

# Drug consumption during the first 18 months of life of infants from smoking and non-smoking families

ANDERS HÅKANSSON

CHRISTER PETERSSON

**SUMMARY.** In a geographically well defined population in southern Sweden, a study was made of the overall consumption of drugs by infants during their first 18 months of life. The study population comprised 240 infants, of whom 90 were from families where tobacco was smoked by one or both parents and 150 were from non-smoking families. The investigation was carried out retrospectively by interviewing the mothers at the routine 18-month check up at the child health clinic, combined with study of the medical records at the district health centre, and at the paediatric and ear, nose and throat departments of the nearby hospital. In addition, the reliability of the interview method compared with review of medical records was investigated. Particular attention was paid to the consumption of antibiotics and the relationship between 'passive smoking' and consumption of antibiotics necessitated by respiratory tract infections. There was widespread use of both prescribed and non-prescription remedies. At the age of 18 months, about two thirds of all infants in the area had been prescribed an antibiotic (or other antibacterial agent) on at least one occasion. Infants from smoking families had been prescribed significantly more antibiotics than had infants from non-smoking families. The same pattern was also apparent for nose drops and dimethicone/dicyclomine hydrochloride. The incidence of respiratory tract infections requiring antibiotic treatment was higher in infants from smoking families than from non-smoking families in all the three-month age groups up to 15 months. The responses to the retrospective interview accorded closely with the details recorded in the medical records. The interview method was therefore deemed to be a simple and practicable way of carrying out this type of investigation.

**Keywords:** patient use of medication; smoking; family; infants.

## Introduction

SINCE 1970 it has been the practice in the county of Jämtland in northern Sweden to record the prescription of medication on an individual case basis.<sup>1</sup> The prescribing of pharmaceutical preparations is monitored in outpatient care for one inhabitant in seven in all age categories.

In recent years a number of population based investigations have been published, focusing particularly on the prescribing of drugs to children. One such series concerns the town of Tierp

A Håkansson, MD, PhD, district physician and C Petersson, MD, district physician, Teleborg Health Centre, Växjö and Department of Community Health Sciences, University of Lund, Dalby, Sweden.  
Submitted: 15 August 1991; accepted: 29 November 1991.

in central Sweden.<sup>2-4</sup> In 1989 a study was published of health problems and drug consumption in a child population in Växjö in southern Sweden.<sup>5</sup> Two investigations concerning the consumption of antibiotics by children in various forms of day care in this town, one based on diaries<sup>6</sup> and another based on records,<sup>7</sup> have also been published.

From the other Scandinavian countries, various studies have appeared on this subject,<sup>8,9</sup> but as far as we are aware, there have been no population based investigations. In a special report on child health, published some years ago, by the Nordic School of Public Health in Göteborg, Sweden,<sup>10</sup> it was stated that the consumption of drugs by children under outpatient care had received insufficient attention. Unfortunately this assertion is still largely true.

The aim of this study was to determine the overall consumption of drugs — particularly antibiotics — in a geographically well defined infant population, from birth up to the routine 18-month check up at the child health clinic. A further aim was to study the association between drug consumption and various social variables, especially the association between 'passive smoking' and the use of antibiotics. In addition, the reliability of the interview method compared with review of medical records was investigated.

## Method

The study population was recruited from a geographically defined area — the catchment area of the Teleborg health centre, Växjö, covering approximately 11 000 inhabitants. The 324 mothers who registered for antenatal care during the periods November 1983 to December 1984 and January–December 1986 had been studied earlier, during pregnancy.<sup>11,12</sup> The 240 women that had not had a miscarriage and had not moved were asked to participate in this study. A total of 239 mothers (240 infants) agreed to take part.

At the 18-month check up at the child health clinic, all 239 mothers were interviewed by a district nurse using a structured questionnaire. The questionnaire included questions about the infants' consumption of medical preparations and their parents' smoking habits. All the questions were straightforward, for example 'Have you ever given your child an antibiotic?'

