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T H E S I S

For the degree of M.D., EDINBURGH UNIVERSITY

on

The FREQUENCY, INCIDENCE and DURATION of VARIOUS
COMPLICATIONS met with in a SERIES of 500 CONSECU-
TIVE CASES of SCARLET FEVER.

by

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PREFACE.

The scope for the work in the following thesis arose while I was Resident Medical Officer in Kings Cross Fever Hospital, Dundee, during the whole year of 1912 and part of 1913.

During my term of office, there were admitted to the Hospital (over and above other Infectious Diseases) more than 600 cases of Scarlet Fever: I have taken 500 consecutive cases of these as a basis for my calculations and deductions.

In every case the patient was admitted and discharged during my tenure of office so that only my own observations are recorded.

EXPLANATORY NOTES.

- A. In the following pages, "Frequency", is given as a percentage of the total series of cases (500) under review irrespective of whether complications arose or not.
- B. "Incidence", is given as a percentage only of those cases (186) that developed one or other of the complications.
- C. As regards "Duration", this is expressed as an average, in days or weeks, over which the complications were observed to last.
- D. The total number of complicated cases given includes all fatal cases; and also, such conditions as Double Infection, Post Scarlatinal Diphtheria and Return Cases.
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ACCOUNT OF THE CASES INVESTIGATED.

The total number of cases under review was 500.

Males 202.

Females 298.

Of these 500 cases of Scarlet Fever 492 were discharged cured = 98.4% of recoveries and 8 died which is equal to a mortality of 1.6%.

Number Complicated.

The number of cases in which complications of one kind or another occurred in these 500 cases was: -

186 = 37.2%.

Males 77 = 38.1%.

Females 109 = 36.5%.

From these figures it will be observed that in Scarlatina the mortality is an exceedingly low one (1.6%).

On the other hand Scarlatina is a disease which does not appear to run an un-interrupted course free from complications of one sort or another as is shown by the high figure of 37.2% of total complicated cases.

As was pointed out in Note D. this includes such/

such conditions as Double Infections, Post Scarlatinal Diphtheria and "Return Cases"; but, as complications are just as liable, if not more so, to occur in these, it would be a great error to leave them out in arriving at any calculation or in making any deduction.

SUMMARY OF COMPLICATIONS.

The various Complications met with and their frequencies of occurrence are given in the following table.

COMPLICATION.	FREQUENCY.
Arthritis	6.2%
Adenitis	10.2%
Otitis Media	7.8%
Rhinitis	9 %.
Acute Nephritis	2.2%
Relapse	2.8%
Broncho-Pneumonia	1 %.
Endocarditis	.4%
Toxaemia	1.4%
Double Infections	2 %.
Post Scarlatinal Diphtheria	1.8%
"Return Cases"	1.6:
Miscellaneous.	-

ARTHRITIS.

FREQUENCY.

The condition of Arthritis was found to occur in 6.2% of the total cases under review; the corresponding figure for males being 5.9% and for females 6.3%. Now, in these 500 cases it will be seen that the proportion of females is very much larger than males (298 against 202) therefore the slight difference in the percentage obtained would be very much larger if an equal number of males and females had been taken; from this then it is safe to deduce that the occurrence of arthritis is much more frequently met with in the female group than in the male group.

INCIDENCE.

The number of cases actually observed was 31, of which 12 were males and 19 females, so that the incidence of this complication out of the total number of complicated cases was 16.6%; the corresponding figures for males and females read 15.5% and 17.3%.

ONSET.

As regards the time of onset of the joint affections/

affections, 22 cases developed the symptoms within the first week = 70%. Only 4 cases showed it during the second week = 12.9%. In the third week only 2 cases, and in the fourth week 2 cases again = 6.4% in both. No fewer than 15 cases occurred on the fourth or fifth day of illness, therefore it is safe to assume that the first week is the most likely period for this complication to assert itself.

AGE APPEARING.

Under 5 years of age arthritis was only noted in one case = 3.2%.

Between 5 and 10 years it occurred in ten cases = 32.2%.

Between 10 and 20 years it again occurred in ten cases and once more between 20 and 30 years it was observed in ten cases.

On taking the incidence up to 10 years (i.e. in the 1st decade) I find arthritis occurring in 35.4% of my series of cases; while over 10 years and up to 20 years yields 32.2% and again over 20 years and up to 30 years gives the same i.e. 32.2%.

Now, in view of the fact that scarlet fever is primarily a disease of childhood, it will be very evident/

evident that more cases will be met with in the first 10 years of life. Fewer cases will be found during the 2nd 10 years of life and fewer still in the 3rd 10 years.

Bearing these factors in mind, the results above given point to the 3rd decade being the most usual age at which arthritis is likely to appear; similarly, the 2nd decade will come next in order of frequency, and the first decade the least frequent.

As there were no cases recorded over 40 years of age, it is impossible to say what the results would then have been but, if any deduction can be drawn from the material at hand, it would point to arthritis being more frequent as the age of the patient advances.

JOINTS AFFECTED.

The joints affected in their order of frequency were (1) wrists, (2) shoulders, (3) knees, (4) elbows, (5) fingers.

One child developed a typical Erythema Nodosum rash on the fronts of both legs the day following the onset of the joint pains, which were situated in his wrists and ankles.

DURATION./

DURATION. Average 4.3 days.

Arthritis complicating scarlet fever does not appear to be of a very severe type, though the pain experienced, and disturbance of temperature noted, are very often considerable.

The condition has generally subsided within 4 or 5 days. In the series under observation, 22 were quiescent in less than 5 days, 8 in less than 10 days, while one lasted for very much longer and eventually developed into a Tubercular Synovitis of the knee.

This is the only case that required operative treatment and was unusual from the beginning in that the arthritis was very long in making its appearance, namely the 69th day, and was probably tubercular from the beginning. Suppuration occurring in a joint after Scarlatinal Arthritis is, I hold, very rare. The above example was the only one noted and the probability is that the diagnosis was Tubercular Synovitis of the knee from the very commencement.

ADENITIS/

ADENITIS.

In considering the cases under this heading no attention has been paid to enlargement of the glands during the first week of illness, i.e. during the acute stage of the disease, as it is obvious that where the throat is acutely inflamed, as in scarlet fever, there must also be some enlargement of the sub-maxillary and cervical glands in the neck.

In septic cases of scarlet fever the initial enlargement is often of such a degree as to practically encircle the whole neck.

The adenitis now under observation is one that arises after the acute stage in the throat has disappeared and will hereafter be spoken of as "late adenitis". (See, Ker page 104).

FREQUENCY.

Late adenitis was found to appear in 10.2% of the total cases examined and in 13.3% of the males and 8.05% of the females.

It was in all cases associated with an elevation in temperature, generally from 101° - 103°F, simultaneously with enlargement of the glands in the neck, either on one side or on the other, and occasionally on both sides.

INCIDENCE/

INCIDENCE.

In all, 51 cases were found to develop enlargement which is equal to a percentage of 27.4 of complications. Of these 51 cases, 27 were in males and 24 in females, which is equal to 35% and 22% respectively.

ONSET.

In the first week no notice was taken of any as explained above.

In the second week 12 cases were observed which is equal to 23.5% of this particular complication.

In the third week 30 cases were observed = 58.8% of cases.

In the fourth week no cases were observed.

In the fifth week 9 cases were noted = 17.6%.

Thus it would appear that adenitis is most likely to develop in the third week of illness i.e. somewhere between the 15th and 21st days.

AGE APPEARING.

Up to 10 years of age 39 cases were observed which is equal to 76.4% of the number.

From 10-20 years of age the remaining 12 cases/

cases were noted = 23.5%. There were no cases after 20 years of age.

From these facts it would seem that the first decade is the most common age period for this complication to be found, and that the condition becomes rarer as the age of the patient advances. This is in direct contrast to what was found to be the case in arthritis.

GLANDS AFFECTED.

