

EPIDEMIOLOGY OF GONOCOCCI WITH DECREASED SENSITIVITY TO PENICILLIN IN MALMÖ, SOUTH SWEDEN

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Abstract. Gonococci with a decreased sensitivity to penicillin isolated from patients attending the V.D. clinic in Malmö, south Sweden, were studied with regard to place of origin. During 1969 there were 490 strains (27.5%) with decreased sensitivity to penicillin out of 1781 diagnosed. They occurred proportionately more in higher age groups than did normal strains. There was a higher incidence of gonococcal strains with decreased sensitivity to penicillin among infections acquired abroad than in Sweden. Most cases of gonorrhoea contracted abroad originated from Poland and strains from that country showed a decreased sensitivity to penicillin of 75%.

During 1969 the steadily increasing amount of reported new cases of gonorrhoea in Sweden came close to the figure of 35 000. About 5% of all cases were diagnosed in the V.D. clinic at Malmö General Hospital. The majority of gonococcal strains cultivated during recent years in Sweden (4, 6), Denmark (9), Norway (11), and Finland (8) have shown a full sensitivity to penicillin although figures for decreased sensitivity vary between 12 and 39% from different Scandinavian centers. (Direct comparisons between different laboratories are difficult because of varying criteria for "decreased sensitivity".) Since gonococcal strains with decreased sensitivity to penicillin (GDSP) imply special therapeutic problems it is natural to direct epidemiologic measures against these cases especially. At the V.D. clinic in Malmö an impression was gained that GDSP originated to a large extent from non-Swedish countries. Therefore, a one-year material of GDSP was investigated with special reference to place of contraction of the disease.

MATERIAL.

In the city of Malmö 2 151 new cases of gonorrhoea were reported in 1969. Of these, 1 781 or 83% were

examined in the only V.D. clinic of the city, that at Malmö General Hospital. All cases were studied with direct microscopy and culture. Samples from urethra in men, and from urethra, cervix and rectum in women were directly inoculated in Thayer-Martin medium. Bacteriologic examination including determination of sensitivity to penicillin, streptomycin, tetracyclin and chloramphenicol was performed in the Institute of Clinical Bacteriology (Head: Professor S. Winblad). Details of the method and sensitivity patterns through the years have been published by Juhlin (3, 4). GDSP were defined as those with an IC_{50} of ≥ 0.1 IU benzylpenicillin/ml (corresponding to $0.06 \mu\text{g/ml}$). In the V.D. clinic 490 cases of GDSP occurred during 1969, i.e. 27.5% of the whole material.

The epidemiologic study was performed retrospectively on every second case of the 490 GDSP cases in alphabetic order, i.e. on 245 patients. Data were collected on age and sex, month of diagnosis, sensitivity pattern to the four antibiotics tested, degree of sensitivity to penicillin, and place of contraction of the disease.¹ 245 patients with the same sex distribution as the GDSP cases, but infected with gonococci showing full sensitivity to penicillin served as controls; they were picked out from the register in immediate alphabetic order following the GDSP cases.

For the statistical evaluation the χ^2 -test was used throughout.²

Epidemiologic background. Malmö is Sweden's third largest city, pop. 260 000. It is an industrial town in the southern-most county, but also a port at the narrow strait of Öresund between Sweden and Denmark. The boat-trip to Copenhagen in Denmark takes 35 minutes and no passport is needed to cross the border. There are direct communications across the Baltic to the continent from other southern ports one hour's drive from Malmö: From Trelleborg to Travemünde in West Germany (nine hours by boat); from Trelleborg to Sassnitz in East Germany (four hours by boat); and from Ystad

¹ All patients had been interviewed by Mrs Eva Bremer, social officer.

² The analysis was performed by Peter Vorwerk, Ph.D., statistical adviser of the Swedish Medical Research Council.

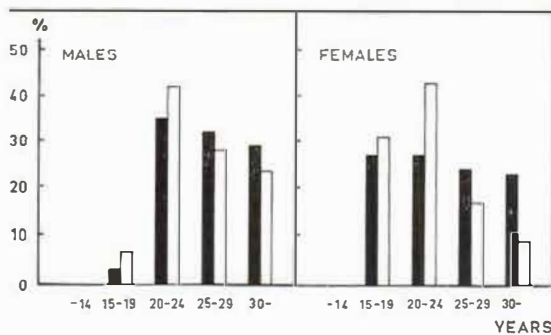


Fig. 1. Age distribution of 170 males and 75 females infected with gonococci with decreased sensitivity to penicillin (black columns) compared with as many cases with normal gonococci (open columns).

to Świnoujście (Swinemünde) in Poland (seven hours by boat).

RESULTS

Of the 245 GDSP cases there were 170 males and 75 females. The age distribution is given in Fig. 1 which shows that GDSP occurred in the higher age groups in comparison with the controls. This difference, illustrated for males as well as females, is statistically significant ($p < 0.01$).

The distribution of GDSP and normal strains followed each other fairly closely over the different months of the year, and GDSP were not diagnosed in any particular season.