In addition, the infants' medical records, held at the district physician's surgery and the child health clinic at the district health centre and at the paediatric and ear, nose and throat departments of the Central Hospital in Växjö, were studied and all medical prescriptions written during the 18 months noted. From the maternity care files information on the mothers' occupation and smoking habits during pregnancy, and parity were extracted. Information on the outcome of the pregnancy and delivery was also obtained from the same source. Occupational data were encoded according to the socioeconomic classification of the Central Bureau of Statistics.<sup>13</sup> Infants from smoking families were those whose mothers had smoked during pregnancy and/or where the mother and/or father smoked after the child's birth.

The chi square test was used to compare proportional values.

## Results

Table 1 shows the characteristics of the population who were included in the study. The majority of mothers from smoking families were characterized as having manual occupations, while civil servants and other salaried workers dominated among non-smoking families. In addition, significantly more women from smoking families had previously undergone an abortion, compared with those from non-smoking families. There were no differences between the two groups as regards pregnancy outcome.

The consumption of the most common drugs by the 240 infants during their first 18 months of life is shown in Table 2. According to the medical records 155 infants had been given antibiotics (or other antibacterial agents) on at least one occasion (64.6%). The largest consumption of antibiotics took place when the infants were aged 7–12 months — 46.1% of the 349 prescriptions versus 14.9% when younger and 39.0% when older. The most common indication was some form of respiratory tract infection — by the age of six months, 15.8% of the 240 infants had been given antibiotics for a respiratory tract infection, at 12 months, 47.1%, and at 18 months, 61.3%.

Table 3 shows that significantly more infants had been given antibiotics (or other antibacterial agents) in smoking families than in non-smoking families. Infants in smoking families were also given significantly more nose drops and dimethicone/dicyclomine hydrochloride, than infants in non-smoking families. Figure 1 shows that infants from smoking families had been more affected by respiratory tract infections requiring antibiotics than had infants from non-smoking families in all age groups except the oldest. Figure 2 shows the cumulative difference between the groups which increases as the infants get older.

There was no significant difference in drug consumption between infants whose mothers were manual or non-manual workers. The 87 infants of primiparas received dimethicone/dicyclomine hydrochloride significantly more often than the 153 infants of multiparas (41.4% versus 24.8%,  $P<0.01$ ), but other-

**Table 1.** Characteristics of study population.

	% of women/infants		
	All ( <i>n</i> = 239/ 240)	Smoking families ( <i>n</i> = 90/90)	Non- smoking families ( <i>n</i> = 149/150)
<i>Mother's characteristics</i>			
Manual occupation	36.8	51.1	28.2***
Non-manual occupation	53.6	35.6	64.4***
Other/no occupation <sup>a</sup>	9.6	13.3	7.4
Smoker	23.4	62.2	0
Primipara	36.4	40.0	34.2
Had previous miscarriage	18.0	22.2	15.4
Had previous induced abortion	15.9	26.7	9.4***
<i>Delivery and birth outcome</i>			
'Normal' delivery	71.5	72.2	71.1
Caesarean section	11.7	11.1	12.1
Preterm (<37 weeks)	4.2	4.4	4.0
'Healthy' infant	79.2	81.1	78.0
Low birthweight infant (<2500 g)	5.0	7.8	3.3
Care required at paediatric department	10.4	8.9	11.3
Perinatal mortality	0	0	0

\*\*\* $P<0.001$ . *n* = total number of women/infants as appropriate. <sup>a</sup>Includes students, housewives and so on.

**Table 2.** Consumption of common drugs by the 240 infants during their first 18 months of life, according to their medical records and the interview with the mother.