The glands affected in this complication of Scarlet Fever are all situated in the cervical region. I have never noted inflammation of glands in other regions of the body, e.g. groin or axilla etc., without an apparent cause for such:-- viz. a wound or abrasion of the skin in such a situation as would affect these glands if the lymphatics running into them were involved.

In enlargement, then, of the glands of the neck in Scarlet Fever, it is highly probable that the infection is conveyed directly to them from the throat. In support of this theory, it is sometimes found that one or other of the tonsils or pillars of the fauces is at the same time inflamed or ulcerated; but, on the other hand, one can often find no obvious lesion/

lesion to account for it. Again, adenitis may simply be the result of irritation from toxins, as is supposed to be the cause of nephritis and arthritis; in my opinion, however, I hold the belief that it is due to direct action from oral sepsis and is analogous to the occurrence of such conditions as Otitis Media and rhinitis.

DURATION.

The condition is not one of long duration, averaging only 4.4 days in any series of cases. Even when actual suppuration does occur, once the pus is evacuated, the condition very rapidly heals up. In 41 cases the adenitis subsided without any surgical means, while in the remaining 10 cases it progressed to suppuration and required incision and drainage.

OTITIS MEDIA.

FREQUENCY.

Complications under this heading were found in 7.87 of the total number of cases examined. This is equivalent to a percentage of 10.3 in males and 6.04 in females.

INCIDENCE/

INCIDENCE.

Thirty-nine cases were found to develop acute inflammation of the middle ear, in one or other (or both) of their ears. This gives an incidence of 20.9% of the total complications observed. Of these 39 cases, 21 were in males and 18 in females which is equal to 27.2% in males and 16.5% in females.

ONSET.

Otitis Media is very often preceded by a sharp rise in temperature and pain in, or behind, the ear. Sometimes, however, no pain is complained of and in a few cases not even was a rise in temperature noted.

During the first week of illness 9 cases developed Otitis Media - 23.07% of the actual number found to have this condition (i.e. 39 cases of Otitis Media).

In the second week 13 cases developed this complication = 33.3%.

In the third week 8 cases were observed = 20.5%.

In the fourth week only 3 cases and in the fifth week 4 cases - 7.6% & 10.2% respectively.

From/

From these figures it will be seen that the 2nd week is the most likely time for this complication to set in, but that it is also very frequently observed during the first and third weeks. After the third week, though Otitis Media is by no means unknown, there is a decided diminution in the number of cases recorded.

It will also be noted that no less than 30 out of the 39 cases occurred within the first three weeks, (i.e. 76.9% of them) while the remaining 23.1% occurred at a later date.

The obvious inference from this is, that acute Otitis Media, as a complication of Scarlet Fever, most commonly makes its appearance within the first three weeks of illness. This general statement is made irrespective of the type of Scarlatina, for, whereas in septic cases Otitis Media makes its appearance early - usually within the first week - in the ordinary mild types it appears later in the disease - from the second week onward.

AGE APPEARING.

The age at which Otitis Media is most frequently observed is in the first 10 years of life.

Out/

Out of the 39 cases under discussion, no less than 34 of these developed Otitis Media under this age, which is equal to 87.1% of the total number. From 10-20 years of age the remaining 5 cases made their appearance = 12.8%.

There were no cases of Otitis Media after that age.

It will thus be seen that Otitis Media presents points of marked similarity in its age incidence to that of Adenitis: e.g. more frequent in first decade, rarer in second decade and total absence in third. As in Adenitis there is a marked contrast to the age incidence of Arthritis.

EAR AFFECTED.

The affection does not appear to be more frequent on one side than on the other. In my series of 39 cases, 15 affected the right ear only, 13 affected the left ear only and in 11 cases there was a double ^{of} infection.

DURATION/

DURATION AVERAGE.

After making its appearance, Otitis Media varies greatly in the length of time it persists. On an average the condition was found to be completely cured in 25.3 days. The shortest time I have observed was 4 days, and in that time the ear was perfectly dry and did not discharge again. On the other hand one of my cases continued to discharge persistently for 70 days before finally ceasing, and this in spite of all treatment. These two examples, however, are both extremes, and the average duration was between 3 and 4 weeks.

All my cases eventually made a complete recovery and there is no record of a case having to be discharged with the ear still 'running'.

In no case did the condition spread to the mastoid cells causing an acute mastoiditis, and in no case was there even a superficial mastoid abscess.

There were no cerebral complications either noticed in any of the cases.

It would seem, therefore, that Otitis Media does not commonly give rise to the more serious complications of itself, but the scanty number of cases actually under review may partly account for this.

RHINITIS./

RHINITIS.

FREQUENCY.

This condition was found to be present in 9% of the total cases; in 11.3% of the total males and in 7.3% of the total females.

INCIDENCE.

The number of cases of this complication noted was 45. This is equivalent to a percentage of 24.1% of the total complications - of these 45 cases 23 were in males and 22 in females - the corresponding percentages being 29.8 and 20.18.

ONSET.

During the first week of illness, 15 cases developed discharge from the nose = 33.3% of the actual cases.

During the second week, 7 cases developed it = 15.5% of the actual cases.

In the third week, only 4 cases took it = 8.8% of actual cases.

In the fourth week, 7 cases developed it = 15.5%.

In/

In the	fifth	week	4	Cases	=	8.8%
"	"	sixth	"	7	"	=15.5%
"	"	seventh	"	0	-	
"	"	eighth	"	1	Case	= 2.2%

From these figures it will be readily seen that, rhinitis is liable to develop at practically any time during the whole period of illness or convalescence.

In my series of cases, however, the largest number were found to develop this condition in the first week of illness. This result may, quite probably, be due to the fact that the type of Scarlatina was, in their cases, more or less of the septic nature.

It would appear, therefore, that though rhinitis is frequently present in the acute stage of the illness, it is also not rare during the desquamating and convalescent stages as the preceding analysis shows.

After the first week it may develop at any time and is just as commonly found in the 6th week as in the 2nd.

In my series of cases, there is a curious co-incidence in the numbers observed during the 2nd, 4th/

4th and 6th weeks, which are all the same, and again the co-incident is found in the numbers of the 3rd and 5th weeks.

The condition when met with, is often associated with the presence of enlarged tonsils, and, as they again are generally accompanied by an exuberance of adenoid tissue at the back of the nose, it can readily be imagined that the presence of adenoids must greatly predispose to the occurrence of this complication.

Where this (adenoids) is the case, one would expect the Rhinitis to show itself early in the illness, (i.e. within the first 2 weeks). Rhinitis, however, often appears at a much later date, as is shown in the figures analysed, and another cause must be found to explain its occurrence at this period. In these later cases, Rhinitis is probably the result of a general debility or anaemia, following on the original illness and long confinement in Hospital.

AGE APPEARING.

Under 5 years	there were	12	cases	=	26.6%	} 95.5%
From 5-10 "	"	"	31	"	= 68 %	
" 10-15 "	"	"	2	"	= 4.4%	

From/

From these figures it will be seen that the 1st decade is ^{by far} the most common age for this complication to arise. No less than 95.5% of the cases occurred at this time.

After the age of 10 it is very rare to have Rhinitis as a complication of Scarlet Fever. In my series of cases there were only two such cases (aged 12 and 13 years) observed, and none after the age of 15 years.

This frequent occurrence during the first 10 years only of life, is a strong argument in my opinion, in favour of adenoids being to a great extent a predisposing factor in the causation of Rhinitis as a complication of Scarlet Fever. On the other hand, Scarlatina is essentially a disease of childhood, and therefore, the majority of cases are under 10 years to begin with. But, if comparison is made with the figures from other complications - e.g. Arthritis, there can be no doubt about the incidence being more frequent under 10 years of age.

DURATION.

