

\\THE PRESENTING FEATURES AND OUTCOME IN

ACUTE BACTERIAL MENINGITIS

IN KENYATTA NATIONAL HOSPITAL, NAIROBI //

A DISSERTATION FOR MASTERS DEGREE IN MEDICINE(PAEDIATRICS)

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SUMMARY

Cases of acute bacterial meningitis were studied by reviewing case records retrospectively over the five-year period from 1971 to 1975. Records of 372 children aged one month to twelve years were studied. A slight male predominance, sex ratio M:F being 1.3:1 was noted. The majority of cases occurred in children under the age of 2 years, and the greatest number in the 1-6 month age group. 38.7% of cases grew an organism on cerebro-spinal fluid (C.S.F.) culture and both streptococcus pneumoniae and Haemophilus Influenzae were together the commonest organism accounting for 48.0 and 26.7% of positive cultures respectively. The case-fatality rate was 16.4% the six leading presenting features in order of frequency were neck stiffness, fever, positive Kernigs sign, convulsions, irritability and a bulging anterior fontanelle. The age group under 2 years developed most of the complications, with hydrocephalus being the commonest complication encountered. All the cases which subsequently developed hydrocephalus had convulsions as a presenting feature. Breast feeding did not influence the outcome of the disease. Possible ways of reducing mortality rate are discussed and a recommendation for rapid evaluation of C.S.F. made.

INTRODUCTION

Acute bacterial meningitis remains a leading medical emergency and constitutes an important cause of illness and death in infancy and childhood. Bacterial meningitis accounted for 25 per cent of all neurological admissions at two centres in Kenya reviewed recently (Oduori and Shah (1)). Amongst the "top ten" diseases in Kenya, meningitis was ranked fifth and seventh commonest illness in paediatric admissions at two centres (Khan (2)), Oduori (3)).

Several features of the disease are of current interest. First, although the advent of effective antibiotic therapy has greatly improved the outlook of the patient with meningitis, over the last two decades there appears to have been little reduction in the case-fatality rate. (Haggerty (4), Smith (5)). Secondly, epidemics of meningococcal meningitis are still reported increasingly from all over the world including Kenya, and the appearance of resistant strains resistant to chemotherapeutic agents has been disturbing (Shafer A.G. (6)) Ogumbi (7), B.M.J. Editorial (8) Goldacre (9)). Thirdly there has been a documented increase in cases of H. Influenza meningitis and the discovery of Ampicillin resistant strains of H. Influenza B has meant a revision of treatment protocols which were in use over the last decade (Michaels (10), B.M.J. Editorial (11)) Finally interest has been rekindled into the possibility of immunising susceptible populations against the commonest occurring strains of haemophilus influenzae and meningococcus (Mortimer (12), Goldacre (9)).

The pattern of meningitis has been well documented in East Africa though the actual incidence in the general population at large is yet to be estimated as most series are from selected hospital populations. This type of information is especially valuable for local health personnel and in making geographical and

historical comparisons. A study of clinical features in pneumococcal meningitis has been done in Uganda (Hutton 13)) but there has been no similar report on meningitis in Kenya. This study was undertaken to analyze all cases of acute bacterial meningitis admitted at the Kenyatta National Hospital over the five year period 1971 to 1975 in the Paediatric wards. It was the aim of the study to identify the presenting features in this disease and to relate these to the outcome of the illness. The second aim of the study was to evaluate the importance of the laboratory diagnostic criteria in the diagnosis of the disease. Thirdly it was the aim of the study to identify factors which influenced the outcome of the disease and those factors that can be manipulated to effect a reduction in mortality and other complications resulting from this disease.