Drug category	Number (%) of infants		
	Medical records	Interview	Medical records or interview
Antibiotics and other antibacterial agents	155 (64.6)	160 (66.7)	172 (71.7)
Phenoxymethylpenicillin	120 (50.0)	—	—
Erythromycin	57 (23.7)	—	—
Amoxycillin	45 (18.7)	—	—
Cephalosporins	16 (6.7)	—	—
Flucloxacillin	7 (2.9)	—	—
Nitrofurantoin	4 (1.7)	—	—
Co-trimoxazole	2 (0.8)	—	—
Nose drops	117 (48.7)	198 (82.5)	207 (86.2)
Cough mixture	96 (40.0)	113 (47.1)	131 (54.6)
Dimethicone/dicyclomine hydrochloride	64 (26.7)	62 (25.8)	74 (30.8)
Chloramphenicol (eye drops)	53 (22.1)	—	—
Skin disinfectants	46 (19.2)	—	—
Topical corticosteroids	42 (17.5)	62 (25.8)	74 (30.8)
Paracetamol	40 (16.7)	218 (90.8)	218 (90.8)
Clemastine	13 (5.4)	—	—
Antihistamines	11 (4.6)	—	—
Salicylates	3 (1.2)	10 (4.2)	10 (4.2)

\*Some of these infants received antibiotics on more than one occasion.

**Table 3.** Consumption of drugs by infants from smoking and non-smoking families during their first 18 months of life, according to their medical records and the interview with the mother.

Drug category	% of infants	
	Smoking families ( <i>n</i> = 90)	Non-smoking families ( <i>n</i> = 150)
Nose drops	92.2	82.7*
Paracetamol	91.1	90.7
Antibiotics (or other antibacterial agents)	81.1	66.0*
Cough mixture	61.1	50.7
Dimethicone/dicyclomine hydrochloride	40.0	25.3*

*n* = total number of infants in group. \* $P<0.05$

wise there were no significant differences between these two groups in terms of drug consumption.

Table 2 shows that as regards prescribed drugs such as antibiotics, the interview responses agreed closely with the medical records. As expected, for non-prescription medications, the figures obtained from the interviews were higher than those recorded in the medical records. If the medical record figures are regarded as true, of the 160 respondents who at the interview said that their infants had been given an antibiotic on at least one occasion, 143 stated the truth and 17 replies were false positive; 12 further replies were false negative. Consequently as regards recollection of antibiotic treatment the sensitivity of the interview method was 92.3% and the specificity 80.0%. The positive predictive value was 89.4% and the negative predictive value 85.0%.

## Discussion

In this study medical records have been studied and a structured interview with mothers used to form an impression of the overall

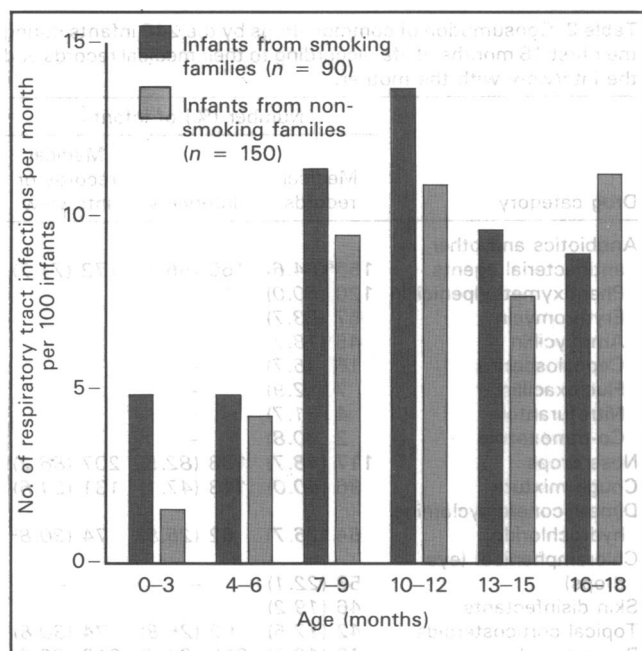


Figure 1. Incidence of respiratory tract infections treated with antibiotics during first 18 months of life for infants from smoking and non-smoking families ( $n$  = total number of infants in group).

