Arch. Dis. Childh., 1968, **43**, 53.

Incidence and Treatment of Infantile Gastro-enteritis in General Practice

DAVID WHEATLEY

From the General Practitioner Research Group, Twickenham, Middlesex

Before the advent of antibiotics, it was accepted teaching that breast-fed babies were less liable to infective gastro-enteritis than bottle-fed babies, and that the outcome in the former was better. However, coincident with the widespread use of antibiotics in treatment, there has been a gradual change in infant feeding habits, with a decline in breast-feeding. Thus, Newson and Newson (1962) in a survey of more than 700 mothers of 12-month-old children, in Nottingham, found that 83% were breast-feeding at 4 days after birth, while only 60% were still doing so at 2 weeks and 50% at 3 weeks. Only 1 in 10 mothers continued for as long as 6 months, the age which is commonly taken as the normal time to wean from the breast. These figures have been complemented more recently by Burnett (1965), in a survey on 288 patients attending the maternity department of the West Middlesex Hospital, Isleworth: 75% new patients expressed a wish to breast-feed their babies, and on discharge from hospital 88% were actually doing so, but 6 weeks later only 34% still breast-fed their babies. Comparable figures have been given by Mellander, Vahlquist, and Mellbin (1959).

Newson and Newson (1963a, b) have compared their results with those of previous surveys (Dykes, 1950; Royal College of Obstetricians and Gynaecologists and Population Investigation Committee, 1948; Spence, Walton, Miller, and Court, 1954; Ross and Herdan, 1951), noting a progressive decline in breast-feeding over the years, particularly marked in the lower social classes.

The death rate from infective gastro-enteritis in children under 1 year, over the past seven years, has shown a tendency to increase (Registrar General, 1960–66). Thus, the death rate per 100,000 live births in children under 1 year, from gastro-enteritis, was 36·5 in 1958, 53·3 in 1962, and 48·0 in 1964. The increase in the incidence of this infection may be related to the change in feeding habits from breast to bottle. Thus, Robinson (1951), in a survey of 3266 infants from the ages of 3 weeks to 7 months, found that both morbidity and mortality from various infections were significantly greater in the bottle-fed babies than in those breast-fed. This was particularly so in relation to mortality, since among 971 breast-fed infants there were 10·2 deaths per 1000, as compared to 25·7 deaths per 1000 in 1441 part bottle and part breast-fed infants, and 57·3 deaths per 1000 in 854 bottle-fed infants. Gatherer and Wood (1966) investigated bacterial contamination of teats and bottles and found that only 69% of bottles and 46% of teats were satisfactory, a likely factor in the initiation of infection.

In 1962, there were 10,000 admissions to hospital for this condition in children under 1 year (Ministry of Health and General Register Office, 1966), and a very much larger number were treated by general practitioners at home (Registrar General, 1960). However, this survey was carried out in 1956–57, and showed that general practitioners were then treating gastro-enteritis at a rate of 95·4 per 1000 children on their National Health Service lists, representing something like 95,000 cases per year. These figures imply that general practitioners were treating some ten times the number of cases treated in hospital. It is of interest to know whether or not the incidence of the condition in general practice has changed in the ensuing 10 years, and whether the increasing numbers of babies that are bottle-fed have affected the situation.

Material and Methods

The survey was designed in two parts, a retrospective section covering the preceding 12 months to October 1, 1966, and a prospective section conducted over the three-month period, October 1–December 31, 1966. For the purposes of this survey, the infective gastro-enteritis was defined as, 'any condition of infective diarrhoea and vomiting treated with an antibiotic', and the study was confined to infants aged 0–12 months.

Retrospective study. This part of the survey depended on the keeping of accurate records, and this

Received June 1, 1967.

limited the response. Of 170 members of the Group who were circulated with the questionnaire, completed answers were received from 39. Of these doctors, 9 were in the London area, 11 in Southern England (other than the London area), 10 in the Midlands, 4 in Wales, 1 in Ireland, and 4 in the North and Scotland. The following questions were asked:

(1) The number of babies aged 0–12 months registered in the practice, divided into the following age-groups, according to sex: 0–1 month, 2–3 months, 4–5 months, 6–7 months, 8–9 months, and 10–12 months.

(2) The number of live births registered in the practice during the last 12 months (i.e. September 1965–September 1966). These were also recorded according to sex.