The length of time this condition takes to recover is an exceedingly protracted one. The average/

average of my series was no less than 35.4 days, i.e. considerably over 1 month. The shortest time I observed was 14 days and the longest 89 days. Now, in view of the fact that Rhinitis is liable to commence at almost any time during the isolation of the patient, it will be readily seen that it can (and does) delay the convalescence abnormally.

Rhinitis is an extremely difficult complication to combat, as it so often persists in spite of all kinds of treatment. Even when it has been successfully stopped, it is liable to break out again on the slightest provocation, and when this happens after the patient has been sent home, it ^{is apt to} give rise to what is termed in Hospital "Return Cases". Rhinitis is probably the most fruitful source of these so called "Return Cases".

NEPHRITIS.

FREQUENCY.

Complications of the above were conspicuous by their extreme scarcity in my series of 500 cases. Only 11 cases were found to develop acute Nephritis at one stage or another of the whole illness. This is/

is equal to a percentage of 2.2% of the total cases under review. 1.4% in males and 2.6% in females.

INCIDENCE.

Only 11 cases, as stated before, were observed. This is equal to 5.9% of the total complications.

Of these 11 cases 3 occurred in males, which is equal to 3.8% of the male complications, while 8 were in females giving the corresponding percentage of 7.3.

It will thus appear that, as regards the purely sex incidence, the occurrence of Nephritis is more frequently to be observed in the female group.

ONSET.

In all but two cases the diagnosis was undoubtedly a correct one - blood and albumen appearing and lasting for some considerable time.

In the two exceptions mentioned there is some doubt as only albumen appeared, and lasted 1 day in one case, and 3 days in the other.

During the 1st. week of illness, 1 case developed acute nephritis with the presence of blood and albumen in the urine and all the symptoms of a typical case. This is 9% of the actual cases.

During/

During the 2nd. week, 2 cases developed this complication = 18.1% of the actual cases.

During the third week, 4 cases developed it = 36.3%.

During the fourth week, 3 cases = 27.2% and in the fifth week, 1 case = 9%.

From the facts stated above it will be evident that the third and fourth weeks of illness are the most frequent times for this complication to show itself. No less than 7 out of the total 11 cases commenced between the 17th and 26th days inclusive = 63.6% of them.

As regards the presence of Acute Nephritis in the 1st. week of illness, this must be looked upon as a rather unusual occurrence. It is certainly quite common to meet with albumen in the urine during the first week but this is true of nearly all diseases where the temperature is sufficiently raised to create a disturbance in these eliminating organs of the body. These cases, however, differ markedly from true nephritis, in that blood is never present in the urine, and there is no cedema of the cellular tissues. In addition the albumen present, though perhaps plentiful, is of short duration and entirely disappears when the temperature regains its normal level. Also the/

the amount of urine passed is nearly normal. This is quite unlike true Nephritis.

AGE APPEARING.

Under 5 years	there were	5 cases	=	45.4%.		
From 5-10	"	"	"	5 "	=	45.4%.
" 10-20	"	"	was	1 case	=	9 %.

From these data it is impossible to form any more definite opinion than that acute nephritis is much more commonly met with in the 1st. 10 years of life.

Only 1 case was observed after this time and that was in a youth of 16 years.

Adults, therefore, would appear to be particularly free from this complication.

DURATION.

The average duration in my series of cases was 13.3 days, but, if exception is made of the two doubtful cases before mentioned, then the average is 15.8 days.

This strikes me as being a particularly short period but it may be able to be explained by the fact that in all the cases the condition is quickly recognised in Hospital Practice and prompt treatment at once carried out. With one exception all/

all the cases eventually made a good recovery and were discharged with the urine absolutely free from the slightest trace of albumen. The exception I refer to was one boy who was taken away from Hospital at his parents' request (and needless to say against my advice). In his case there was still a trace of albumen left though the amount of urine passed daily was quite normal.

Whether in his case the condition became chronic I am unable to say, or, whether it would have become chronic if he had been allowed to stay in longer is equally uncertain. Certain it is, that, in Hospital, cases of Nephritis do not appear to have any great tendency to become chronic.

There were no deaths from Nephritis.

RELAPSES.

Under this heading it will be necessary for me to make two divisions of this complication.

I. True Relapse.

II. So-called relapse.

In I. the patient is admitted with an undoubted attack of Scarlet fever and after a certain period experiences a further similar attack, of rash, sore throat/

throat, desquamation, etc.

In II: or "SO-called Relapses", there has been a grave doubt about the original diagnosis, as, on admission neither rash nor sore throat was visible.

The tongue also was not typical and the patient never desquamated. In this group it is probable that the "relapse" was in reality the first attack, and, that the child had been sent into Hospital on a wrong diagnosis and contracted the fever in the wards.

In Dundee Fever Hospital, where there is no Observation Ward for doubtful cases, I found it exceedingly difficult to know what to do with them, as I could hardly take it on myself to doubt the diagnosis of the various medical Practitioners in the city, and send the children home again. As all cases were admitted to the Wards directly from the ambulance, according to the notification of the specific disease to the Medical Officer of Health, without the Resident first seeing them in the ambulance, a further difficulty arose with regard to them, namely, that they were now in an infected area and could not be discharged until after the incubation period had elapsed.

Whenever possible, however, a Side Room was allocated to these cases, and if at the end of a fortnight/

fortnight there was no sign of desquamation they were sent home.

Of Relapses in Scarlet fever I have notes of 20 cases altogether. 14 of these were cases of True Relapse and 6 of them were of the "So-called" variety.

Of the So-called variety no more need be said, as it could be of no utility in this work to analyse it further.

TRUE RELAPSES.

FREQUENCY.

They occurred in 2.8% of the total cases under review and in 2.4% of the males and in 3.02% of the females. True relapses are, therefore, according to the above statistics of a fairly common occurrence, but their cause is difficult to determine. It may be that a fresh infection is got from other cases in the wards, or it may be the result of auto-infection from the original sore throat. C. B. Ker (page 97), states that it is not entirely a Hospital Phenomenon but that it occurs also in General Practice, which points rather to auto-infection being the cause/

cause. In Hospital, however, it may easily be the result of a perfectly fresh infection from other cases, and who can say that there may not be different strains of the causative organism giving rise to mild or severe forms of the original illness?

INCIDENCE.

The actual number of true relapses was 14 cases = 7.5% of the total complications noted.

Of these 14 cases 5 were in males and 9 in females which is equal to 6.4% and 8.2% respectively.

The percentage incidence of 7.5 of the total complications met with seems to me to be a remarkably high one and one that had not struck me so forcibly while resident at Kings Cross Hospital as now when I come to compare the various complications observed.

It would also appear to be more frequent in attacking females than males.

ONSET/

ONSET.

During the first week there were 0 cases.

"	"	2nd.	"	"	was 1 case	= 7.1%.
"	"	3rd.	"	"	were 5 cases	=35.7%.
"	"	4th.	"	"	" 3 "	=21.4%.
"	"	5th	"	"	" 3 "	=21.4%.
"	"	6th.	"	"	" - "	-
"	"	7th.	"	"	was 1 case	= 7.1%.
"	"	8th.	"	"	" 1 "	= 7.1%.

The third week would appear to be the commonest time for a relapse to occur as 35.7% of the actual cases took place during that time.

The fourth and fifth weeks are also very likely dates for this to occur, the figures being the same for both weeks, namely, 21.4%.

The earliest date on which I observed a true case of relapse was on the 12th day, and the two latest on the 49th and 52nd days, but both of these cases had obviously been detained for a much longer period than usual owing to some other complication.

The inference is obvious and points to the fact that though the 3rd, 4th and 5th weeks of illness are the most frequent periods for this complication to appear, relapse may take place at a later date/

date and particularly so, it would appear, if the patient is kept in longer than the usual 6 weeks.

AGE APPEARING.

Under 5 years	1 case	had a relapse	=	7.1%
From 5-10	" 10 cases	" relapses	=	71.4%
" 10-20	" 3 "	" "	=	21.4%

From these data it will be seen that it is rare to have a relapse during the first span of life (under 5 years).