MATERIAL AND METHODS

All the case records of the Paediatric admissions at Kenyatta National Hospital over the period January 1971 to December 1975 were studied. The cases who were treated for acute bacterial meningitis excluding tuberculous meningitis, meningitis secondary to central nervous trauma or malformations like fistulous tracts of the spine, were selected. Also excluded were all babies aged less than 28 days and having meningitis because their pattern of disease is an entity on its own (Murray (14)). This left children aged between one month to 12 years for inclusion in the study. Cases were also sought from the records of the laboratory where cerebrospinal fluid (C.S.F.) is done, records of death certificates at the City Mortuary, selecting instances where meningitis was recorded as a cause of death. Also studied were postmortem records where meningitis was established on necropsy. The diagnostic criteria for inclusion in the study were the following:

- (i) Bacterial culture from the C.S.F.
- (ii) Sterile pyogenic C.S.F. where more than 5 white blood cells per cu mm. were found. The majority of the cells having been polymorphs.
- (iii) Positive bacterial culture from blood and a C.S.F. tap which showed more than 5 white cells per cu. mm. The organism isolated from blood was presumed to be the offending agent in causing meningitis.
- (iv) All cases which at postmortem showed evidence of meningitis even though there was no report of a positive C.S.F.

From the cases that satisfied the above criteria was then extracted standard items of information which included age of the patient, sex, report of the C.S.F., history, results of physical examination, any treatment given before admission and in the ward, outcome of the disease and type of complication where present and duration of stay in the ward. In appropriate case and where recorded, mode of feeding, on the breast or otherwise was noted.

For purpose of analysis cases were then divided into four age groups as follows:

- a) Age 1 month to 5 months and 29 days and group called 1 month -
- b) Age 6 month to the last day of the second year and group named as 6 month -.
- c) Age 2 years to end of the fourth year and the group named as 2 years -.
- d) Age 5 years to the twelfth birthday and group called 5-12 years.

The data so collected was then analysed and tabulated to show the age scatter of the cases according to these groups, annual incidence, case-fatality rates, types of organisms causing meningitis, duration of stay in the ward, frequency distribution of the presenting features and their relationship to complications and for the age groups 1 month, 6 month, and 2 years - the association of breast feeding and outcome of disease.

RESULTS

A total of 372 patients were identified as having had acute bacterial meningitis. There were 213 males and 159 females giving male:female ratio of 1.3:1

Table 1 shows the annual incidence of meningitis due to all organism;; during the period under study compared to the total admission in the Paediatric wards. There was a case fatality rate of 16.4% over the 5 years.

TABLE 1: Annual Incidence and Case fatality Rates
of Acute Bacterial Meningitis during the
Study Period, 1971 1975. Percentages are
expressed in brackets.

YEAR	TOTAL ADMISSIONS for the YEAR	CASES OF MENINGITIS	DEATHS DUE TO MENINGITIS
1971	2822	57 (2.0)	10 (17.4)
1972	2149	89 (4.1)	17 (19.4)
1973	2012	63 (3.1)	17 (17.8)
1974	2391	71 (3.0)	13 (19.9)
1975	2036	92 (4.5)	10 (10.9)
TOTALS	11410	372 (3.4)	62 (16.4)

The age scatter of the cases over the age groups shows that 79.5% of the patients were under the age of 2 years as can be seen in Table 2.

TABLE 2: Age Scatter of Patients in the Study

AGE	NUMBER OF PATIENTS	PER CENT
1 month	165	44.3
6 months	131	35.2
2 years	40	10.8
5 years - 12 years	36	9.3
Totals	372	100

Table 3 shows the duration of stay in the ward and the period stayed in the ward of those who died.

TABLE 3: Duration of Stay in Ward. In Brackets is number who died in relation to Period in Ward:

NO. OF DAYS IN WARD	LESS THAN 5 DAYS	5-6 DAYS	7-13 DAYS	14-20 DAYS	21 DAYS	TOTAL
1 month	39 (1)	7	34	4	44 (1)	165 (34)
6 month	22 (7)	3 (2)	37 (3)	38 (5)	31 (5)	131 (24)
2 years	9 (3)	5	11 (2)	8	7	40 (4)
5-12 years	5 (1)	2	11 (1)	10	4	36 (0)
Totals	75	17	93	60	86	372 (62)

208 cases were diagnosed as meningitis after a cell count alone in C.S.F. and 107 cases by both cell count and culture of C.S.F. Direct smear with gram stain showed organisms in 26 cases amongst which 17 cases subsequently did not grow any organisms on culture. In 131 cases C.S.F. sugar was less than 45 mgms.