(3) The number of babies aged 0–12 months treated for infective gastro-enteritis, recorded according to age-groups, sex, and whether bottle- or breast-fed.

(4) Antibiotics, specified, used in the treatment of the cases of infective gastro-enteritis.

(5) The outcome of treatment of the cases, and whether they were referred to hospital, together with the outcome of hospital treatment, recorded according to age and sex.

Results

Retrospective survey. The over-all incidence of the condition was 9% in relation to the number of babies registered in the various practices in the appropriate age-group, and 11% in relation to the number of babies born in the practices during the preceding years. There was considerable variation in incidence from practice to practice, and the over-all incidences for the various areas were as follows (the first figure shows the incidence in relation to the babies registered in the practices, and the figure in brackets refers to the incidence in relation to the number of babies born during the preceding one year): London area 8% (10%); Southern England 3% (5%); Midlands 6% (8%); Wales and Ireland 23% (32%); North and Scotland 11% (11%).

The condition was commonest in the youngest age-group of 0–1 month (19%), with decreasing incidence in relation to increasing age, as follows: 2–3 months (12%), 4–5 months (10%), 6–7 months (9%), 8–9 months (7%), and 10–12 months (6%). The condition was also commoner in males (10%) than in females (8%).

In relation to the method of feeding, 91% of cases had been bottle-fed and 9% breast-fed, while the commonest antibiotics used in treatment were 'broad-spectrum antibiotics' (73%), followed by sulphonamides+streptomycin (50%), sulphonamides+neomycin (37%), and sulphonamides alone (30%). The outcome of treatment was recorded as being satisfactory recovery in 90%, with only 10% needing hospital admission. The rate for hospital admission was highest in the youngest age-groups of 0–1 month (21%), and 2–3 months (15%), and lowest in the 6–7 months group (2%), followed by 8–9 months (7%), 4–5 months (8%), and 10–12 months (10%).

Prospective survey. This part of the survey was conducted over the three months from October 1–December 31, 1966, and members of the Group were asked to record any case of infective gastro-enteritis, occurring in infants aged 0–12 months, during this period, using the same definition for the condition, and recording the same facts as in the retrospective part of the survey.

Returns were received from 73 doctors, of whom 31 (42%) had seen cases and the remaining 42 (58%) had seen no cases according to the definition, in the three month-period of the survey. The 31 doctors who did see cases during the period saw numbers ranging from 1–8 per practice and the total number of cases seen by these doctors was 79, which gives an incidence for all 73 doctors of one case per practice in this three-month period, or an annual incidence of 4 cases per practice, assuming that the incidence remains constant throughout the year.

Incidence. Of the doctors taking part in the prospective survey, 33 had also taken part in the retrospective part, and Table I shows the incidence in the various regions for both parts of the survey, using the criterion of the numbers of babies registered in the practices.

A similar regional pattern of incidence is apparent in the prospective part of the survey as in the retrospective part, suggesting a true difference in incidence of the condition in the various regions.

The total incidence in the prospective part of the survey, when corrected for 12 months, was lower (6%) than in the retrospective part of the survey (9%). Probably the prospective part of the survey provides the more accurate figures, but on the other hand it did only cover three months, and these months were October, November, and December 1966. If the condition is indeed an epidemic one, then it might well be that this period did not in fact cover the maximum epidemic incidence, since epidemics of infective gastro-enteritis in older children and adults are usually maximal in the spring. Nevertheless, at the most conservative estimate, the incidence of the condition would be shown on these figures to be about 6% of children in the age-group. Probably taken in conjunction with the figures from the retrospective part of the survey, it would be reasonable to conclude

TABLE I

Case Incidence by Regions

Area	Retrospective			Prospective			
	No. of Cases	Babies Registered	Incidence (%)	No. of Cases	Babies Registered	Incidence For 3 Months (%)	Corrected Incidence For 1 Year (%)
London	62	767	8	6	767	1	3
Southern England	22	683	3	12	683	2	7
Midlands	63	1042	6	11	1042	1	4
Wales and Ireland	92	397	23	10	397	3	10
North and Scotland	34	309	11	10	309	3	13
Totals	273	3198	9	49	3198	1·5	6

TABLE II

Case Incidence by Age and Sex (Prospective Survey)

Age (mth.)	Males			Females			Total—M and F		
	No. of Cases	No. at Risk	Incidence (%)	No. of Cases	No. at Risk	Incidence (%)	No. of Cases	No. at Risk	Incidence (%)
0–1	0	106	0	3	91	3·3	5*	197	2·5
2–3	5	177	2·8	2	178	1·1	8*	355	2·2
4–5	5	215	2·3	2	225	0·9	8*	440	1·8
6–7	3	219	1·4	5	243	2·1	8	462	1·7
8–9	9	267	3·3	3	284	1·1	12	553	2·1
10–12	5	336	1·5	3	355	0·8	8	689	1·2
Totals	27	1320	2·0	18	1376	1·3	49*	2696	1·8

* Sex not recorded in 4 cases.

that the incidence of the condition lies somewhere between 6 and 10%.

