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Journal of the Royal Army Medical Corps

Original Communications

POLIOMYELITIS AND ARMY HEALTH—A LIMITED REVIEW¹

BY

Lieutenant-Colonel C. L. DAY, M.B., D.P.H.

Royal Army Medical Corps

INCIDENCE IN THE GENERAL POPULATION

A REMARKABLE feature of anterior poliomyelitis in recent years has been the extent to which older children and adults have been affected. The gradual shift of incidence from the younger to the older groups has been reported from many civilized countries. In the 1947 epidemic in England and Wales for example, about one-third of the cases were under the age of 5, about one-third between 5 and 15 and about one-third over 15.

These figures show a very great change from those pertaining in past years. In 1912 to 1913 of the 1,559 cases reported no less than 1,105 (approximately two-thirds) were in children under 5 years of age. In 1926 out of a total of 276 cases only 37 (about one-seventh) were over 15 years of age [1].

The figures for 1947 show that the disease can no longer be regarded as one essentially attacking infants. This trend has been noted in those countries which have a high standard of sanitation, for example, U.S.A., Sweden and New Zealand [2], whereas in those communities with less advanced sanitation the earlier type of age distribution is found (e.g. Malta in 1943; Mauritius in 1945 [3]).

It should not be assumed, however, that areas with a high standard of sanitation are particularly liable to a heavy incidence of poliomyelitis when the disease becomes epidemic.

A review of notifications from a large number of towns in England and Wales shows "no such association between the attack rates (of poliomyelitis) they suffered in the 1947 epidemic and the infant and general death rate they experienced in the two preceding years, 1945-46. In other words, according

¹ Received for publication in November 1950.

to this experience, favourable mortality rates, indicating favourable social conditions in a locality, need not raise fears of an unduly heavy risk when poliomyelitis becomes widespread" [4].

INCIDENCE IN THE ARMY (BY DR. R. STALBOW, PH.D., A.M.D.5)
Number of Cases of Poliomyelitis and Polio-encephalitis among British Army Troops January–October 1947. (As Reported on A.F.W. 3166)

	U.K.	B.A.O.R.	M.E.L.F.	F.E.L.F.	Other Theatres	Total
January ..	17	—	8	1	—	26
February ..	3	2	1	2	—	8
March ..	19	1	1	1	—	22
April ..	6	—	—	—	1	7
May ..	1	—	3	—	1	5
June ..	8	—	2	—	—	10
July ..	12	1	8	2	—	23
August ..	50	4	2	1	1	58
September ..	26	3	8	2	1	40
October ..	17	3	5	1	—	26
	—	—	—	—	—	—
Total (Jan.–Oct.) ..	159	14	38	10	4	225

Since the great majority of the Army population lies within the 15–24 age range, a rough and ready comparison can be made on the basis of the incidence for this age group alone in the civilian population and for the whole Army in the United Kingdom.

INCIDENCE OF POLIOMYELITIS AND POLIO-ENCEPHALITIS IN U.K. IN 1947
E.A.R.s per 1,000 Strength

	Male civilians (15–24 years only)	Military (all ages)
1st Quarter ..	0.03	0.44
2nd Quarter ..	0.04	0.16
3rd Quarter ..	0.80	1.08
First 3 Quarters taken together..	0.29	0.56
Crude figures ..	456	142

To some extent, however, even these figures contain an element of bias in that the Army population contains a negligible number of men in the range of 15 to 17 where the incidence is relatively high, while at the same time it does include a considerable number of men above the age of 25 among whom the incidence is low. For both these reasons, figures cited above tend to flatter the Army, and if the age distribution of the two groups tallied more closely the excess of the Army rates over civilian would be accentuated.

Owing to the fact that (a) the age breakdown of the civilian figures is very broad especially in the age range with which we are here concerned, and

(b) there are no readily available figures showing the age distribution of troops in U.K., it is not possible to apply accurately the normal age—standardization technique. It is possible, however, to estimate *approximately* what male civilian rates would be if civilians had a similar distribution to that of the Army. These appear below, and represent the fairest basis of comparison after due allowance for divergent age comparison.