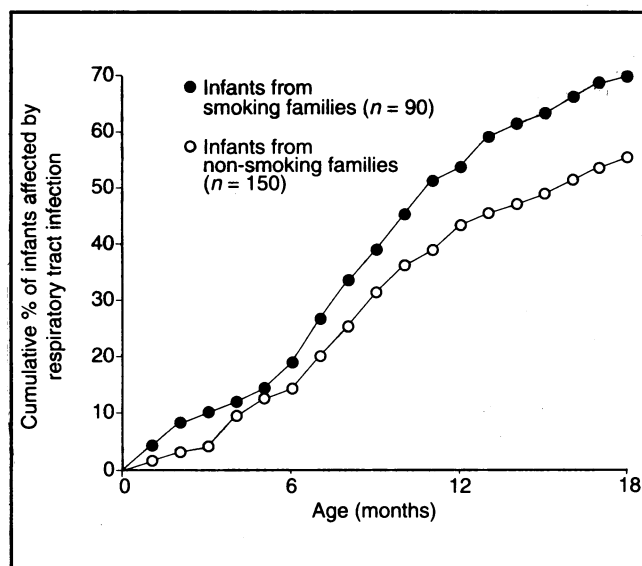


Figure 2. Cumulative percentage of infants from smoking and non-smoking families affected by respiratory tract infections treated with antibiotics during first 18 months of life ( $n$  = total number of infants in group).

drug consumption of infants in a geographically well defined area during the first 18 months of life. This method allows both prescribed drugs and non-prescription medication to be monitored.

Since comparable Swedish studies have been based solely on prescribed drugs,<sup>3,14</sup> this study has concentrated on antibiotics. At the 18-month check up, about two thirds of all infants in Teleborg had been given an antibiotic (or other antibacterial agent) on at least one occasion. The Tierp study produced rather lower figures — at the age of two years, 56% of Tierp children had received antibiotics on at least one occasion; at the age of one year, the corresponding figure was 33%.<sup>3</sup> The Jämtland

study, which is now over a decade old, reported even lower figures.<sup>14</sup>

The overall drug consumption of the infants in this study would appear to be relatively high. This tendency to treat even very young infants with medication in cases of sudden illness has been demonstrated in a Swedish study of parent-reported drug consumption.<sup>15</sup> It is tempting to assert that the consumption of antibiotics in this study population was too high. This problem has been considered in a recent Swedish doctoral dissertation<sup>16</sup> and in the international literature.<sup>17,18</sup> Another Swedish study has demonstrated differences in antibiotic consumption between towns and smaller urban areas and furthermore that a deliberately restrictive policy regarding antibiotic prescribing can lead to a considerable reduction in their use.<sup>19</sup>

As regards the association between parents' smoking habits and infant morbidity, particularly respiratory tract infection, the study has demonstrated that infants from smoking families are more often given antibiotics than infants from non-smoking families. The impression that the difference is a real one is strengthened by the higher incidence of respiratory tract infections requiring antibiotic treatment among infants from smoking families in all the three-month age groups except the oldest during the first 18 months of the infants' life and by the fact that the cumulative difference between the groups tended to increase as the infants' age increased. No differences in drug consumption were found between infants whose mothers were manual or non-manual workers. Thus, the fact that the majority of the mothers from smoking families were manual workers, while most of those from non-smoking families were non-manual workers, cannot explain the differences in drug consumption between infants from smoking and non-smoking families.

In a review of 25 articles concerning the association between smoking and respiratory tract infections during the period 1969–82, it was found that the parents' smoking habits were of no consequence for the incidence of respiratory tract infection in their children in only five of the investigations.<sup>20</sup> In the majority of the studies a dose-response relationship was evident — the more the adult members of the family smoked, the more their children suffered from respiratory tract infections. The younger the children who were affected, particularly by lower respiratory tract infections the more strongly this relationship was demonstrated.<sup>21–23</sup> Even excess morbidity owing to other forms of respiratory tract infection has been correlated with 'passive smoking' by children from smoking families.<sup>24–26</sup> The majority of studies demonstrate a relationship between a mother's smoking habits and the frequency of infections in her children; the father's smoking seems to be of lesser importance.<sup>22–24</sup>

As the definition of smoking family used in this study was so broad, families where only the father smoked, if only occasionally have been included. This suggests that the difference between smoking and non-smoking families demonstrated here would have been even larger if we had compared infants whose mothers were heavy smokers with infants whose mothers were non-smokers.