Effects of sex and age. The results for the prospective part of the survey are shown in Table II.

In the total figures for both sexes, there is a slight suggestion that the incidence of the condition was highest in the youngest age-group of 0–1 month (2·5%), with a progressive decline in incidence to the oldest age-group of 10–12 months (1·2%), with the exception of the 8–9 months group (2·1%).

The higher incidence in males (2·0%) over females (1·3%), if corrected for 12 months, is statistically significant at the 5% level, as was also the sex difference recorded in the retrospective part of the survey (Clark and Downie, 1966).

Influence of feeding methods. For this analysis, the 30 cases have been added from those doctors who did not complete the retrospective part of the survey. These figures are shown in Table III, in relation to age and sex.

In some cases, more than one method had been used together, i.e. bottle and breast or bottle and

TABLE III

Feeding Method

Age (mth.)	Male				Female				Total—M and F			
	No. of Cases	Bottle	Breast	Solids	No. of Cases	Bottle	Breast	Solids	No. of Cases	Bottle	Breast	Solids
0–1	2	2	—	—	3	3	—	—	7*	7	—	—
2–3	9	8	2	2	3	3	—	1	13*	12	4	3
4–5	7	6	1	4	5	5	—	3	13*	12	1	7
6–7	5	5	—	3	9	8	2	6	15*	14	2	9
8–9	11	20	—	10	3	2	1	1	14	12	1	11
10–12	7	2	1	7	10	5	—	9	17	7	1	16
Totals	41	33	4	26	33	26	3	20	79*	64 (81%)	9 (11%)	46 (59%)

* Sex not recorded in 5 cases.

TABLE IV

Duration of Illness

Age-groups (mth.)	No. of Cases	Duration				Referred to Hospital
		1–3 Days	4–7 Days	8–14 Days	>14 Days	
0–1	7	6 (86%)	1 (14%)	—	—	—
2–3	13	4 (31%)	3 (23%)	5 (38%)	1 (8%)	1 (M)
4–5	12	9 (75%)	2 (17%)	1 (8%)	—	1 (F)
						1 (M)
6–7	15	9 (60%)	6 (40%)	—	—	—
8–9	13	9 (69%)	4 (31%)	—	—	—
10–12	17	10 (59%)	5 (29%)	2 (12%)	—	—
Totals	77	47 (61%)	21 (27%)	8 (10%)	1 (1%)	4 (5%)

solids, and this accounts for the disparity in numbers between the totals of the types of feeding and the number of cases.

The total figures given at the foot of Table III show that the proportions fed by the three methods were similar for the two sexes, and, combining both sexes, bottle-feeding had been used in 81% of all cases, breast-feeding in 11%, and solids in 59%. Thus there was the same excess of bottle-feeding in these cases as was shown in the retrospective part of the survey. No conclusion can be drawn from the incidence of the condition in relation to solid foods, because all infants in this age-group would have solids added as their age increased, but the figures do not suggest any association between solid feeding at an early age and an increased incidence of the condition. With regard to age, the numbers in the individual groups are too small for comparison, but it is perhaps notable that in the youngest age-group, 0–1 month, there were no cases being breast-fed, whereas Newson and Newson found that 50% of mothers breast-fed their children for this period. Otherwise, the proportions being breast-fed are probably no different from those in the population generally, our over-all figure of 11% breast-fed babies in the survey cases corresponding with the 10% breast-feeding at 6 months in Newson and Newson's survey. In brief, our figures do not suggest that breast-feeding is of importance in lowering the incidence of infective gastro-enteritis in these infants.

Results of treatment. The participating doctors were asked to record the effectiveness of treatment; this was 'completely satisfactory' in 86% of cases, 'partially satisfactory' in 9%, and 'ineffective' in 5%.

