

Changes in antibiotic consumption among day-care children in Oslo

Summary

Background. Day-care children in Oslo had a high proportion of infections (97%) and a high consumption of antibiotics (65%) in 2000. The study from 2000 was repeated in 2006 to see if prescriptions for antibiotics had changed.

Material and methods. Parents in 22 randomly chosen day-care centres in Oslo answered a questionnaire about their children (concerning infections, contact with physicians and antibiotic treatment).

Results. 605 parents (53%) participated. The proportion of children treated for infections was reduced from 65% (95% confidence interval 61–69%) in 2006 to 50 (46–54)% in 2000 and infections treated were reduced from 29 (26–32)% to 20 (17–23)%. Ear infections were treated in 62% of the children in 2006 (75% in 2000) and throat infections in 53% (85% in 2000) of the cases. Medical consultations resulted in prescription in 50% of the cases in 2006 and 80% in 2000.

Interpretation. Day-care children in Oslo used significantly less antibiotics and had significantly fewer medical consultations in 2006 than in 2000.

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Studies have shown that children in day-care centres are more susceptible to infections than other children and that the first months in day-care entail the greatest risk (1, 2). A questionnaire to parents with children in day-care centres in Oslo and Akershus (winter 2000) showed that 97% of the children had acquired one or more infections in the preceding year, and that 65% had been treated with antibiotics in the same period (3). Of those who had seen a doctor (four in five), 80% had been treated with antimicrobial agents. Knowing that viruses, unaffected by antibiotics, cause 70–80% of respiratory infections and that reduced use of antibiotics is an important weapon in the fight against resistance, these were disturbingly high numbers.

The health authorities have (in recent years) prioritized to disseminate information on the correct use of antibiotics to the general public, doctors and other medical staff (part of the plan for action against antibiotic resistance 2000–04) (4). One of the measures taken was the Norwegian Institute of Public Health's campaign in 2004: «Correct use of antibiotics – best for your child» (5). The campaign was aimed at reducing the use of antibiotics, and the target groups were medical staff and parents with small children. Information brochures were distributed to GP and health clinics, and pharmacies (6). The aim of this study was to see whether the consumption of antibiotics among day-care children was less now than in a corresponding study undertaken in 2000.

Material and methods

Data were collected by means of an anonymous questionnaire to parents of children in day-care centres in Oslo, January–February 2006. The study procedures (same questionnaire) were the same as in the previous study. Parents were asked about their children's infections and use of antibiotics during the last 12 months, as well as total antibiotic consumption in their child's lifetime (3).

The respondents were also asked if they were familiar with the brochures on infections and antibiotics from the Norwegian Institute of Public Health and if so, where they had heard about them. The questionnaire was distributed to all parents in 22 day-care centres in Oslo. One day-care centre from each of Oslo's 15 boroughs was randomly selected and one more from each of seven randomly chosen boroughs. The day-care centres had to have 30 or more children aged 1–5 years to be eligible for inclusion. Both private and public day-care centres were used and permission to perform the study was granted by the borough administration and the centre supervisors. The study included 2.3% of the children in Oslo's day-care centres in 2005 and 1.5% of all children in the same age group in Oslo (7).

SPSS version 12 was used to analyze data and, in addition to central tendency and measures of spread, a t-test was used for comparison with the 2000 study. The significance level was set at 5% and, for mean values and percentages, 95% confidence intervals (CI) are given in parentheses.

Results

The questionnaire was distributed to 1 154 parents. 605 (53%) replied and data from all these children are included in the study. The percentage of replies from the day-care centres varied from 31 to 71%. The level of education was significantly higher for the respondents ($p < 0.001$) and there were more non-ethnic Norwegian parents ($p < 0.05$) in 2006 than in 2000. The children were younger in 2006 (mean 3.1 years [95% CI 2.9–3.3]) than in 2000 (3.5 years [95% CI 3.4–3.6]). Table 1 shows background information for the children in the studies from 2006 and 2000.