The geographical distribution of all 490 gonorrhoea cases showed that 350 strains originated in

Table I. Distribution of gonococci with decreased sensitivity to penicillin (GDSP) and of normal strains according to place of contraction

Twelve patients were excluded from the material of 490 cases because of unknown source of infection

	Place of contraction	♂	♀	Both sexes
GDSP (<i>n</i> = 235)	Sweden	88	63	151
	Abroad	73	11	84 (36%)
Normal strains (<i>n</i> = 243)	Sweden	129	70	199
	Abroad	40	4	44 (18%)
All strains (<i>n</i> = 478)	Sweden	217	133	350
	Abroad	113 (34%)	15 (10%)	128 (30%)
		330	148	478

Sweden, 116 in other European countries, and 12 in non-European countries; in 12 cases the source of infection was unknown. It may be seen from Table I that 34% of the males but only 10% of the females had contracted their infection abroad. From the same table it appears that among GDSP 36% were imported while among normal strains only half that percentage came from abroad; this difference is highly significant ($p < 0.001$).

Among the 151 GDSP contracted in Sweden, 129 cases originated from Malmö, 12 cases from the county of Skåne excepting Malmö, and 10 cases from other parts of Sweden.

It appears immediately from Fig. 2 that Poland was the foreign country from which most cases of gonorrhoea were imported to Malmö. There were 116 "European" cases, 38% of which originated in Poland. Furthermore, there was a high amount (33/44) of GDSP among the "Polish" infections. On the whole, GDSP occurred frequently in gonorrhoea contracted abroad.

All 44 patients with gonorrhoea from Poland were males. In half of the cases the sexual contact was made in Szezecin (Stettin).

When the 33 GDSP from Poland were grouped according to degree of sensitivity to penicillin, 12 had an IC_{50} of 0.1–0.49 IU/ml, 20 an IC_{50} of 0.50–1.49 IU/ml, and 1 an $IC_{50} > 1.50$ IU/ml. The sensitivity pattern showed 4 strains with decreased sensitivity to penicillin only, 12 strains



Fig. 2. Geographical distribution of 116 gonorrhoeal infections contracted in European countries outside Sweden. Black columns: gonococci with decreased sensitivity to penicillin; open columns: normal strains.

with decreased sensitivity to penicillin and streptomycin, and 17 strains with decreased sensitivity to penicillin, streptomycin and chloramphenicol. In the 129 GDSP from Malmö there were 70 cases with decreased sensitivity to penicillin only, 36 with decreased sensitivity to penicillin and streptomycin, and 23 with decreased sensitivity to penicillin, streptomycin and chloramphenicol. The predominance of gonococcal strains with multiple decreased sensitivity to antibiotics in infections acquired in Poland as compared with those acquired in Malmö is highly significant ($p < 0.001$).

DISCUSSION

With convenient international communications it is natural that venereal diseases tend to spread across the borders. In the Southampton area of southern England 14% of gonococcal infections were reported to originate abroad (10); in the whole of United Kingdom it was, however, only 4% (12). The figure for "foreign" gonorrhoea (infection contracted abroad, incl. sailors) in Helsinki, Finland, was 15% (8). In the 1963 material from the Malmö V.D. clinic 8% of gonorrhoea infections were acquired abroad (5). Traditionally, the male is more mobile than the female in this aspect (1), and the present results emphasize that tradition is still unbroken: 34% foreign infections in males, against 10% in females.

As had been suspected, it was confirmed that more than one-third of GDSP was imported, twice as much as among normal strains. In the 1963 material from this clinic 25% of GDSP had been brought from abroad (5). High figures for GDSP in imported strains have also been registered in the Southampton area in England (10), and earlier this year in Helsinki, Finland (8). This similar finding, now reported from three different geographical areas, all, however, relatively big ports, is difficult to explain. The source of infection, i.e. the sexual contacts available to international travellers, could possibly harbour selected gonococcal strains. It is of interest in this connection that Danish "prostitutes" are not infected with GDSP to a higher degree than other patients with gonorrhoea (7).

It was also shown that the higher age groups, males as females, harboured proportionally more of the GDSP. This age difference is probably explained by the high incidence of GDSP in in-

fections from abroad and, correspondingly, by a relatively high age of those patients contracting gonorrhoea outside Sweden.

The patients with gonorrhoea acquired in Poland were of particular interest for several reasons. The number of patients was impressive, since the trip to Poland is far less convenient than to nearby Copenhagen in Denmark. Only a few years ago Copenhagen was our main V.D. source, providing us with two-thirds of all gonorrhoea acquired abroad (5). Also surprising were the very few infections contracted in West and East Germany. Communications to the metropolitan areas of Hamburg and Berlin are convenient, and by tradition our connections with the continent go this way. The ferry to Poland opened up only four years ago; low prices and secure anonymity might explain the attraction to Swedish male holiday-makers. Poland was, however, already in the fifties by far the largest source of imported gonorrhoea in Finland (2; Table 4).

With regard to therapy, the most serious problem with the gonococcal infections acquired in Poland was the findings that the bacterial strains showed a decreased sensitivity to penicillin by 75%, and in addition, a high degree of resistance to streptomycin and chloramphenicol. From an epidemiologic standpoint, it appears of prime importance to halt the dissemination of such infections in the population. Thus, adequate treatment should be installed without delay for gonorrhoea acquired abroad in particular.

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Received May 25, 1970

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