

ON THE
PREVALENCE AND FATALITY OF SCARLATINA AS
INFLUENCED BY SEX, AGE, AND SEASON.

BY EDWARD BALLARD, M.D., F.R.C.P.

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DURING the twelve years 1857-68, I have found recorded in the books of the Poor-law Medical Staff and of various medical institutions in Islington to which I have access, 3,850 cases of scarlatina. These twelve years include three epidemics, namely, those of 1859, 1863, and 1867-8; three years intervening between 1859 and 1863, and three years again between 1863 and 1867.

Sex and Age in their Relation to Scarlatina.—The following table gives the numbers of each sex and at each age of importance attacked with the disease during the twelve years.

The statements of authors upon this subject are neither precise nor accurate, as I shall point out as I proceed. In the first place, my tables show that there is scarcely any age, except, perhaps, the very earliest infancy, which is absolutely exempt from the invasion of scarlet-fever. The youngest patient whose age I have found in my records stated in weeks was a female infant aged 5 weeks; the oldest was a woman aged 74 years. Bouchut remarks that the disease is "scarcely observed until towards the end of the first year". Out of my 2,375 cases, 45, or about 2 per cent., were in children under 9 months. My observations, when the ages of attack are taken in quinquenniads, also bear out the statement of Bouchut, that the maximum of cases occur between the ages of 5 and 10 years; and that of Dr. Clark (as quoted by Willan), together with the opinion currently held in the profession, that children under 10 years of age are the most liable to attack. Dr. Copland gives a very broad range when he states that the susceptibility is greatest between the period of weaning and fully adult age. No doubt it is; but, inasmuch as comparatively

* See note, page 182.

TABLE I.

Total,	Under 3 Mos.	3 Mo.	6 Mo.	9 Mo.	Under 1 Yr.	1.	2.	3.	4.	Under 5 Yrs.	5.	6.	7.	8.	9.	5 Yrs. and under 10 Yrs.	10.	15.	20.	40.	60 Yrs. and up- wards.
Males, 1112.	4	9	15	7	35	49	94	129	138	445	131	110	88	61	47	437	133	42	47	8	...
Females, 1260.	1	3	13	11	28	56	84	119	138	425	124	119	120	83	44	490	186	66	81	11	1
Sex not named, 3.	...	...	...	...	...	...	...	2	...	2	1	...	...	...	...	1	...	...	...	...	...
Both sexes, 2375.	5	12	28	18	63	105	178	250	276	872	256	229	208	144	91	928	319	108	128	19	1

It relates to 2,375 *pauper* cases in which the age and sex are specially mentioned. The proportionate liability of each sex and age to suffer from scarlatina may be deduced from the next table, in which the numbers are stated per 10,000 of the population at each age in each sex.

TABLE II.

	Under 1 Yr.	1.	2.	3.	4.	Under 5 Yrs.	5.	6.	7.	8.	9.	5 Yrs. and under 10 Yrs.	10.	15.	20.	40.	60 Yrs. and up- wards.
Males ... 159	144	235	445	629	723	421	713	624	521	377	305	517	195	68	20	6	...
Females ... 148	118	275	413	625	717	414	668	665	697	502	278	570	251	75	27	8	2
Both sexes, 132	132	255	430	627	720	418	693*	645	610	441	291	544	224	72	24	7	1

* The liability at separate ages from 5 to 10 is calculated on a basis of population obtained by assuming a regular arithmetical progression in the numbers living from 10 years to 5 years, as given in the Census Tables.

very few cases indeed occur after adult age, such a statement is equivalent to giving no information at all. The greatest age at which this writer has observed it was between 50 and 60 years. According to my tables, the age at which the largest number of cases occurred was between 4 and 5 years; that is to say, in the course of the fifth year of life. This is also, according to Table II, the age of greatest liability to attack. The age of greatest proclivity to scarlet-fever, then, is a year later than that of greatest proclivity to measles (according to my observations). There is a gradual, but not absolutely regular, progression in the liability to scarlet-fever from birth to the fifth year of life. On the whole, this increase of liability is much more rapid than the decrease of liability year by year after the fifth year of life is completed. Hence it is that a larger proportion of cases is met with from 5 to 10 years than from 0 to 5 years of age. At 6 years of age, the liability is much the same as at 3 years, and at 8 years not very different from what it is at 2 years of age. After 8 years of age has been attained, the liability lessens rapidly to 10 years. From 10 to 15 years the decline of liability is again rapid, and continues so to extreme age. Dr. Tweedie gives a table of the ages of 200 persons of the two sexes admitted with scarlatina into the London Fever Hospital. Of these, 110 were between 15 and 25 years of age, and hence he says it "disproves the assertion of Sir Gilbert Blane, and others, that the majority of those who are seized with scarlatina are under puberty". But nothing can be more fallacious than the statistics of hospitals in respect of such a question as this, for not only are young children almost invariably excluded, but the tendency of mothers among the lower classes is distinctly to nurse their offspring at home, however infectious the disease, until they are overruled by the independent will of the latter. Among the pauper population of my district, so far from even half the cases being between 15 and 25, only 10.7 per cent. of all the cases happened at any age over 15 years. I may mention that the greatest age at attack mentioned by this writer was 57 years. As I remarked in speaking of measles,* my tables give no indication at all that the period either of first dentition or of puberty exerts any influence in predisposing to an attack. Nor is it clear that the period of second dentition has any remarkable predisposing