TABLE 4: Mode of Diagnosis by C.S.F. in Cases under Study

Cell count above 5 per cu mm.	208 cases
Significant pleocytosis and Positive culture	107 cases
No cell count done but culture positive	43 cases
on C.S.F. or blood	43 cases
Diagnosis at Post Mortem	14 cases
C.S.F. sugar less than 45 mgm%	131 cases

Table 5 shows the organisms isolated from the C.S.F. In cases diagnosed at postmortem no attempt was made to obtain a C.S.F. culture presumably because of the ever present danger of contamination. The children with salmonella meningitis all had a high mortality and only 2 survived. In all cases salmonella typhimurium was the type isolated and all the cases were in age group 6 months to 2 years. In addition to recovery of salmonella from C.S.F. they had positive cultures for salmonella in blood, stools, and urine. One case aged 3 years had E.Coli grown from blood and significant C.S.F. pleocytosis and died. It is shown under column of salmonella and other organism. No cases of Bacterium Anitratum meningitis were found.

TABLE 5a Organisms isolated on C.S.F. in Brackets is shown number of deaths from each organism

ORGANISMS	NO. OF CASES IN 1 month -	NO. OF CASES IN 6 months-	CASES IN 2 years-	NO. OF CASES 5 - 12 years	TOTAL
H. Influenzae	12 (1)	19 (2)	0	0	31 (3)
Pneumococcus	39 (4)	34 (4)	7 (0)	4 (0)	72 (8)
Meningococcus	2 (0)	2 (1)	8 (0)	10 (0)	22 (1)
Salmonella/others	4 (4)	2 (1)	1 (0)	0	7 (5)
No Organism	108 (25)	24 (16)	24 (4)	22 (0)	228 (45)
Totals	165 (34)	131 (24)	40 (4)	36 (0)	372 (62)

TABLE 5 (b) Shows the organisms isolated over the Period under study

	1971	1972	1973	1974	1975	Total
H. Influenzae	4	8	4	7	8	31
D. Pneumoniae	13	16	12	14	17	72
N. Meningococcus	3	2	4	6	7	22
Salmonellae/others	2	4	0	1	4	7
No organisms	35	59	43	42	56	228
Total	57	89	63	71	92	372

Table 6 shows a list of presenting features in cases under study. Neck stiffness was the most frequent observed sign occurring in 65% of all cases and was recorded most commonly in the age group 1 month - where in 83% of cases it was observed.

Fever was the next most frequent finding especially in the age group 6 month - where 73% had a temperature above 38 degrees Centigrade recorded.

A positive Kernig's sign was noted in 44 percent of cases especially in the older child 5-12 years old, with three quarters of cases having a positive sign.

TABLE 6: The Frequency of Presenting Signs and Symptoms with percentage of cases showing each Feature in the four age groups.

PRESENTING	1 MONTH -		6 MONTH-		2 YEARS -		5 - 12 years		TOTAL	
	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
1. Neck Stiffness	105	64	108	83	20	50	20	56	243	65
2. Fever	98	59	94	73	12	30	17	47	221	59
3. Positive Kernigs	69	42	71	54	12	30	27	75	165	44
4. Convulsions	62	38	70	53	4	10	0	0	136	34
5. Irritability	68	41	48	37	11	28	7	19	134	33
6. Bulging Anterior fontanella	66	40	48	37	0	0	0	0	114	31
7. Vomiting	68	41	36	28	4	10	20	56	110	29
8. Other infections	37	22	37	28	4	10	11	31	89	24
9. Pneumonia	52	32	27	21	8	20	0	0	87	23
10. Sicklooking	22	13	24	18	7	18	8	22	61	16
11. Anorexia	27	16	24	18	0	0	3	13	52	14
12. Otitis Media	11	7	11	8	4	10	0	0	26	7
13. Diarrhoea	0	0	18	14	4	10	3	13	25	7
14. Decerebrate	13	8	2	2	0	0	0	0	15	5
15. Headaches	0	0	1	1	4	10	8	22	13	3
16. Hepatomegaly	0	0	10	9	0	0	3	13	13	3
17. Splenomegaly	6	4	4	4	0	0	3	13	13	3
18. Rash	0	0	2	2	3	8	3	13	8	2
19. Large head	5	3	3	2	0	0	0	0	8	2
20. Dehydration	1	½	4	4	4	10	0	0	9	2
21. Coma	0	0	2	2	3	8	3	13	8	2
22. Abdominal Pain	0	0	0	0	3	8	0	0	3	1