It will also be seen that during the second span the majority of relapses occurred, no less than 71.4% of the actual cases being under the ages of 5-10 years.

From 10-20 years relapses are probably fairly numerous too, and may compare quite favourably with the 5-10 years group as it must be admitted that in Scarlet Fever Wards there will be more children under 10 years of age than over 10.

SEVERITY OF ATTACK.

With one exception all the attacks were of a milder description than the original attack. The exception was one in which the patient developed an extremely/

extremely septic throat and septic type of rash. On swabbing the throat, the culture was seen to consist of numerous Hoffman's bacilli along with staphylococci and streptococci.

Though the attacks then, on the whole, were mild ones, the same cannot be said of the complications following them. No less than 7 out of the 14 cases (50%) developed one complication or another at a later date.

These were:-

	Otitis Media	2
	Nephritis & Otitis	1
	Severe Arthritis	1
	Diphtheria	2
(Very mild)	Second relapse	1

This second relapse took place one month after the first one, but the patient did not desquamate a third time.

DURATION of FEVER.

The average duration of the eruptive stage of the fever was 6.1 days. The shortest time was 2 days and the longest 19:

Leaving/

Leaving out the two longest periods (16 and 19 days) in which septic throat and severe arthritis prolonged the temperature unduly, the average is only 4.9 days.

It will thus be seen that with these two exceptions the type of fever is a much more mild one than the average initial one of Scarlet Fever.

BRONCHO-PNEUMONIA.

Complications of this nature were exceedingly rare, only 5 cases being observed out of the whole total = 1%. This is equal to 2.6% of the total complications.

A further analysis of such a small percentage would only be reducing the text of this thesis to a farce and could serve no useful purpose.

As regards the onset of the complication all cases were observed during the 1st. week of illness.

As regards age, all were under 10 years. The duration of the complication averaged 7 days and the condition terminated with one exception by gradual lysis.

There were no fatal cases.

ENDOCARDITIS/

ENDOCARDITIS.

The number of cases where true organic valvular disease of the heart was diagnosed was exceedingly small, and there can be no doubt that endocarditis as a complication of Scarlet Fever is a very rare condition indeed.

The presence of soft blowing systolic murmurs on the other hand, is quite frequently observed, but gives rise to no discomfort to the patient and very soon passes off. These cases are, of course, not endocarditis, but merely functional bruits, the result of slight debility in the patient during the attack of Scarlet Fever.

Endocarditis was only noted in two cases altogether = .4% of the total cases, or in 1.07% of total complications.

In both cases it was the mitral valve which was affected.

The conditions were observed on the 21st and 25th days of illness and were ushered in by a rise in temperature to 101° and 102°.

The fever lasted in one case for 7 days and in the other for 13.

In/

In neither case had there been any other complication previously and in neither case was pain in the joints complained of.

Both cases eventually were discharged looking and feeling quite well though the bruit was still present.

TOXIC or FATAL CASES.*

These have been included in the total number of complications, not because they are complications per se of Scarlet Fever, but merely to give an idea of the mortality of this disease. They are, of course, more a type of the disease and perhaps ought to have been omitted altogether. They will serve as a guide, nevertheless, to the type of epidemic being dealt with in this thesis.

FREQUENCY.

These cases amounted to 7 in number, which was equal to a mortality of 1.4% of the total cases under/

* The type "Toxic Scarlet" is taken from C. B. Ker's classification of Scarlatina in his book on Infectious Diseases pp. 88-92.

under review. Of these, 4 were in males and 3 in females, which is equal to 1.9% and 1% respectively.

They were all cases where the patients were suffering, in addition to the rash and sore throat, a profound toxæmia. The rash was peculiar in that, instead of being universally bright scarlet, it was of a very dusky dull red colour, and often very patchy in its distribution.

ONSET.

With one exception, all were toxic from the commencement. The exception was a boy of 6 years, who was of the septic type on admission, but who gradually developed into the toxic state at the end of a week and died within the next.

DURATION.

The average time a toxic case takes to come to a fatal termination, naturally varies according to the amount of toxæmia present and to the resistance shown by the particular patient.

In my series of cases the average was 3.5 days for the six cases where toxæmia was the predominant symptom from the commencement.

In/

In 1 Case the child only lived 1 day.
 In 2 Cases death supervened on 2nd day.
 In 1 Case " " " 3rd day.
 In 2 Cases " " " 6th "

With regard to the exception before mentioned, death took place on the 16th day. The cause of death was complete suppression of urine from the 14th day of illness. Previous to this, there was no trace even of albumen in the urine and this case has not been included in my list for Nephritis. My conclusion, therefore, is that Toxic Scarlatina is fatal within a week.

AGE INCIDENCE.

Up to 5 years	3 Cases (2 m. & 1 f.)
5 to 10 "	2 " (1 m. 1 f.)
10 to 20 "	- - -
20 to 25 "	2 " (1 m. 1 f.)

From these figures it may be deduced that a toxic type may commence at any age period up to 10 years. Whether or not there is a safety zone between the ages of 10 and 20 it is impossible to say owing to/

to the scarcity of data. After 20 years it would appear to become more frequent again.

DOUBLE INFECTIONS.

These were all cases admitted into Hospital as Scarlet Fever, but where it was found that, in addition to the primary affection of Scarlet Fever, there was running concurrently with it another infectious disease, such as Diphtheria, Whooping Cough or Chicken Pox, and I thought fit to include them in my List of Complications. Scientifically speaking, though these cannot correctly be looked upon as complications per se of Scarlet Fever, they were, at the time of admission undoubtedly complicating the Scarlet Fever, and thus I have included them in this thesis.

FREQUENCY.

The number of such cases was 10, which is equal to 2% of the total series under review. Scarlet Fever and Diphtheria alone were 1.4%.

Of these 10 cases, 7 were Scarlet + Diphtheria
 2 " " + Whooping Cough
 1 was " + Chicken Pox.

Diphtheria/

Diphtheria therefore furnished 70% of them, and here it may be as well to state that this number is quite apart from any that actually developed Diphtheria after coming into Hospital. These latter are given under a subsequent heading as Post Scarlatinal Diphtheria.

Whooping Cough it will be seen furnished 20% of the double infections and -

Chicken Pox gave the other 10%.

The one case of Chicken Pox developed the typical crops of eruptions commencing on the 2nd day after admission, and, as at that time there were no other cases in Hospital, and in view of the incubation period of Chicken Pox being 12-21 days, it is safe to assume that the disease was incubating on admission, and that the child had really a double infection. This one case eventually gave rise to 5 other cases in that same Ward, though immediately transferred to a side Ward on being recognised.

No note has been taken of these 5 cases as my Double Infections are stated to be all cases admitted with both diseases.

It will thus be seen that Scarlet Fever can run concurrently with another infection and also that/

that possibly Diphtheria is the most likely one to be found associated with it. This is not greatly to be wondered at, when one takes into consideration the fact that in both Scarlet Fever and Diphtheria the throat is the primary seat of infection, and when the throat is inflamed, as in Scarlet Fever, and thereby less resistant to attacks by organisms, the way is paved for the Klebs Löffler bacillus should it happen to find a settling ground on such a throat. The question now arises, may the Klebs Löffler bacillus not already be present in the throat before the Scarlet Fever attacks the patient? It is well known that there are such persons as "Diphtheria Carriers", and it is quite possible that these double infections of Scarlet Fever and Diphtheria may be due to one of these "Carrier Cases" developing Scarlet Fever, and the resulting sore throat forming a ready means of access for the attack of the Klebs Löffler in addition. On the other hand, it is well known that Diphtheria bacilli are frequently found in otherwise healthy throats in few numbers and in a latent condition, and it may be that the inflammation from the Scarlatina re-awakens these few bacilli to activity. Were this the case, however, one would expect to find the/

the condition much more common than it is. It is only 1.4% of the total complications in my series.