* The mention of observations as to measles here and in other parts of this paper has reference to a previous paper, similar to this, which was communicated to the Metropolitan Association of Medical Officers of Health, but still remained unpublished.—E. B.

influence; for although the age 5 to 10 corresponds with the eruption of the first molar incisor and bicuspid teeth, and during this period the liability to scarlet-fever is high, yet the greatest liability to scarlet-fever is observed between 5 and 8 years, when the influence of second dentition on the general health is, I believe, if noticeable at all, less than at a more advanced period. Comparing now scarlet-fever with measles, it is observable that, in the first quinquenniad of age, the latter is nearly four times more commonly met with than the former; in the second quinquenniad, scarlet-fever is a somewhat more common disease than measles; in the third quinquenniad, scarlet-fever is three times as common as measles; in the fourth quinquenniad, about five times as common as measles; from 20 years of age onwards, although the difference of liability is not so great, still it is very greatly on the side of scarlet-fever. As regards the first year of life, it is to be noticed in Table I that the liability to the disease increases in the several successive trimensual periods (allowing for the correction* necessary for the fourth of these periods). Taking this fact in connection with the regular increase of liability afterwards, we can have no difficulty in setting aside the far-fetched and not very scientific explanation of the immunity of sucking-children from scarlet-fever put forth by Dr. Copland, viz., that the infant is "then nourished by a secretion directly from the secreting organ of the mother, and thus possessing some measure of an invigorating vital emanation, thereby enabling the infant to resist the infection."

The general law of age thus enunciated for the two sexes taken together applies to each separately, although there are differences in the liability of the same ages in the two sexes, which I shall allude to presently. It is to be noticed that while there are 1,112 males included in Table I, the females attacked with scarlatina amounted to 1,260. Taking these numbers without proper allowance for the numbers of each sex living, the inference might be drawn that the female sex was more predisposed to scarlatina than the male. And this, indeed, is the statement made by some writers, and among them by Dr. George Burrows. Dr. Tweedie, basing his opinion upon the unreliable table constructed from the Fever Hospital cases, also states it as his experience that females are more liable than males. Among his 200 cases there were 138 females to 62 males, the females being in excess at all ages. I cannot explain this, except by some peculiarity attaching to the hospital itself, such,

* This correction is for the tendency of mothers in stating ages about twelve months to call them *one year*.

possibly, as the accommodation for female patients being greater than that for males, or the greater proportion of males being received into the hospital on account of other febrile diseases. Anyhow, it is utterly at variance with the facts as they come out in my more extended tables. Withering and Bouchut state that the number of boys and girls attacked are equal, and Dr. Clark that they are almost equal under twenty years of age. If Table II, however, be consulted, the fact becomes apparent that, taking the numbers of each sex living into account, males are, on the whole, rather more liable to scarlet-fever than females. A similar difference, but more strongly marked, was noticed in the case of measles. But while this is the fact as respects all ages taken together, it is not the fact when distinct periods of life are compared in the two sexes. Up to about six years of age, males are more liable to be attacked by scarlet-fever than female children, but beyond this age the greater liability is decidedly on the side of the females. A similar fact was noticed when I was considering the subject of measles, but, in this latter disease, the turning point of liability was the fourth, and not the seventh year of life. Both Clark and Withering noticed that adult females are more liable to attack than adult males. Hence, it results that, under five years of age, the preponderance of liability to suffer from the disease is slightly on the side of the male sex, and between five and ten years, and in each succeeding quinquenniad, very much on the side of the female sex. There are, however, two ages at which this rule does not seem to apply. One is the second year of life, the period of active first dentition, when it is clear that female children are more liable to scarlatina than male children. The other, my table indicates, is the tenth year of life; but, from the mode in which this part of the table is calculated, the indication may not be true.