INCIDENCE OF POLIOMYELITIS AND POLIO-ENCEPHALITIS IN U.K. IN 1947

E.A.R.s per 1,000 Strength

	<i>Male civilians (age standardized)</i>	<i>Military</i>
1st Quarter.. .. .	0·02	0·44
2nd Quarter	0·03	0·16
3rd Quarter	0·67	1·08
First 3 Quarters taken together	0·24	0·56

An interesting feature of this table, is that although the Army starts at a very much higher level, the proportionate increase from the pre-epidemic to the epidemic period was much less in the Army than among civilians. The E.A.R. based on the first six months of the year for civilians was 0·03 which rose to 0·67 during the epidemic quarter. Corresponding Army figures were 0·38 and 1·08. Thus the civilian rate increased 20 fold while the Army rate less than 4 fold. It is impossible to say whether this may not be partially due to defective notification by civilian authorities in the early part of the year, before the epidemic turned the spotlight on "Polio."

The high initial rate in the Army may well be attributable to living conditions which are inevitably liable to be propitious to the spread of infections, and the comparatively small increase during the epidemic period may reasonably be regarded the result of effective precautionary measures.

Summary.—With certain reservations arising out of the difficulty of obtaining comparable figures for civilian and soldiers for the same age-groups the outstanding conclusions of this note are :

- (a) Before the epidemic of the summer of 1947, Army incidence of poliomyelitis and encephalitis in U.K. was much higher than corresponding civilian figures ;
- (b) During the epidemic, Army rates were still higher than civilian but the disparity was very much smaller ;
- (c) the comparatively small increase in Army rates during the epidemic may be attributed to effective precautionary measures.

MULTIPLE CASES

The frank clinical case of poliomyelitis is an occasional occurrence in a "carrier" epidemic. It is estimated that approximately 100 infections occur to one clinically recognized case. The occurrence of multiple case outbreaks in a family is uncommon but not so rare as was generally considered to be the case in the 1947 epidemic.

During 1949 two or more cases in a household were frequently reported.

Pearson *et al.* [5] found that carriers of the virus were concentrated about those households in which there was a paralysed patient.

An example of this "multiple infection" occurred in an Army family in Egypt in the summer of 1950. A child aged 7½ months died of poliomyelitis complicated by gastro-enteritis. The onset of illness was on June 30. The following day the child's father was taken ill and later died of polio-encephalitis.

THE EFFECTS OF PHYSICAL ACTIVITY

The avoidance of excessive physical strain in children, such as violent exercise, during an epidemic or in the case of known exposure to infection is a recognized control measure [6].

Summarizing an investigation into this problem, Dr. Ritchie Russell concludes that "complete physical rest in bed from the onset of the pre-paralytic stage greatly reduces the danger of severe paralysis. Severe physical activity at this stage is almost suicidal while the continuance of even average physical activity is dangerous. During the epidemic physical activity should be avoided entirely in minor illnesses . . ." [7].

The same author surveying the effect of activity in a series of cases in the 1947 epidemic gives as an example the history of a paratrooper [8].

Case 9.—"A paratrooper aged 19. Day 1: From 11 p.m. the previous evening to 2 a.m. there was severe lumbar pain which kept him awake; he kept moving restlessly to change his position. On getting up in the morning he felt shivery and had little appetite. Heavy training manœuvres as usual during the day. He slept well that night—no return of lumbar pain was noticed. Day 2: He does not remember pain, still had some difficulty in getting down to fasten his boots in the morning. He still had little appetite and felt shivery. During the morning he took part in heavy infantry manœuvres and carried machine guns up a hill. By 2.30 p.m. his legs began to feel weak and he noticed lumbar pain. By evening both lower limbs and right arm were completely paralysed. Day 3: The paralysis spread to his trunk muscles; there was some vomiting. Day 4: Respiration failed—respirator required. Six weeks later he was still in respirator and there was little recovery in his muscles."

Of interest is a review of cases which occurred in Southern Command (England) in the summer of 1947. The following is an extract of the report of the D.D.H.