Again, it may simply be the result of Scarlet Fever and Diphtheria organisms attacking the throat at the one and the same time.

DURATION.

The occurrence of Scarlet and Diphtheria together does not prolong the state of convalescence to any great extent unless other complications arise, which however they are naturally more apt to do. Five out of my series developed complications of one sort or another.

I had not a fatal result from any of these concurrent - Scarlet and Diphtheria - affections, which may be put down solely to the great benefit of Antitoxic Serum in combating the Diphtheria affection.

Of Scarlet and Whooping Cough, and Scarlet and Chicken Pox, nothing further need be said.

POST/

POST SCARLATINAL DIPHTHERIA.

These were cases admitted to Hospital as Scarlet Fever, and who at a later stage developed Diphtheria.

The same theories hold good for this complication as were advanced for the Double Infection of Scarlet and Diphtheria before alluded to; but in addition others must now be supplemented.

To most people, the occurrence of Diphtheria attacking a patient while in Hospital would point to a fault in the administration of that Hospital, and that a "Cross Infection" had occurred i.e. the disease had been conveyed from one patient in a Diphtheria Ward to another in a Scarlet Ward by one of the staff (Nurse or Doctor). While admitting this possibility if due and proper precautions had ^{not} been carefully carried out, it seems to me more likely that some other means must be looked to for the cause.

To quote from C. B. Ker's book on Infectious Diseases (page 109) "it probably depends upon" "the presence of diphtheria in an unrecognised form" "in another patient in the same Ward".

Or again, "it is possible that the patient" "himself/

"himself may have harboured the bacillus for a long" "time and that it has only become active in the con-" "valescent stage of the attack of Scarlatina".

Again, in the chapter on Fever Hospital Problems, (page 231-526 Cross Infection, so called, in Fever Hospitals), he deals with the subject at more length and presents in a clear and concise manner the possible sources of the so called Cross Infection.

Whatever the cause may be, the fact remains that Post Scarlatinal Diphtheria is a constant and fairly frequent complication in the convalescence of Scarlet Fever.

FREQUENCY.

It occurred in 1.8% of the total cases.

The figures for males reading 2.4% and for females 1.3%.

INCIDENCE.

It was present in 9 cases, which is equal to 4.8% of the total complications met with. Of these 9 cases 5 were in males = 6.4%, and 4 were in females = 3.6%.

From this it will be seen that there is no practical difference in the incidence between the sexes.

ONSET/

ONSET.

There were no cases observed during the 1st two weeks.

During the 3rd week there were 3 cases = 33.3% of the actual number.

During the 4th week there was 1 case - 11.1% of the actual number.

During the 5th week there were 0 cases and during the 6th week 5 cases = 55.5%.

In drawing conclusions it might be as well to divide the convalescence of Scarlet into 2 Periods.

A. While the patient is confined to the Ward.

B. " " " " allowed out into the Hospital grounds.

A. From these it may be gathered that the third and fourth weeks are probably the most likely periods for Diphtheria to complicate Scarlet Fever.

B. The occurrence of the largest number, however, in the 6th week would point to the infection in these cases having been derived from a source outside the Hospital Wards, as, in every case, the children were running about outside "hardening up" preparatory to their discharge home. Now, as, in Kings Cross Fever Hospital, there are no "railed off" playing grounds, (as there are in other Hospitals e.g. City Hospital, Edinburgh/

Edinburgh), it is conceivable that they became directly infected from a Diphtheria convalescent while at play. The children of one Ward, however, here let me state, were not allowed to mix with children from another Ward when outside, but were confined as much as possible to their own "areas", but, in the absence of definite railed off spaces and lack of adequate supervision, the inevitable "boys will be boys" result did occasionally take place, a few of the bolder spirits taking a delight in breaking the rules.

AGE APPEARING.

From 1-5	years	there was 1 case	= 11.1%
"	5-10	" "	were 5 cases = 55.5%.
and "	10-20	" "	3 " = 33.3%.

Age grouping, of course, can have no meaning if the cause is infection from one to another. If, on the other hand, the cause is "diphtheria carriers" it would point to the second span of life being the commonest age for these to have Klebs Löffler bacilli in their throats.

RETURN/

RETURN CASES.

By these are meant cases of Scarlet fever admitted to Hospital, infected, or suspected of having been infected at home from another case that has been discharged more or less recently. In some instances, perhaps, they have in reality been infected by the discharged patient developing a rhinitis or faucial lesion at home; but in many other cases it may only be a co-incidence "the return case" having caught the infection elsewhere.

Such cases will, however, continue to show themselves in every Hospital until such time as we are in a better position to say definitely when a child ceases to be infective. This will naturally follow on the discovery of the actuating organism, and if we could only examine the throat, or nose, bacteriologically, (as in Diphtheria), and say whether the organism was present or not, what a vast improvement would immediately take place in our treatment of Scarlatina. Incidentally this discovery would also lessen the amount of worry and anxiety to the Authorities of Fever Hospitals. I have no doubt that were this so, complications would become very much less/

less in number than they are at the present day.

The number of these Return Cases observed in my series of 500 cases was 8. These 8 cases were actually only affecting 6 different homes, as two of them furnished two cases each.

The frequency of Return Cases then = 1.6% of the whole series, or 4.3% of the total number of complications.

Any further subdivision would be useless and unnecessary, as it is obvious that sex and age incidences cannot matter in the least.

As regards what time should be allowed to elapse, between the patient discharged and the case coming to Hospital, to enable us to determine a Return Case; this must of necessity be equal to the maximum incubation period of Scarlatina at the least, namely, 7 days.

It is usual, however, to allow a very much longer period, and in some Hospitals a margin of 6 weeks is allowed. In Dundee a margin of 4 weeks was allowed, but the length of time, in itself, does not particularly affect the number of return cases, as the majority of them are admitted within 14 days of the discharged case.

Of/

Of my eight cases, 7 were admitted within 2 weeks of a discharged case, and one in exactly 3 weeks. "

Details were: - 1 on 8th day.

3 " 9th "

2 " 10th "

1 " 12th "

and 1 " 21st "

Average time taken is thus 11 days.

MISCELLANEOUS COMPLICATIONS.

These may, or may not, be the result of the toxins of Scarlatina.

HERPES BRACHIALIS.

This occurred in one case, in a boy aet. 7, on the 9th day of illness.

The eruption was on the right upper arm and followed the course of the musculo-spiral nerve.

CATARRHAL JAUNDICE.

This occurred in two cases, (both females) aet. 5 and 7 years, on the 4th and 5th weeks of illness/

illness. In both, the bowels had been in good order previous to the attacks. Each attack was characterised by yellow tinging of the conjunctivae and of the skin all over the abdomen. Urine was very dark in colour and bile stained. No albumen. Stools clay coloured. Temperature elevated to 102° and lasted so for 3 days. No tenderness in region of gall bladder and no pain complained of.

ACUTE DERMATITIS.

This occurred on the 1st week of illness in a girl aet. 3 years, and proved most obstinate in its response to treatment; the skin of the whole body (face, neck, trunk and limbs) becoming involved and the child scratching incessantly. Eventually splints had to be applied to the elbows and knees to prevent this happening.

ACUTE TONSILLITIS.

This was frequently observed, especially in the older patients, during convalescence and may have been rheumatic in origin or simply a septic condition due to the inhalation of infected atmosphere from the other cases in the Wards.

PSEUDO/

PSEUDO RENAL COLIC?

This occurred in one patient (a girl aet. 19) on the 26th day of illness. The pain suddenly started in the left lumbar region and shot into the left groin. It lasted a few minutes and was severe enough to double her up. She did not cry out. There was no increase in temperature or pulse rate and nothing abnormal was found in the urine. There was no recurrence of the symptoms.

ACUTE MANIA and DEATH.