Season, etc.—Authors are pretty well agreed that autumn is the season at which, as a rule, scarlatina is most prevalent, and my observations confirm their opinion. Stating its prevalence during the twelve years, as per 1,000 cases in the whole public practice, I find that they were distributed thus

1st or Winter Quarter.	2nd or Spring Quarter.	3rd or Summer Quarter.	4th or Autumn Quarter.
Jan. ... 65 cases	April ... 57 cases	July ... 91 cases	Oct. ... 145 cases
Feb. ... 68 ,,	May ... 56 ,,	Aug. ... 86 ,,	Nov. ... 114 ,,
March... 44 ,,	June ... 60 ,,	Sept. ... 122 ,,	Dec. ... 92 ,,
— 177 ,,	— 173 ,,	— 299 ,,	— 351 ,,

As a rule, then, this disease forms one wave of prevalence in the course of the year, the smallest number of cases occurring in the month of March, the largest in the month of October. Spring and winter are the seasons when it prevails least, and summer and especially autumn those in which it prevails most. Erasmus Wilson states that "the atmospheric conditions favourable to scarlatina are cold and moisture combined, and the existence of this state of the weather for any time gives rise to a medical constitution in which scarlatina is apt to be developed." There could scarcely ever occur a year in which this combination of conditions would be more marked than the memorable year 1860, yet in this year scarlatina, as an epidemic, was in abeyance throughout. It had prevailed as a severe epidemic in the summer and autumn of 1859; and in the first quarter of 1860, which, though cold in February, was not wet, there was an amount of scarlet-fever above the average for the season; but, throughout the rest of the year, which was very wet, cold, moist, and miserable, scarlet-fever was below the average prevalence. And, if it be said in reply that the susceptibility of the population had probably been exhausted, I may refer to the epidemic of 1867, which failed to exhaust the susceptibility of the population so far as to prevent the disease raging through the hot and dry year 1868. Indeed, it has appeared to me pretty clearly from my own comparisons of the meteorological conditions of the several forty-eight seasons with the prevalence of scarlet-fever in each, that its extension is favoured by quite an opposite state of weather to that mentioned by Mr. Wilson, namely, by a temperature above the average for the season, and that a dry state of the atmosphere with little rain favours its spread more than the reverse conditions. In the autumn, however, it was most prevalent in the years when the seasons on the whole were warm and rainy. My observations have led me to infer that the weather most favourable to an outbreak of scarlet-fever is one in which the mean temperature is somewhere between 56 and 60 deg., but that a temperature higher than this is not absolutely unfavourable. When the temperature falls below 53 deg., we may, when scarlet-fever is prevalent, look for the commencement of its decline. There is, as I have before mentioned, something like an indication of cyclical recurrence of an epidemic of this disease to be observed in my records, having a period of recession extending over three years. That it did not recede after the epidemic year 1867, may be due to the peculiarly favourable (to scarlatina) meteorological conditions of 1868. Dr. Tweedie says (and this observation has been copied by systematic

writers) that "epidemic visitations are most observed after a warm summer, especially when the heat has been accompanied by continual rains." Our epidemic of 1859 commenced in the third week of September, the mean temp. being about 58 deg. the week before. The summer throughout, from the beginning of June to the end of August, had been hot and dry, with the exception of two weeks of heavy rainfall. The epidemic of 1863 may be regarded as commencing in the third week of September 1862; but the preceding summer was remarkable for being cold and damp from the very beginning of June. The worst of the 1863 epidemic began about the first week in July, the previous winter and spring months having been comparatively warm, with very little rain. The epidemic of 1867 commenced with severity in the first week of October, although the disease had been prevailing unusually all the year since the autumn of 1866. There had been about five weeks' warm weather in August and September, with a good deal of rainfall—indeed, the quantity of rain that fell that summer was enormous (11.40 inches); but, with the exception of these five weeks, the weather had been comparatively cold, almost uniformly so, from the third week in May to the third week in August. So that thus far Dr. Tweedie's observation does not correspond with mine.

The Fatality of Scarlatina in Relation to Age.—This is represented in the following table*:

TABLE III.

AGES.	CASES (among Paupers; <i>vide</i> Table I).	DEATHS (in entire Parish).	Proportion of Deaths in whole Parish, to 10 Pauper Cases.
Under 1 year ...	63	139	22.1
1 & under 2 yrs.	105	265	25.2
2 " 3 "	178	365	20.5
3 " 4 "	250	300	12.0
4 " 5 "	276	232	8.4
Under 5 years...	872	1301	14.9
5 & under 10 yrs.	928	495	5.3
10 " 15 "	319	106	3.3
15 " 20 "	108	38	3.5
20 " 40 "	128	54	4.2
40 " 60 "	19	15	7.9
60 years and up- wards.	1	1	10.0

* These old results of mine may be usefully compared with the results of a similar comparison of cases and deaths more recently made by the Registrar-General. (*Registrar-General's Forty-Ninth Annual Report*, pp. xiv-xviii.)—E. B.