The anterior fontanella is generally patent up to 2 years of life. It was found to be tense in 31% of total cases but with the under 2 years 39% of cases were having a bulging anterior fontenalla, being more often found in those 6 months and less. Vomiting was most often reported in the age group 5 - 12 years and least common in the age group 2 years - . About one third of cases were described as irritable or listless.

Skin rashes were infrequently seen and only the 5-12 years had a sizeable number of observations when 13% of cases were recorded as showing them.

53% of the age group 6 month - , had a history of fits. The same age group also recorded the highest number with fever.

Whereas a total of 47% of children were observed to have either pneumonia or other infections, the latter consisting of upper respiratory infections mainly; only a small number (7%) had otitis media. An even smaller number of patients presented with signs of altered consciousness either comatose or semicomatose. This feature was commonest in the older child 5-12 years. The older child again had more vomiting, a feature which occurred in 56% of them. 22% of these older children also complained of headaches in a larger number than the other groups (22%).

204 children received ampicillin which was the main drug of treatment, initially given intravenously and later intramuscularly and often being discharged on oral ampicillin. The 28 cases shown as having received some other treatment in Table 7, the "other treatment" consisted of drugs like gentamicin in salmonella cases or Kanamycin for other types of gram-negative organisms. Intrathecal medications were not used widely except in cases of salmonellae when gentamicin was often introduced intrathecally.

TABLE 7: Treatment used for Cases:

Ampicillin	204 cases
Crystapen/Chloramphenicol	87 cases
Crystapen	59 cases
"other treatment"	38 cases

77 of the cases were treated for some days before arrival to hospital, most of them in a local dispensary. Table 8 shows the duration of symptoms in all the cases before arrival to hospital. It also shows the complications that resulted from the disease.

48% of 29 cases who had had symptoms for 3 days before arrival developed complications. In all the age groups it was observed that 59% of the 44 cases who had had symptoms for one or more days before arrival to hospital, subsequently developed a complication permanent in nature.

6 children had sickle cell disease and in 4 pneumococcal organisms were grown on C.S.F. culture.

TABLE 8: Duration of Symptoms before arrival in Hospital
and Subsequent development of Permanent Complications.
Percentages are expressed in brackets.

DURATION OF SYMPTOMS IN DAYS	1 month - .		6 month - .		2 years - .		5 - 12 years		Total	
	<u>Cases</u>	<u>Complications</u>	<u>Cases</u>	<u>Complications</u>	<u>Cases</u>	<u>Complications</u>	<u>Cases</u>	<u>Complications</u>	<u>Cases</u>	<u>Complications</u>
1	12	0	14	0	2	0	12	0	40	0
2	43	9 (21)	21	0	0	0	0	4	68	9 (13)
3	29	13 (48)	17	2 (15)	14	2 (14)	8	0	68	17 (27)
4	18	4 (22)	15	1 (17)	14	1 (7)	4	0	51	6 (15)
5	12	3 (25)	8	1 (13)	2	1 (50)	7	0	29	5 (42)
6	7	2 (29)	4	0	2	0	0	0	13	2 (15)
7 +	14	26 (59)	4	3 (75)	6	3 (50)	1	1 (100)	55	33 (60)
Total	165		131		40		36		372	72

Table 9 shows the incidence of complications. 137 cases developed complications which were either temporary or permanent. Death was the commonest complication and occurred in 62 cases. On 14 occasions meningitis was discovered for the first time at necropsy. Next frequent was hydrocephalus in 15 cases. Subdural effusion which is an example of a temporary complication occurred with the same frequency as brain damage and paralysis of limbs which was commonly hemiplegic in type. The eight cases who developed other cranial nerve palsies consisted of 5 cases with seventh nerve palsy and 3 with various types of ocular muscle palsies. These were in some cases temporary complications.