This occurred in one patient - a woman of 48 years of age. She was admitted on the 30th day of March 1912 and was an exceptionally mild case of Scarlatina. Pulse 108. Temperature 100. Slightly congested throat and typical red strawberry tongue. No rash present but a staining of the skin round the neck and in the axillae. A rash was seen 4 days before admission.

All went well for 1 week and desquamation proceeded as usual. Patient was always morose and rather reluctant to answer questions.

On April 6th she first manifested symptoms of mental derangement. She had delusions of persecution and had to be carefully supervised as she threatened/

threatened to drown herself in the bath. Temperature 99.4.

She gradually became more and more restless for the next week and refused all food and had to be forcibly fed through a nasal tube. Temperature never above 100°F. Pulse running about 80-90. Had morphia and hyoscine when very violent.

Her condition gradually became worse and she was evidently going downhill rapidly. Up till the 18th April the temperature was never above 100°F. On the 19th it was 100.4 and on 10th 102°. Next day it dropped to 100.6 and on the 22nd to 99°F. when she died.

Whether or not this Mania was the result of ~~Scarlatina~~ not is very difficult to determine.

There was a hereditary taint of Mental Disease in the family history as her mother died in an Asylum.

The Scarlatina appears to have been the exciting cause however.

Such cases must be exceedingly rare and I can find no mention of another such in Ker's Text Book on Infectious Diseases.

COMPARISON/

COMPARISON OF RESULTS OBTAINED WITH THOSE FOUND
IN TEXT BOOKS.

In making a comparison between the results found in my own series of 500 cases, I have thought fit to do this with only one author, as the actual numbers of the various complications found in 500 are comparatively few, when compared with those of any Standard Text Book, where, in all probability, the results so obtained were from observations on thousands of cases. Now, in proportion as the fewer the number of cases observed, the greater is the possibility of error in the deduction made, when taken in comparison with the results from a large number of cases, so, the greater discrepancies would be found the more authors of Text Books consulted.

For these two reasons I have decided to compare my results with those of only one author of a standard Text Book on Infectious Diseases.

The Text Book I have taken is the well known work on Infectious Diseases by Claude Buchanan Ker M.D., F.R.C.P. Ed., Medical Superintendent of the City Hospital, Edinburgh, and Lecturer on Infectious Diseases to the University of Edinburgh. Therefore, in making my references I will only state the author's name/



name, and mention a certain page, and it will be understood that it refers to a page in the above mentioned book.

ARTHRITIS.

Table showing comparisons between -

My own Series and C.B. Ker's Series.

Frequency	6.2%	4%
Age occurring	Over 10 years	Mostly over 10 years
Sex	Most common in females	Females more than males.
Onset	In 1st week	Early 2nd week (9th day)
Duration	4 days	3 or 4 days.

It will be seen that in my series the frequency of occurrence is greater than that given in the Standard Text Book. This may possibly be explained by the fact that in my series there may have been a greater proportion of adolescents than in the other series. This alone would account for the discrepancy as we are both agreed that Arthritis is more frequently observed over 10 years of age than under it. As regards sex, Ker does not give figures but states that "Females are more apt to suffer than males". (See Ker page 102). In my series I find that this difference/

difference occurs also, and, that Arthritis is much more frequently met with in the female group.

My figures, perhaps, do not show this difference to be very much, but, for the reason given when dealing with the frequency of Arthritis as a complication, the discrepancy is greater than it appears. The figures were 5.9% for males and 6.3% for females as regards frequency, and 15.5% and 17.3% as regards incidence.

As regards the time of onset of Arthritis in Scarlet Fever, Ker (page 102) gives the 2nd week of illness as being the most usual time of occurrence, and, in one series, found that the 9th day was the most usual one for the appearance of the first symptoms. In my series I found that by far the greater proportion occurred during the first week of illness, while the rash was still in evidence. No less than 70% of my cases (22 out of 31) commenced then; while only 12.9% occurred during the 2nd week of illness. Further, out of the 22 cases, in the 1st week no fewer than 15 of them began on the 4th or 5th day of illness i.e. 48.3%.

Ker, however, though giving the 2nd week as the most usual time, also states, (page 102-103), "That Arthritis may occur as soon as the 4th or 5th day"/

"day" and, certainly, in my series I found this to be the case in the majority of them.

As regards duration, my figures entirely agree with those of Ker. My average duration of illness being 4.3 days. Ker, (page 103), says "The condition is very short lived, often disappearing entirely in 3 or 4 days, and being seldom prolonged for more than a week".

ADENITIS.

Table showing comparisons between -
My own Series and C.B. Ker's Series.

Frequency	10.2	13%.
Age	1st Decade	Nil.
Sex	More frequent in males.	Nil.
Onset	In 2nd and 3rd weeks.	In 3rd and 4th weeks.
Duration	4.4 days.	3 or 4 days.

From this table, it will be seen that, the frequency of Adenitis in my own series is slightly less than that given by Ker. It is impossible for me to give an explanation of the cause of this discrepancy; but the personal element must of course be taken/

taken into consideration in every case, where different observers are taking notes of cases. Much, of course, will depend on the severity of the illnesses observed, and, when one considers the various types of Scarlatina, it is not to be wondered at that results are different. Again, epidemics of Scarlet fever vary very much in their severity.

As regards the age at which Adenitis is most likely to appear, Ker has no mention of it in his Text Book. In my series I found that the first decade provided the most cases, but this is, again, not to be wondered at, when one considers that Scarlatina is a disease primarily of childhood. Still, it is in direct contrast with what was observed in Arthritis. In my series, 76.4% occurred in cases up to 10 years, and 23.5% from 10-20 years. There were no cases recorded after the age of 20.

In regard to sex, there is again no mention of the difference, if any, between males and females, in Ker's book. In my own series I found the condition to be much more frequent in males than in females, the figures being 13.3% for males and 8.05% for females.

As regards time of onset of Adenitis, Ker,

(page/

(page 105), found that, "the condition was most frequently to be observed during the third and fourth weeks of the fever".

In my own series I make the third week, as by far, the most usual time to find this complication, no less than 58.8% of my cases being found then. In the 4th week I observed no cases, but in the 2nd week of illness I had 23.5% of my cases. In the 5th week there was 17.6%.

There is, thus again, a slight discrepancy in our observations, Ker putting the time as between the 3rd and 4th weeks, whereas I put it at a slightly earlier date, namely, between the 2nd and 3rd weeks.

As regards duration of the complication, my figures entirely agree with those in the text book. Adenitis is of short duration and averaged only 4.4 days in my series of cases.

OTITIS/

OTITIS MEDIA.

Table showing comparisons between -

My own Series and C.B. Ker's Series.

Frequency	7.8%	12%
Age	1st. Decade	Young children most
Sex	Commoner in males?	
Onset	In 1st 3 weeks.	Within three weeks.
Duration	3-4 weeks. (25.3 days).	Usually ceases with- in 12 weeks of on- set of fever.

From the above table, it will again be seen (as in Adenitis) that, the percentage found in my series to develop Acute Middle Ear Disease is decidedly less than the figure given in Ker's Book. In my series it was found to be 7.8%, whereas in the Text Book it is given as 12%. (See Ker page 105). In this case the figure given in my series is probably of too low a standard, as Ker, in arriving at his 12% deduction, did so from the enormous total of 4,889 consecutive cases of Scarlet Fever; whereas in my series it was only 500 consecutive cases that furnished the 7.8% frequency. It will thus be seen how really futile it is to make comparisons where the/

the data vary to such extents.

As regards the age at which Otitis Media is most commonly found, Claude Ker states, (page 106), that "it is young children who suffer most from Otitis", and, in my own series, the results I obtained entirely co-incide with this remark. I found that, out of 39 cases recorded no less than 34 of them were under 10 years of age i.e. 87.1% of them were in children. The remaining 5 cases all occurred in the age-period of 10-20 years.

Regarding Sex affections, Ker does not state whether the condition is more frequent in males than in females or vice versa. In my series of observations there was a definite increase in the percentage for males as compared with that for females, the figures being 10.3 and 6.04 respectively.