Hence, taking both sexes together, we observe that *the fatality lessens from infancy, when it is greatest, up to about fifteen years, after which it gradually increases until advanced age.* But at no period of life is the fatality of the disease so great as it is at the ages below four years. This result corresponds with the observation of Mason Good, that scarlatina is not only rare, but, also for the most part, less violent in adults, and is opposed to the opinion expressed by Dr. Tweedie, that the disease is more severe in adults than in children; an opinion which Dr. Maunsell also adopts. Equally are my statistics at variance with the results of Dr. Copland's observation, who says that, according to his experience, the younger the child the milder is the attack.

The second year of life is only a little more disposed to impart a fatal tendency to scarlet-fever than the first; and although the period of puberty is the turning-point at which the disease begins to become again more fatal, there is no reason to believe that this period in itself is especially dangerous.

The Influence of Sex on the Fatality of Scarlatina.—In order to discover this I have tabulated the ages of 466 fatal cases in males and 414 fatal cases in females, which were all that occurred in Islington during the six years, 1857-1862: the following statement represents the result, together with the proportion borne by the deaths at each age in the entire parish to the cases in public practice at corresponding ages during the same period.

TABLE IV.

AGES.	CASES (among Paupers, Table I).		DEATHS (in entire Parish), 1857 to 1862.		Proportion of Deaths in entire Parish, to 10 Pauper Cases.	
	Male.	Female.	Male.	Female.	Male.	Female.
Under 1 year ...	35	23	34	20	9.7	7.1
1 & under 2 yrs.	49	56	56	54	11.4	9.6
2 " 3 "	94	84	85	72	9.0	8.6
3 " 4 "	129	119	79	64	6.1	5.4
4 " 5 "	138	138	53	49	3.8	3.7
Under 5 years...	445	425	307	259	6.9	6.1
5 & under 10 yrs.	437	490	130	99	3.0	2.0
10 " 15 "	133	186	20	29	1.5	1.6
15 " 20 "	42	66	5	13	1.2	2.0
20 " 40 "	47	81	4	11	0.9	1.4
40 " 60 "	8	11	0	2	0.0	1.8
60 years and up- wards.	0	1	0	1	?	10.0

The inference to be drawn is, that to a slight extent scarlet-fever is a more fatal disease with males than with females up to about the period of puberty, when the state of things is reversed, and the disease presses more fatally upon females than upon males. My experience quite confirms the opinion commonly held of the special fatality of scarlet-fever when it attacks women recently confined. As respects males, it is observable that the table indicates a steady decrease of fatality from infancy onwards. During the six years there were six cases of scarlet-fever in the public practice among males above 40 years of age, but no deaths; among females there were five cases above 40 years, and three deaths. But neither among adult males nor adult females is the fatality of scarlet-fever such as it is in infancy.

Fatality of Scarlet Fever in its Relation to Season.—During the twelve years, 1857-68, there were recorded 3,850 cases in public practice, and 1,993 deaths from scarlet-fever occurred in the entire parish. Distributing both into the seasons in which they happened, and calculating the proportion borne by the deaths in the entire parish to the cases in the whole public practice, we arrive at the following result.

TABLE V.

	CASES.	DEATHS.	Proportion of Public Cases, to 10 Deaths in entire Parish.	Proportion of Deaths in entire Parish, to 10 Cases in the Public Practice.
1st or Winter Quarter	670	459	15	6.9
2nd „ Spring „	671	362	19	5.4
3rd „ Summer „	1174	456	26	3.9
4th „ Autumn „	1335	716	19	5.4

The inference deducible from these numbers is that scarlet-fever has proved with us a less fatal and serious disease on the whole in summer months, and that it has been most fatal in the months of winter. In spring and autumn the fatality of the malady has been intermediate, but approaching in its severity nearer to the character of the disease in winter than to its character in summer. It is curious, therefore, to find Hebra stating that his observations do not lead him to attribute to the season of the year any perceptible influence on the issue of this exanthem. It is right, however, that I should state that the mortality given in my table includes deaths from such sequelæ as dropsy. In the summer-time, exposure during desquamation is less dangerous than at

other periods of the year, while the danger is greatest in the winter, and in those months of the spring and autumn quarters which approach nearest to winter in their weather characteristics. Dr. Tweedie states that the disease is generally of a milder character in the spring and summer than in the autumn and winter months.

[I cannot but feel that some apology is needed on my part for permitting the publication of this antiquated paper, which was originally (about the year 1869) communicated to the then "Metropolitan Association of Medical Officers of Health". But since the Society have considered that the facts recorded in it are even now worthy of preservation, in connexion with Dr. Whitelegge's more recent observations, I can only submit to their decision, leaving it to the discretion of the President to publish the paper in full (notwithstanding its criticisms of writers now more or less superseded) or to elide such portions as might be regarded superfluous.—E. B.]