TABLE 9: Incidence of complications in various age groups
Percentages are expressed in brackets

<u>COMPLICATION</u>	<u>CASES IN EACH AGE GROUP</u>				Totals
	1 month -	6 months -	2 years -	2-5 years	
1. Subdural Effusion	6 (3.6)	6 (4.6)	0	0	12 (3.2)
2. Hydrocephalus	7 (4.2)	7 (5.3)	1 (2.5)	0	15 (4.0)
3. Cranial Nerve Palsies					
i) Blindness	3 (3.3)	0	0	0	3 (0.8)
ii) Deafness	0	2 (.5)	0	0	2 (.5)
iii) Other Cranial Nerve Palsy	1 (0.3)	5 (3.6)	1 (2.5)	1 (2.8)	8 (2.2)
4. Cerebral Palsy	2 (0.6)	10 (7.2)	0	0	12 (3.2)
5. Hemiplegia	4 (1.2)	8 (6.0)	0	0	12 (3.2)
6. Death	34 (9.2)	24 (16.8)	4	2 (5.6)	62 (16.4)
7. Recurrence	0	2 (1.5)	0	0	2 (0.5)
8. Epilepsy	1 (0.3)	7 (5.3)	0	0	8 (2.2)
9. Others	1	0	1	0	2 (0.5)
Totals	27 (14.4)	69 (49.3)	3 (18.0)	3 (8.4)	137 (36.7)

TABLE 10: Association of Presenting features and one temporary complication i.e. Subdural Effusion with Subsequent development of Complications. In brackets is percentage developing complications of those cases with a given presenting feature.

Feature/Temporary Complications	Permanent Complications	Number of Cases
1. Convulsions	Epilepsy	6 (4.4%)
2. Convulsions	Hemiplegia	7 (5.1 %)
3. Convulsions	Cranial Nerve Palsy	7 (5.1%)
4. Convulsions	Hydrocephalus	15 (11.0%)
5. Convulsions	Death	23 (17.2%)
6. Subdural Effusion	Epilepsy	5 (41.7%)
7. Subdural Effusion	Cranial Nerve Palsy	4 (33.3%)
8. Subdural Effusion	Cerebral Palsy	1 (8.3%)
9. Treatment Elsewhere	Any complications	

In a total of 149 cases age less than 5 years dietary history was recorded and the outcome of disease was related to the mode of feeding. The aim was to evaluate the influence of breast feeding on the outcome of disease.

TABLE 11: Mode of feeding and outcome of disease. In brackets is number of cases who developed complications - death included, (in percent)

Type of feeding	Number of Cases and Complications			
	1 month	6 month	2 years	Total
1. Breast	58 (12.3)	55 (44.1)	1	114 (28.8)
2. Cows milk and other foods.	16 (11.9)	16 (42.3)	7	39 (28.1)

DISCUSSION

ANNUAL INCIDENCE

The average admission rate of 3.4% of all the Paediatric admissions is consistent with Oduori's series (1) in which meningitis accounted for 3.8% of his patients. Elsewhere in Africa it accounts for 0.3% to 10% of total Paediatric admissions (Brown (15), Hadgn (16)).

The lowest admission rate occurred in 1971 (2%). Over the years under study there was a fluctuation of the number of cases, with a general tendency to increase annually. There has been a general increase in cases of meningitis seen elsewhere in recent years (Michaels (10)). The factors associated with fluctuation in numbers of cases were not clear from this study. However, towards the end of 1974, there was an epidemic in meningococcal meningitis at Machakos which is 40 miles away and this could have partly accounted for the increase in the number of cases seen in that year.