In an earlier diary-based study from the same district,<sup>6</sup> it was found that more than 90% of the antibiotics given to children aged one to six years were prescribed by physicians working at one of the outpatient clinics included in the present study. Thus, we have good reason to believe that in this study of medical records almost all instances of antibiotic prescribing in the area during the study period were identified.

With regard to the reliability of the interview method for retrospective investigation of antibiotic consumption by infants, a sensitivity of 92% and a specificity of 80% must be regarded as excellent in view of the length of the study period. Thus, even

over a period of 18 months the mother seems to remember quite well whether her infant has been prescribed an antibiotic. Were shorter periods of investigation to be used, the method should prove even more reliable, but even in a weekly retrospective interview it is possible to discern the same pattern — good sensitivity but poorer specificity.<sup>27</sup> The methodological alternative that could be applied in a study such as this would be some form of continuous self-reporting. This will be necessary if more subtle variables are to be investigated. The diary is an excellent research tool, though it requires considerably more resources to maintain a high and constant degree of validity.<sup>27</sup>

In conclusion, at the age of 18 months about two thirds of the infants in this study had been given an antibiotic (or other antibacterial agent) — more infants from smoking families than non-smoking families received these drugs. The responses to the retrospective interview accorded closely with the details recorded in the medical records and the interview method can therefore be seen as a simple and practicable way of carrying out this type of investigation.