Regarding the onset of the symptoms, Ker states, (page 105), that "it usually appears early, within three weeks of the Onset of the fever, but sometimes develops late in convalescence".

This is entirely in agreement with the results I obtained, as 76.8% of my cases occurred within the first three weeks of illness. Out of the total of 39 cases, in the first week 9 developed Otitis/

Otitis Media, in the second week 13 developed Otitis Media, and in the third week 8 developed Otitis Media. In the fourth week there were only three cases and in the fifth four cases.

It will thus be seen that possibly the 2nd week is the most usual time for this complication to assert itself, but, that certainly, the most frequent time is within the first three weeks, as previously stated by Ker.

As regards the length of time the complication is likely to persist, this is a very variable quantity. In some cases the condition heals up very rapidly, while in others the course becomes tedious and monotonously slow in responding to treatment.

Claude Ker states, (page 106), that "the otorrhoea itself may be very persistent, sometimes lasting for months". "In many cases, on the other hand the tendency from the first seems to be towards cure and the discharge may entirely cease in a week or a fortnight".

He further states, (page 107), that "as regards the persistence of the discharge it usually ceases within 12 weeks of the onset of the fever".

In the main these statements were practically what I found to be the case in my series of observations/

observations. By taking an average over all of my cases, I find that the discharge had ceased between 3 and 4 weeks of its commencement. The shortest time I observed was 4 days and the longest 70 days!

I have no record of Otitis Media developing any of its more serious results such as Mastoid abscess, cerebral abscess, or thrombosis of lateral sinus; and it would appear, therefore, that they are relatively uncommon sequelae.

RHINITIS.

Table showing comparisons between -

My own Series and C.B. Ker's Series.

Frequency	9%	10%.
Age	Under 10 years	Youngest patients.
Sex		
Onset	Any stage.	
Duration	4-6 weeks.	

In this table the only comparisons possible are those of frequency and age, as Ker, in his work, does not give any other figures.

It will be seen, regarding the frequency of occurrence/

occurrence, that our figures correspond sufficiently closely as to be practically similar.

Regarding the age at which it is found most frequently, Ker states, (page 107), that "it occurs most frequently in the youngest patients and is especially frequent in those who suffer from Adenoids, and in those who are pulled down as the result of the fever".

The figures obtained from my series of cases co-incide in practically every way with these statements.

Ker states that "the youngest patients" are those mostly affected, and in my series the greatest number were not actually "the youngest" but were in the age-group of 5-10 years. My figures were: -

Under 5 years - 12 cases = 26.6%)) 95.5%.
From 5-10 " - 31 " = 68 %)	
" 10-20 " - 2 " = 4.4%.	

If the divisions, however, were made into Decades (i.e. 1-10 years, 10-20 years etc.) then his statement and mine would entirely co-incide. As my figures stand, it is impossible to say which of the first 2 groups gives the largest percentage, as it is highly/

highly probable that more children would be met with in Hospital over 5 years of age than under 5 years.

As regards the time of onset in the illness that Rhinitis makes its appearance, there is no "time limit" apparently, if conclusions can be drawn from my figures, which are: -

In 1st week	- 15 cases	- 33.3%.
" 2nd "	- 7 "	- 15.5%.
" 3rd "	- 4 "	- 8.8%.
" 4th "	- 7 "	- 15.5%.
" 5th "	- 4 "	- 8.8%.
" 6th "	- 7 "	- 15.5%.
" 7th "	- 0 "	- -
" 8th "	- 1 case	- 2.2%.

The universal tendency of Rhinitis to make its appearance at any stage of the illness is thus apparent.

Possibly the figures for the later stages of the disease co-incide with Ker's statement, (page 107), "that Rhinitis is frequent in those who are pulled down as the result of the fever".

As regards duration, Ker, (page 107), gives no figures, but contents himself with the statement that Rhinitis "is extremely persistent, resisting treatment"/

treatment".

In my series I find that there is much truth in this statement as the average duration was between 4 and 5 weeks after making its appearance. In one case the discharge persisted for 89 days!

NEPHRITIS.

Table showing comparisons between -

My own Series and C.B. Ker's Series.

Frequency	2.2%.	8.78%.
Age	Under 10	2nd 5 years of life.
Sex	Commoner in females	Nil.
Onset	3rd and 4th weeks	Between 16th and 26th days.
Duration	2-3 weeks.	2-6 weeks.

From the above table it will be seen that there is a great divergence of opinion, as to the frequency of this complication of Scarlet fever, between the results of my series of cases and those of Claude Ker. Ker, (page 99), states "As to the frequency with which this complication occurs, it is apt to vary in different epidemics". As in Otitis Media, the explanation is possibly the scarcity of data on which my calculations are based.

In/

In Claude Ker's series, the estimation of the frequency was arrived at by taking the average between two results, both of which were obtained from series of more than 3,000 cases. To be exact; in one series, of 4,436 cases, the percentage of Nephritis was found to be 11.02, while in the other series, of 3,172 cases, it was 5.64. (See Ker, page 99-100). He accordingly takes the average between the two, viz. 8.78%, as the most likely one. When it is thus seen that the percentage may vary to such an extent in two separate observations by the same person, and when both were made over such huge totals, it is not to be wondered at that my figures show such a marked contrast to those given in the Standard Text Book, as it was made from only one observation, and that one from an exceedingly small total of cases.

My figure of 2.2% is certainly an abnormally low one, and it was one of the most striking features to me while Resident in the Hospital that Acute Nephritis was so seldom met with. It may be that the type of fever was a particularly mild one, but Ker, (page 98-99), states that "The severity of the original attack, curiously enough, plays little or no part in determining the occurrence of Nephritis".

Whatever the cause may be the fact remains that/

that only 11 cases were found to develop Acute Nephritis = 2.2% of the total cases under review.

The only special precaution taken in Kings Cross Hospital is the provision of warm blanket material jackets, which are worn during the day time, as it is impossible to keep children quiet in bed for 4 weeks. This simple remedy may have had not a little to do with their seemingly rare susceptibility to Nephritis, by probably warding off chills, when the patients became restless in bed during the convalescence and before they were allowed to get up.

Chills undoubtedly predispose to Acute Nephritis as is plainly recorded in C. B. Ker's Book, (page 99), where ventilating outlets in one Hospital were found to be acting as inlets and douching the backs of the patients with cold air as they sat up in bed.

As C. B. Ker, (page 99), states - "the frequency with which Acute Nephritis occurs is apt to vary in different epidemics" and goes on to say, (page 100), that "it is probably unusual for the incidence of kidney complications to be lower than 10 or 11 per cent;" my figures can only mean that, during my term of office in Kings Cross Hospital, I must have struck a most unusual type of epidemic.

As/

As regards the age at which Nephritis is most usual to appear, Ker, (page 99), states that "the second five years of life seems the most susceptible period for kidney trouble, the greatest percentage incidence occurring between the ages of five and seven in a recent series".

In my own series the figures read: -

Under 5	years	there	were	5	cases	=	45.4%.
From 5-10	"	"	"	5	"	=	45.4%.
" 10-20	"	"	was	1	case	=	9 %.

From these it would be impossible to state anything more definite than that the most common age was in the 1st 10 years of life. Still, it is probable that more children would be met with in Hospital over 5 years of age than under it and in that case my figures would make out the 1st 5 years of life as being the most usual time. This surmise on my part, however, cannot be considered as it can prove nothing

Over 90% of my cases occurred in children under 10 years of age.

Regarding sex, Ker does not give any indication of difference (if any) between males and females/

females.

In my own series, I find that the proportion of females affected was considerably larger than the males, the figures being 2.6% for females as against 1.4% for males.

Regarding the time of onset of Nephritis, Ker, (p.100), puts it "usually the end of the 3rd week or the beginning of the 4th, say between the 16th and 26th days". In my own series, I can agree with him on this point, as, out of the 11 cases observed, 7 of them developed Nephritis between the 17th and 26th days inclusive.

