the highest figures.

Mortality and previous disease.—The diseases contracted before infection with leprosy play no role as regards death. Of the deceased

lepers 52.6 per cent had not been sick before; of those giving a history of one or another kind of disease practically one-half had had infectious diseases. Descent from a leper family was not a factor influencing the death.

Mortality and season.—The mortality figures are higher for the spring (being of the same height during the 2nd, 3rd, 4th and 5th months) than for the other seasons of the year. September also gives a high figure, but lower than the spring. The most favorable season is the summer, the fewest deaths being in June. Mitsuda, in Japan, finds the greatest death rates in spring and in autumn.

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