No attempt was made to analyse the tribal breakdown of these cases as the majority were Kikuyus, who compose the majority of admissions to this hospital. This is because of geographical reasons as they live in region around the hospital and others when analysing admissions to this hospital have had a similar experience (Kungu (17)).

AGE SCATTER:

The majority of patients (79.5%) in this study were aged 2 years and below. Others (Brown (15), Murray (14), Wehole (18), Goldacre (9)), had similar results in series of patients in and outside Africa. Meningitis is primarily a disease of the younger child. This observation is relevant when considerations for a target group in immunisation programmes are made when it becomes a practical procedure in a wider scale eventually. (Goldacre (9)).

CASE-FATALITY RATES

The case-fatality rate of 16.4%, the average for the five years under study, compares favourably with the British study reported by Goldacre (9) where a rate of 12.9% was recorded in regional study. Reported case-fatality rates from Africa range between 22 - 34.9% (Hadgn (16)).

Over the five-year period the case-fatality was constant with a significant drop in 1975. Haggerty (4) has commented on the absence of reduction in case-fatality despite optimal treatment. This calls for continued research into management plans of this disease.

The drop in case fatality rate seen in 1975 may be attributed to the increased numbers of meningococcal meningitis which as has been shown elsewhere carries a lower mortality rate (Brown (15)).

STAY IN WARD

41 per cent of patients stayed in the ward for two to three weeks. For those who died, death occurred in most (71%) before the fifth day of admission. 23% of patients were in the ward for more than three weeks.

A knowledge of duration of stay in these cases is relevant in relation to the need for repeat lumbar punctures, a procedure that carries a definite risk (B.M.J. (22)). Such risks include in the short term ^{vs} cerebellar coning and death. The knowledge of duration of ward stay is important in deciding the timing of such a procedure and duration of treatment. Most of the patients (64%) were in the ward for at least two weeks.

In fatal cases where death occurred rapidly after admission, this could have been partly because many of them (60%), came to hospital late when little could be done to save them.

C.S.F. DIAGNOSIS.

The value of prompt cell counts on C.S.F. as has been recommended (Jelliffe (19)), has been shown in this study. In 86% of the cases, diagnosis was made using this procedure alone. It is a procedure that can be carried out easily in the sideroom laboratory. Everyone performing a lumbar puncture should be familiar with the technique of cell counting.

The importance of the estimation of C.S.F. protein sugar is often diminished by the occurrence of bloody taps. Low C.S.F. sugar, a diagnostic feature in meningitis, was found in a third of these cases (34.9%). The diagnostic value of C.S.F. sugar level is enhanced by a simultaneous estimation of blood sugar (Bering (20), Menkes (21)). Blood sugar were rarely done in the cases under study.

Both *Diplococcus pneumoniae* and *Haemophilus influenzae* were the commonest organisms recovered on C.S.F. culture, together accounting for 80% of positive cultures. *H. influenzae* was isolated in cases under the age of 2 years only. This has been the experience of others (Wehole (18), Oduori (3)).

Only 35.7% of cases had an organism causing the disease identified on cultures of blood or C.S.F. or on gram-staining of C.S.F. smears. This left the clinicians with two thirds of cases whom knowledge of necessary specific treatment was lacking. Reported series (Brown (15), Oduori (3)) had organism recovery rates ranging between 28.6% and 44.6%. In order that specific treatment may be given which is a prime consideration in effective management of this disease, a higher rate of organism identification is essential. To achieve this it is advocated that C.S.F. should be plated promptly as in method described by Hughes (Jelliffe (19)), blood cultures obtained in all cases as well as respiratory tract swab cultures.

An additional diagnostic aid that has been described is the counter-immunoelectrophoresis technique (Mitchells (23), Edwards (24)) which detects bacterial antigens. It has been found cheap, rapid and sensitive even after treatment has been started (Whittle (25)). Its main disadvantage lies in the demonstration that with good laboratories and experienced personnel, it has not significantly improved the frequency or the accuracy of clinical diagnosis (Wehler (18)). The method gives no false positives and only a few false negatives (Hambleton (26)). This method would improve identification of organism and would be especially useful in larger District and Provincial laboratories.