## References

- Boethius O. *Prescription of drugs 1970–75 in the county of Jämtland, Sweden. Epidemiological and clinical pharmacological aspects (thesis)*. Uppsala University, Sweden, 1977.
- Rasmussen F, Smedby B. Physician visits and prescribed drugs among young children and their mothers. *Scand J Prim Health Care* 1987; 5: 225–231.
- Rasmussen F. *Self-care, medical care and prescription drugs in early childhood (thesis)*. Uppsala University, Sweden, 1988.
- Rasmussen F, Sundelin C. Use of medical care and antibiotics among preschool children in different day care settings. *Acta Paediatr Scand* 1990; 79: 838–846.
- Håkansson A. Health complaints and drug consumption during the first eighteen months of life. *Fam Pract* 1989; 6: 210–216.
- Petersson C, Håkansson A. A prospective study of infectious morbidity and antibiotic consumption among children in different forms of municipal day-care. *Scand J Infect Dis* 1989; 21: 449–457.
- Petersson C, Håkansson A. A retrospective study of respiratory tract infections among children in different forms of day care. *Scand J Prim Health Care* 1990; 8: 119–122.
- Uldall P. *Spæd og småbørns almindelige sygelighed — forekomst og sociale konsekvenser [Sickness among infants and children. Occurrence and social consequences]*. København, Denmark: FADL's Forlag, 1987.
- Tuomikoski H. Lasten terveydentila ja terveystalvustusten käyttö [Children's health status and health service use]. In: Kalimo E, Nyman K, Klankka T, et al (eds). *Terveystalvustusten tarve käyttö ja kustannukset 1964–1976 [Need, use and expenses of the health service in Finland 1964–1976]*. Helsinki, Finland: Kansane-läkelaitoksen Julkaisuja, 1982.
- Köhler L, Jakobsson G. *Children's health and well-being in the Nordic countries. Clinics in developmental medicine no. 98*. London: MacKeith Press, 1987.
- Håkansson A. Antenatal care in general practice in Sweden. A descriptive study of problems, measures and outcome in a defined population. *Scand J Prim Health Care* 1988; 6: 137–142.
- Håkansson A, Åberg A, Atterwall I, et al. Antenatal care in southern Sweden. A population-based prospective study describing the diagnostic panorama of pregnancy. *Acta Obstet Gynecol Scand* 1991; 70: 531–538.
- Statistiska centralbyrån. *Socioekonomisk indelning (SEI) [Swedish socioeconomic classification]*. Stockholm, Sweden: Statistics Sweden, 1984.
- Boethius G. *Läkemedelskonsumtion under barnåren [Drug consumption in infancy] I: Socialstyrelsens kommitté för läkemedelsinformation. Symposium: barn och läkemedel [Symposium: infants and medication]*. Uppsala, Sweden: Socialstyrelsens Läkemedelsavdelning, 1980.
- Bergström B, Lagerkvist B, Tengvald K, et al. Hälsoproblem och sjukdoms beteende bland småbarnsfamiljer i tätort och glesbygd. V. Slutsatser och framtida forskningsbehov [Health problems and disease patterns in families with young children in urban and rural communities. V. Conclusions and research needs]. *Socialmedicinsk Tidskrift* 1985; 62: 29–35.
- Mölstad S. *Antibiotics usage and betalactamase production in respiratory tract bacteria (thesis)*. University of Lund, Sweden, 1990.
- Kennedy DL, Forbes MB. Drug therapy for ambulatory pediatric patients in 1979. *Pediatrics* 1982; 70: 26–29.
- Grace JF, Goulds RK. An examination of the prescribed therapeutic experience of five-year-olds in general practice. *J R Coll Gen Pract* 1980; 30: 529–532.
- Mölstad S, Hovelius B. Reduction in antibiotic usage following an educational programme. *Fam Pract* 1989; 6: 33–37.
- Holt PG, Turner KJ. Environmental tobacco smoke. Effects in humans. Respiratory symptoms in the children of smokers: an overview. *Eur J Respir Dis (Suppl)* 1984; 133: 109–120.
- McConnachie KM, Roghmann KJ. Parental smoking, presence of older siblings and family history of asthma increase the risk of bronchiolitis. *Am J Dis Child* 1986; 140: 806–812.
- Pereira FA, Guandolo VL, Feroli EJ, et al. Involuntary smoking and incidence of respiratory illness during the first year of life. *Pediatrics* 1984; 75: 594–597.
- Taylor B, Wadsworth J. Maternal smoking during pregnancy and lower respiratory tract illness in early life. *Arch Dis Child* 1987; 62: 786–791.
- Willatt DJ. Children's sore throats related to parental smoking. *Clin Otolaryngol* 1986; 11: 317–321.
- Kraemer MJ, Richardson MA, Weiss NS, et al. Risk factors for persistent middle-ear effusion. *JAMA* 1983; 249: 1022–1025.
- Ståhlberg MR, Ruuskanen O, Virolainen E. Risk factors for recurrent otitis media. *Pediatr Infect Dis* 1986; 5: 30–32.
- Wall S, Ivarsson JI, Tengvald K, et al. Hälsoproblem och sjukdomsbeteende bland småbarnsfamiljer. II. En utvärdering av metoder för självrapportering [Health problems and disease patterns in families with young children. II. Evaluation of methods for self-reporting]. *Socialmedicinsk Tidskrift* 1985; 62: 10–15.

## Address for correspondence

Dr A Håkansson, Vårdcentralen Teleborg, Box 5044, S-350 05 Växjö, Sweden.

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The Scientific Foundation Board's definition of research is catholic and includes educational research, observational as well as experimental studies, and accepts the methodologies of social science as valid. It is not in a position to fund educational activities.

If the study involves any intervention or raises issues of confidentiality it is wise to obtain advance approval from an appropriate research ethics committee otherwise a decision to award a grant may be conditional upon such approval.

Studies which do not, in the opinion of the Board, offer a reasonable chance of answering the question posed will be rejected. It may sometimes be useful to seek expert advice on protocol design before submitting an application.

Care should be taken to ensure that costs are accurately forecast and that matters such as inflation and salary increases are included.

The annual sum of money available is not large by absolute standards and grant applications for sums in excess of £15 000 are unlikely to be considered.

Application forms are obtainable from the Clerk to the Board at: The Scientific Foundation Board, 14 Princes Gate, London SW7 1PU. The closing date for receipt of completed applications is 25 September 1992; any forms received after that date will, unfortunately, be ineligible for consideration.