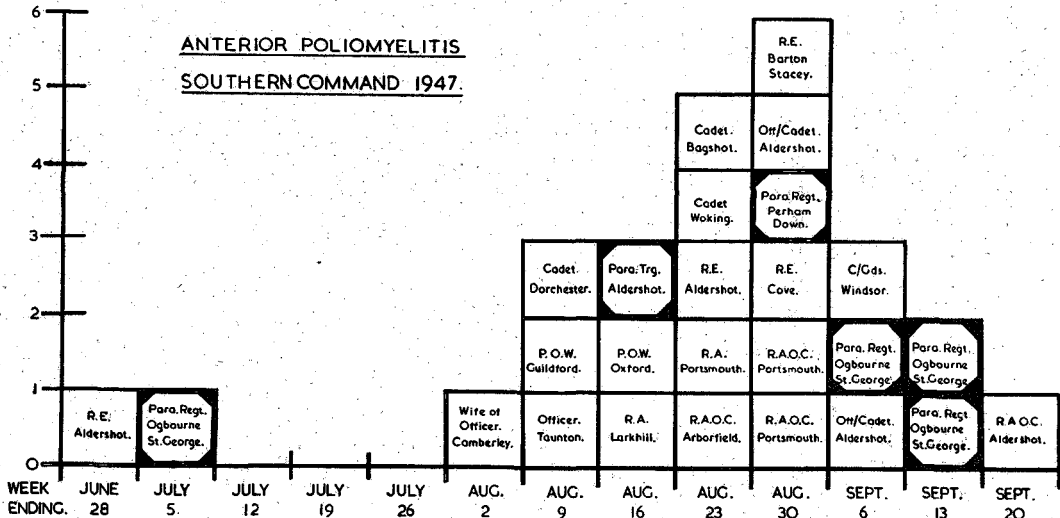
Review of Cases of Anterior Poliomyelitis, Southern Command up to September 20, 1947.—The first of the present series of cases occurred in the week ending June 28, when a Corporal of the R.E. Aldershot was admitted and died on June 29. The next case occurred at Ogbourne St. George, a camp occupied by the 4th Para. Regt. This man is still in hospital. This fact has to be emphasized, as the incidence of the disease in the Paratroopers was out of all proportion to that experienced in other troops in this Command. Further, only in these troops did any cases occur in which any association could be discovered. At a later period during the weeks ending September 6 and 13, 3 further cases occurred in the same hut within a few days of each other.

Similar events have been reported in civil experience, but with these exceptions, it can never be said that the infectivity of the disease is high.

Six paratroopers out of a total of 26 cases, of which only 17 occurred in other ranks, up to September 24 is a high proportion of the total, especially taking into account that

the gross total includes officers—wife of an officer—two Ps.o.W.—two boy cadets up for annual camp and cases from troops outside the Command. 10 of the cases came from Aldershot area; 2 came from R.A.O.C., Portsmouth, but no contact could be proved. The other cases were scattered throughout the Command. It is difficult to explain the high incidence among Paratroopers, but it may be said that no body of troops is worked harder than these. They are carefully picked men, whose physique may be classed as extraordinary. Their feeding is adequate and, when on intensive training, this is supplemented by the issue of haversack and strenuous duty rations. There has been prolonged preparation for a special "exercise."

A table showing schematically the incidence of the disease is attached.



INCUBATION PERIOD

The incubation period is usually considered to be between seven and fourteen days. The period may, however, be as long as thirty-five days and as short as three days [9].

Murray reports cases with an incubation period of only two days [10].

An interesting series of cases occurred in Ceylon in the summer of 1948, in some of which it would appear that the incubation period was of very short duration.

Cases had been reported amongst the civilian population before the onset of the first Service case. This was a soldier from a wireless station in Colombo. The second case was the wife of a serjeant who worked in a wireless unit "A" situated just outside Colombo. She had been to her husband's unit dance about three weeks before being taken ill.

Three cases amongst the R.A.F. were also reported at the time. They were in R.A.F. personnel intimately connected with wireless duties. It was thought that there might not be any further cases when on June 10 a man was admitted from "X" barracks, Colombo, with severe headache, and a temperature of 101° F. Between June 10 and 14, 13 other cases were admitted, all from "X"

barracks. These cases were all similar in their history, characterized by a severe headache with fever, moderate or mild. Some had vomiting and backache. All were symptom free in three or four days. None of these cases developed transient or lasting paralysis. This absence of paralysis in all these cases occurring in succession at first apparently unconnected with the first 5 cases gave rise to some doubt as to the diagnosis. Investigation showed, however, that 4 men from the wireless unit "A" had been billeted at "X" barracks, while awaiting embarkation to the U.K. before a ban on the men of this unit had been imposed.

The first of the new series of cases came off a troopship three days before the onset of headache and two others from the same ship developed similar symptoms within the next five days. The ship from which these men had disembarked was outward bound from the United Kingdom and the question arises as to the source of infection. Were the men infected on the ship or after arrival at "X" Barracks? No case of poliomyelitis was reported from the ship before or after calling at Ceylon and it seems probable that the men were infected in the Barracks (in which cases had recently occurred) after disembarkation.