Other diagnostic aids which are technically more difficult and expensive to perform include the fluorescence-labelled antibody testing of C.S.F. for bacterial antibodies or cell constituents (Fox (27)). The Limulus test for endotoxaemia of gram-negative infections (Nachuum (28)) and the estimation of C.S.F. enzymes. The enzymes lactose dehydrogenase and glutamo-oxaloacetic transaminase are raised in bacterial and not in viral meningitis. Enzymes estimation is therefore nonspecific and will probably remain a research tool for some years.

BACTERIUM ANITRATUM

Bacterium anitratum meningitis has been reported from West Africa (Odugbami (29)) and since the completion of this study one case has been seen (unpublished) from the Paediatric wards at Kenyatta National Hospital. It is an organism belonging to the Mimeoae group, a term which denotes the groups ability to mimic other bacteria on morphological examination, especially the Neisseriae. As the Mimeoae organisms are generally sensitive to a

different range of antibiotics, tetracyclines and aminoglycosides, it can cause difficulties in treating cases initially presumed meningococcal on gram-stained smears. The organism also causes only a mild pleocytosis in presence of numerous gram negative diplococci.

SICKLE CELL DISEASE.

Four of six cases with sickle cell disease had an organism recovered from the C.S.F. and in all it a pneumococcus. Robinson (30) has reported this prediction for sicklers to have pneumococcal meningitis, a feature explained on their defective properdin system.

PRESENTING FEATURES

This study showed that in a child with meningitis, physical examination was more important than history in arriving at a diagnosis. In older children, 58.5% of cases had the tetrad of features of headaches, vomiting, neck stiffness and a positive Kernig's sign. In the children aged less than 2 years the tetrad was seen in only 39% of cases.

Neck Stiffness

This was the commonest presenting feature recorded especially in the age groups 1 month to 2 years. Meningismus, a non-specific sign, and lack of co-operation due to irritability are both encountered commonly in these two age groups. These factors probably account partly for a high proportion of cases recorded as having neck stiffness. 39% of children in these two age groups were recorded as having been irritable, which would suggest they were also un-cooperative.

In all cases, 65% had neck stiffness. Its reported frequency in other studies outside East Africa ranges between 15% and 80% in children of all ages (Brown (15)).

Fever:

Fever was the next commonest presenting feature. It is a nonspecific sign for meningitis. Studies outside East Africa report its occurrence in over 80% of their patients with meningitis (Gosage (33), Seriki (34), Carpenter (35)).

Convulsions:

Convulsions occurred in a third of patients and were most frequently found in the age group 6 month to 2 years. It is a group which has been shown more prone to developing febrile convulsions (Ounsted (36)). This high frequency of fits in meningitis is a strong argument for more lumbar punctures in the diagnostic work-up of any child in this age group who has fever and fits without an obvious diagnosis.

Associated Pneumonia and Other Infections.

Pneumonia and other infections were associated with meningitis in a fifth of cases. Whereas in the 1 month - 6 month age group the associated infection was a pneumonia in 32% of cases, for children 5-12 years it was a different co-existing infection in 31% of cases. In most of these cases in the latter group it was an upper respiratory tract infection.

Otitis media is a difficult diagnosis to make in infants and the 7% who were reported as having had this ear infection is probably an underestimation.

Future studies might with benefit, correlate the organisms causing meningitis and the infection in these other foci. This will increase the number of cases where specific diagnosis in meningitis is to be made if such a correlation demonstrates concordance of organisms causing meningitis and other associated infections.

Bulging Anterior fontanella, Convulsions, and Vomiting

These three features may suggest raised intracranial pressure. They were most commonly seen in the age groups 6 months to 12 years. Few cases had funduscopy examination done which would enable deductions on the association of these features with truly raised intracranial pressure. Their occurrence in these age groups is related to the degree of sutural closure. A bulging fontanella being the expression of raised intracranial pressure in 6 month, to 2 year age group whilst vomiting occurred frequently in the 5-12 year age group.