Ker, (p.100), goes on to state that "in rare instances Nephritis may appear during the eruptive period. Seldom, however is it noticed before the 10th day of illness".

It has been my good fortune to have seen one of these rare cases, as, in one of my series, Acute Nephritis developed during the first week of illness i.e. during the eruptive period. It was not a case of toxic albuminuria, as, both blood and albumen appeared in the urine, simultaneously with rise in temperature, and oedema of face and ankles etc. Again, Ker, (p.100), states that "Nephritis is more/

more frequently seen after the 26th day than it is before the 16th but it is rarely observed after the 40th". On one of these points I cannot quite agree with him as two of my eleven cases developed Nephritis during the second week of illness i.e. before the sixteen day. With the latter part of his statement I am at one with him as I have no record of a case occurring after the fifth week i.e. very much in advance of the fortieth day.

Regarding the duration of the Nephritis, Ker, (p.102), states that "a normal amount of urine is passed after the first 10 days or so. Blood and albumen may persist however for from 2-6 weeks".

This is practically in agreement with what I found in my own series. In my lot, with one exception, the cases were found to be free from albumen in the short average time of 15.8 days i.e. slightly over 2 weeks. The longest case I had was one of 38 days duration and this one as mentioned before, was not quite free when discharged. The second longest one was one of 31 days duration before the last trace of albumen had disappeared.

RELAPSE/

RELAPSE.

Table showing comparison between -

My own Series and C.B. Ker's Series.

Frequency	2.8%	Less than 1%.
Age	5-10 years.	Nil.
Sex	No difference.	Nil.
Onset	3rd week.	4th or 5th week. Not earlier than 16th day.
Duration	Usual course.	Usual course.

From the above table, it will be seen that, again, there is a discrepancy between the percentage frequency of Relapse in my series and that given in the Text Book. I am totally unable to give a reason why my percentage is so much higher, as, in arriving at my total of 14 cases, particular care was taken to exclude the "So-called Relapses", which were in reality first attacks as the result of Mistaken Diagnoses.

No comparisons can be made regarding either age or sex affected as no details are given by C. B. Ker in his book.

As regards the time in the illness at which it is most commonly to be met with, Ker, (p.98) states that "Perhaps the most frequent time for a relapse to occur is in the fourth or fifth week of illness/

illness, especially the former, but its appearance may be delayed till as late as the sixth or seventh week".

In my own series I found that the third week furnished me with most of my cases and that the 4th and 5th weeks came next in order of frequency.

My figures were: -

5 cases in the third week = 35.7%.
3 " " " fourth " = 21.4%.
3 " " " fifth " = 21.4%.

It will be observed however that Ker in his statement begins with the word "perhaps" so that there is evidently some difficulty experienced in fixing on any particular week.

Ker, (p.98), further states that "I do not remember seeing an earlier example than the one illustrated in the chart" (Fig. 16, page 97) i.e. one showing a relapse commencing on the 16th day.

I have a record of one showing a typical relapse as early as the 12th day, so that again I have been somewhat fortunate in my rarer experiences.

The latest days on which I observed relapse were on the 49th and 52nd days respectively, so that,
on/

on the whole, my results co-incide with the statements found in Ker's book on Infectious Diseases.

As regards duration, there can be no comparison as a relapse runs the true course of Scarlatina.

BRONCHO - PNEUMONIA.

No figures having been given in Ker's book, it follows that a comparison becomes impossible. On account of the relative rarity of the condition however this is not greatly to be deprecated.

Ker, (p.108), states that Broncho-Pneumonia "is occasionally severe, but, in my experience, is usually trivial when compared with the complication supervening in measles or whooping cough".

With this I totally agree, as, in my 5 cases recorded, there were no deaths; a 100% recovery! This alone bears out the trivial nature of this complication as affecting Scarlet Fever.

ENDOCARDITIS/-

ENDOCARDITIS.

Here again, a comparison cannot be definitely made, as Ker gives no figures of his own. He merely mentions the results obtained from the Metropolitan Asylums Board Hospitals (.58%), and says, (page 104), "and so far as my observation goes is quite as rare in Edinburgh".

In my own series, the condition was only observed on two occasions, which is equal to a percentage of .4 of the total cases. This figure is strikingly in line with that of the Metropolitan Asylums Board Hospitals' one, though, in their case, the result was obtained from the simply enormous total of 22,096 cases.

DOUBLE INFECTIONS and POST SCARLATINAL DIPHTHERIA.

No comparison of results is possible under these headings as no figures are given. Claude Ker, (page 525), devotes a whole chapter at the end of his book to Fever Hospital Problems and deals thoroughly with such conditions as co-existence of Infectious Diseases, Cross Infection, etc.

I can only add that in my experience I found that two different infectious diseases could run concurrently in the same person.

RETURN CASES.

Comparisons of the number of such cases involve the opening up of a very wide field of discussion, and the many investigations that have been made on this subject. This is dealt with very thoroughly in the chapter on Fever Hospital Problems in Claude Ker's Book. (pp.533-537).

He gives, (p.536), as the percentage of Return Cases, "In Edinburgh from 2.5 to 3 per cent of the discharged patients are suspected of having infected others". "The time limit allowed is 6 weeks" and states that "few patients suspected of being infected by a discharged case come in after a longer interval".

In my series, the percentage was considerably lower than the one given above, it being only 1.6% of the total cases under review. As was mentioned before, the time limit in Kings Cross Hospital was 4 weeks only. Whether that was too small a margin, however/

however, I have my doubts, as, out of the 8 cases recorded, no less than 7 were admitted as "return cases" within 14 days. The eighth case was admitted on the 21st day. The comparison therefore between our figures may differ only in respect of the time allowance.

Ker, (p.536), however, states further that "it is interesting to note that the 'return rate' as a rule rises when there is undue epidemic prevalence of the disease, that is when the chances of infection from other sources are much increased" and quotes "according to Dr Moore's table, the Manchester figures vary from 3.8 per cent during excessive to 1.2 per cent during normal prevalence".

From this cause then the difference, in Ker's figure and my own, may be that in my case the epidemic was a "normal" one.

SUMMARY/

SUMMARY OF CONCLUSIONS.

ARTHRITIS is most frequently observed in females; it occurs generally in the first week of illness, and most frequently in persons over 10 years of age. It is of short duration.

ADENITIS is most frequently observed in males; it occurs most usually in the second and third weeks of illness, and most frequently in children under 10 years of age. It is of short duration.

OTITIS MEDIA is most frequently observed in males; it occurs most frequently in the second week of illness, or, at any rate within the first three weeks. It is most frequent in children under 10 years of age. It is of long duration and its sequelae are rare.

RHINITIS is most frequently observed in males; it occurs at any time of the illness, and is most frequent in children under 10 years of age. Its duration is a protracted one.

NEPHRITIS is most frequently observed in females; it occurs most usually in the third and fourth weeks/

weeks of illness, and in children under 10 years of age. It is of comparatively short duration. The mortality from Nephritis is probably a low one.

RELAPSE is most frequently observed in females; it occurs generally in the fourth and fifth weeks of illness, and at any age period.

BRONCHO-PNEUMONIA is rare and not severe.

ENDOCARDITIS is of very rare occurrence.

TOXIC SCARLET. Death occurs within one week.

DOUBLE INFECTIONS. The most frequent one met with is that of Scarlet Fever associated with Diphtheria.

POST SCARLATINAL DIPHTHERIA is constantly observed.

RETURN CASES are inevitable.

REFERENCES/

REFERENCES.

All references given in this Thesis are taken from
CLAUDE BUCHANAN KER'S Book on Infectious
Diseases.

They are all taken from either -

- A. The chapter on Scarlatina,
- or B. The chapter on Fever Hospital Problems.

The pages quoted have all been indicated as they
arose throughout the text of this thesis.