In addition to recording the over-all results of treatment, the time taken for the condition to resolve was also recorded; rather better results were recorded in females than in males; since for the former, 69% cleared up within 1–3 days, 22% within 4–7 days, and 9% within 8–14 days. The comparable figures for males were: 1–3 days 53%, 4–7 days 35%, and 8–14 days 12%.

Table IV shows the over-all analysis in relation to age-groups, both sexes being combined.

Considering the results now according to age-groups, it is seen that the best results were recorded in the youngest age-group of 0–1 month, since 86% cleared up within 1–3 days and the remaining 14% within 4–7 days. The poorest results were recorded in the next age-group of 2–3 months, with only 31% clearing up within 1–3 days and 23% within 4–7 days; while 38% took 8–14 days to resolve and one patient over 14 days. In addition, one male patient was referred to hospital. The proportion of patients whose condition cleared up within 1–3 days in the 2–3 months group differs significantly at the 5% level from those in the 0–1 months, 4–5 months, and 8–9 months groups.

Only 5% of all cases were referred to hospital, so that the great majority were satisfactorily treated at home.

Results in relation to feeding methods. The method of feeding was recorded in each case, as either breast, bottle, or solids, or any combination of 2 or more methods. Breast-feeding was used too infrequently to draw any comparisons, but there was no suggestion that where breast-feeding was used, results were any better.

Summary and Conclusions

A survey was made of the incidence of infective gastro-enteritis in infants aged 0–12 months, retrospectively over the 12 months before October 1, 1966, and prospectively over October, November, and December 1966. In the retrospective part of the survey, the incidence was 9% in relation to the number of babies registered in the practices; in the prospective part of the survey the incidence was 1·5% for the three-month period. Regional variations in incidence suggested an epidemic

nature for the condition, which was commonest in the youngest age-group of 0–1 month, with decreasing incidence in relation to increasing age. It was commoner in males than females.

Both parts of the survey confirmed the low incidence of breast-feeding in these infants, being only 9% in the retrospective part of the survey and 11% in the prospective part. These figures are probably no different from those for the population generally, and there was no evidence that either the incidence of the condition or its response to treatment were influenced by the method of feeding.

The majority of cases were satisfactorily treated at home with antibiotics, the hospital referral rate being only 10% in the retrospective part of the survey and 5% in the prospective part.

It is concluded that the incidence of the condition remains as high as 10 years ago, and that the majority of cases are treated satisfactorily by the general practitioner.

REFERENCES

Burnett, C. W. F. (1965). Breast feeding today. *Nurs. Times*, **61**, 554.

Clark, C. J., and Downie, C. C. (1966). A method for the rapid determination of the number of patients to include in a controlled clinical trial. *Lancet*, **2**, 1357.

Dykes, R. M. (1950). *Illness in Infancy: a Comparative Study of Infant Sickness and Infant Mortality in Luton.* Leagrave Press, Luton.

Gatherer, A., and Wood, N. (1966). Home standards of sterilization of infant feeding bottles and teats. *Mth. Bull. Minist. Hlth Lab. Serv.*, **25**, 126.

Mellander, O., Vahlquist, B., and Mellbin, T. (1959). Breast feeding and artificial feeding: the Norrbotten study. *Acta paediat. (Uppsala)*, Suppl. **116.**

Ministry of Health and General Register Office (1966). *Report on Hospital In-patient Enquiry for the Year 1962.* H.M.S.O., London.

Newson, L. J., and Newson, E. (1962). Breast-feeding in decline. *Brit. med. J.*, **2**, 1744.

——, and —— (1963a). *Infant Care in an Urban Community*, p. 43. Allen and Unwin, London.

——, and —— (1963b). *ibid.*, p. 164.

Registrar General (1960–66). *Statistical Reviews of England and Wales, 1958–1964.* H.M.S.O., London.

Robinson, M. (1951). Infant morbidity and mortality. A study of 3266 infants. *Lancet*, **1**, 788.

Ross, A. L., and Herdan, G. (1951). Breast-feeding in Bristol. *Lancet*, **1**, 630.

Royal College of Obstetricians and Gynaecologists and Population Investigation Committee (1948). *Maternity in Great Britain.* Oxford University Press, London.

Spence, J. C., Walton, W. S., Miller, J. F. W., and Court, S. D. M. (1954). *A Thousand Families in Newcastle upon Tyne.* Oxford University Press, London.