Essex (31) has drawn attention to the importance of appreciating the presenting features of various diseases occurring in a given locality. A collection of such features is useful in instructing paramedical staff manning busy outpatient clinics in developing countries helping them to arrive at differential diagnosis and plan of management rapidly. Use of these features is made in designing flow charts which he has shown as effective tools in hands of such workers (Essex (32)), and it requires an accurate knowledge of presenting features in diseases like meningitis.

DURATION OF SYMPTOMS BEFORE ARRIVAL.

61% of children had symptoms for 4 days or less before diagnosis, which stresses the acuteness of this disease. The mortality increased progressively the longer a patient had symptoms before diagnosis. Prognosis was influenced by the duration of symptoms before institution of treatment. Below 6 months of age mortality doubled if the patients had symptoms for over six days. A freak result was seen in the age group 1 month to 6 month who recorded a high

rate of complications (48%) if they had had symptoms for 3 days. The factors associated with this observation were not apparent from this study.

TREATMENT.

For the 4 year period 1971 - 1974, Ampicillin was considered the ideal antibiotic for treatment as it was effective against both the N. Meningococcus and H. Influenzae. Since March 1974 however, definite evidence of resistant H. Influenzae B strains was obtained (Murray (14)) necessitating a change from this attitude. More patients then received crystalline penicillin and chloramphenicol. The role of the various chemotherapeutic regimes was not analysed in this study.

COMPLICATIONS.

Death.

Amongst the 62 fatal cases, 23 of them (37%) had convulsions as a presenting feature. Fits occurred in 34% of all cases and this presenting feature was not found strongly associated with death.

Epilepsy.

Eight of the cases which eventually developed recurrent fits, 6 of them had initially had seizures as a presenting feature, and five of them had the course of their illness complicated by the development of a subdural effusion. It would appear then convulsions and subdural effusion predisposed these patients to more brain insults expressed eventually as epilepsy. Epilepsy was the sixth commonest complication in this series.

Hydrocephalus.

The second commonest complication in the series was hydrocephalus. The 15 patients who developed hydrocephalus eventually, all had convulsions as a

presenting feature. This again indicates a more severe inflammatory process by the disease in this group.

Waterhouse-Friedrichsen syndrome

This serious complication of adrenal failure associated with meningococcal infections was not diagnosed in this series of patients. If more post-mortems were done amongst the children presenting in extremis and comatose this clinical entity would probably have been more frequently reported. Mpairwe (37) and Brown (15) do not mention it in their series of patients.

Other Complications

The 6 month to 2 year age group had more complications than all the other age groups and also the highest case-fatality rate. It is the age group vulnerable to febrile fits and as was seen earlier had the highest frequency of convulsions. Their disease pattern would seem to be of more severe nature than the other age groups.

BREAST FEEDING AND COMPLICATIONS.

For the 149 cases analysed the mode of feeding did not influence the outcome of disease. Breast milk has been shown to offer protection against childhood gastro-intestinal and respiratory infections (Jelliffe (19)) 15 per cent of patients had those infections on the initial examination which meant this protective role of breast milk had already been compromised in them. The time sequence of these infections and meningitis was not recorded and this is the only way a meaningful deduction of the role of breast feeding in the outcome of meningitis can be made.

CONCLUSION .

This study has confirmed the high vulnerability of children under 2 years in getting meningitis. It has shown an increase in the number of cases over the years under study.

The duration of stay in the ward has been shown to be two to three weeks in over a third of patients (39.2%). Estimation of C.S.F. sugar was considered useful in diagnosis of one third of cases, and cell counting in C.S.F. as the most important diagnostic procedure.

Haemophilus influenzae and *Diplococcus pneumoniae* were found to be the commonest organisms in the causation of meningitis.

The children aged 6 month to 2 years were shown to have the highest likelihood of developing complications after an attack of meningitis. Convulsions as a presenting feature was found to be associated with more complications especially death and hydrocephalus.

Neck stiffness, fever, positive Kernig's sign, convulsions, irritability and a bulging anterior fontanella were the six leading presenting features in order of descending importance.

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