It may be argued that the diagnosis in these cases is doubtful. Pathological investigation revealed "suggestive" C.S.F. findings—viz. an increase in cell count, ranging between 60 to 700 per c.mm. In addition some had raised total protein and in one case the C.S.F. was under pressure (200 to 220 mm.). In the absence of clear evidence of an epidemic of a new disease in the nature of a virus encephalitis, however, and the knowledge that cases of anterior poliomyelitis were already occurring in the island, there seems little doubt as to the correctness of the diagnosis.

In England and Wales (1950) approximately 1 "non-paralytic" case of poliomyelitis is diagnosed for every 3 "paralytic" cases. A very great number of minor illnesses due to infection with the poliomyelitis virus must escape medical attention and the disease is therefore much more prevalent than the figures of notified cases would suggest.

A series of mild cases such as those reported from Ceylon would quite probably occur in any poliomyelitis epidemic.

QUARANTINE

In Great Britain the Ministry of Health recommend that child contacts of a case of poliomyelitis should be excluded from school for a period of twenty-one days. Apart from this measure, however, quarantine measures are not as a rule applied.

In view of the greater liability of children to contract the disease there can be little doubt that known child contacts should be isolated. It has already been noted that carriers of the virus are concentrated in those households in which a case of paralytic poliomyelitis has occurred and it would appear therefore that segregation has a part to play in the prevention of the spread of the disease. It is wrong to adopt a *laissez-faire* attitude based on the incorrect

assumption that in an epidemic the virus is necessarily widespread throughout the population.

“There is no evidence whatever that during an epidemic the virus of poliomyelitis is ubiquitous throughout the whole population. The most that can be said on the basis of virological investigation is that there is a widespread distribution of poliomyelitis virus in certain households attacked by the disease” (Bradley [11]).

In considering whether quarantine should be applied each case will have to be judged on its own merits, remembering that the life of the community should be interfered with as little as possible unless by quarantine it can be reasonably expected that the spread of the disease will be limited. In the event of a single case or a small outbreak in an isolated detachment of troops it is considered that movements from or to a “non-infected” area or unit should be prohibited for a period of fourteen days.

An example of the type of incident in which quarantine was, quite correctly, applied occurred in an outbreak in Singapore District in 1949. The following is an extract from the report of the D.A.D.A.H.

“The first 3 cases occurred in a Signal Regiment within five days of one another. They included one B.O.R. on a course who had arrived from Kuala Lumpur on March 1, 1949, and whose date of onset was March 15, 1949. (Note: The dates of onset of the other two were March 11 and March 12, 1949.) There was no apparent close connexion between the three cases; they slept in different huts, and were not “close pals” in any way. In view of the fact that this outbreak was both “explosive” and localized to one unit, no personnel from this unit were allowed to embark for the U.K. on release, etc., until the expiry of fourteen clear days from the date of last admission to hospital.”

No reliable evidence exists to show that poliomyelitis is a food-borne infection. Nevertheless the virus is frequently found in the stools of both patients and contacts, and the possibility still exists of a dual mechanism in transmission [12].

Food handlers who are contacts should therefore be warned to be particularly careful of personal hygiene. If any contact food handler becomes ill he should be removed from such duties for at least two weeks [13].

PROPAGANDA AND INFORMATION

It is most important for the Medical Authorities to keep the public supplied with information concerning the course of the epidemic and let them know what steps are being taken to combat the disease. The public should also be told what they themselves should or should not do. Few diseases are more likely to cause alarm and rumours. It is the duty of the medical branch of the Headquarters and of the medical officers on the spot to produce prompt and accurate information to allay doubt and inspire public confidence.

In 1947 an officer was removed from a troopship at Singapore and two days later died of poliomyelitis. Shortly afterwards a London evening paper published a paragraph headed “Epidemic fear in Troopship—Officer dies,” and went on

to mention a "mysterious brain disease," which was feared to threaten the two thousand British Troops in the liner. At the same time a Singapore paper under the heading "Mystery Disease Isolated Singapore Army Camp," wrote of the discovery of what "may be a form of sleeping sickness."

The Army Medical authorities in Singapore immediately issued an official statement to the Press giving an account of what had in fact occurred and this did much to check rumours and allay alarm.

Some newspaper headings which were published in a later Singapore epidemic are reproduced below.

Polio Warning In Federation

ADVICE ON POLIO

THE following advice on pre-cautionary measures to prevent the spread of infantile paralysis has been officially issued:

MAN-IN-THE-STREET

Should The Schools Be Closed?

S'PORE RADIO S.O.S. FOR POLIO NURSES

Public Warned On Polio 'Cures'

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