Main message

- Infections and antibiotic treatment were studied in day-care children in Oslo with a six-year interval
- The proportion of children with infections remained unchanged, but there were fewer infection episodes per child
- Fewer doctors prescribed antibiotics to children with infections
- Antibiotic treatment of children was clearly reduced

Disclosed conflicts of interest: None

Infections and absence

586 of 605 children (97%) had had one or more infections in the past 12 months, on average 6.2 (5.8–6.5) episodes each. The frequency of infections was not significantly different between boys and girls. With the exception of eye infections, there were fewer infections per child in 2006 than in 2000 ($p = 0.001$) (tab 2). Urinary tract infections were not included in the previous study.

Infections were the cause of more than 10 days' absence from day-care in one of five children (21%) during the last 12 months. One third of the parents responded that it was easy or very easy for them to work at home and that they had a lot of flexibility if their child was sick.

Contact with a physician

Four in five parents (78%) had seen a doctor because of their child's infections the previous 12 months. The mean number of consultations for the cohort was 2.2 (2.0–2.4) per child in 2006 versus 2.7 (2.5–3.0) in 2000. The mean number of consultations for the group that had seen a doctor was 2.8 (2.6–3.0) in 2006 and 3.2 (2.9–3.5) in 2000. The regular GP had been contacted in 83% (80–86%) of the cases and the out-of-hours service or another doctor in 17%. In the year 2000, 48% (44–52%) of the parents contacted their regular GP.

Use of antibiotics

330 of 605 children had been treated with antibiotics at least once in the past 12 months; mean 2.2 (2.0–2.4) times per child. In 2006, the mean number of times treated was 2.4 (2.1–2.7) for boys and 1.9 (1.7–2.1) for girls; in 2000 the corresponding numbers were 3.4 (3.0–3.9) for boys and 2.7 (2.4–3.0) for girls.

Fewer children were treated in 2006 than in 2000 (tab 3). 70% (66–74%) of the children (in 2006) had been treated with antimicrobial agents some time during their life versus 80% (77–83%) of those in 2000. Of 3 624 infection episodes in 2006, 20% (17–23%) had been treated versus 29% (26–31%) in 2000 (tab 3). The parents' ethnic origin (Norwegian or minority background) was not associated with different use of antibiotic treatment of children.

50% (45–55%) of those who saw a doctor in 2006 received antibiotics; corresponding number in 2000 were 80% (76–84%). One in four children (25%) were treated more than three times in 2006 versus 40% in 2000. The previous study showed that 47% of the parents thought doctors prescribe antibiotics too often; we found that this now applied to 36% of the parents.

Information

Three in four parents were content with the information they had received on treatment of sick children. Sources of information were GPs (43%), health clinics (10%), and

Table 1 Background information for the studies in 2006 and 2000

| | | Number of respondents 2000 (563/1 126; 50% replied) | Number of respondents 2006 (605/1 164; 53% replied) |
|--|------------------------|---|---|
| Sex | Men | 10% | 15% |
| | Women | 90% | 85% |
| Age [median] | Alone | 35 years | 35 years |
| Parental responsibility | | 17% | 13% |
| | Shared | 83% | 87% |
| Ethnic background | Norwegian background | 89% | 82% |
| | Minority background | 11% | 18% |
| Highest education level | Compulsory schooling | 4% | 5% |
| | Upper secondary school | 38% | 24% |
| | College/university | 58% | 71% |
| Sex distribution of the study children | Boys | 51.2% | 51.2% |
| | Girls | 48.8% | 48.8% |

Table 2 Number and type of infections in children in 2006 and 2000

| Type of infection | Year 2000 (N = 563) | | Year 2006 (N = 605) | |
|-------------------------|--------------------------------|----------------------------|--------------------------------|----------------------------|
| | Children with infections n (%) | Total number of infections | Children with infections n (%) | Total number of infections |
| Cold | 481 (85) | 1 906 | 519 (85) | 1 914 |
| Ear infection | 202 (36) | 414 | 158 (26) | 280 |
| Sore throat | 149 (27) | 287 | 145 (24) | 225 |
| Sinusitis | 13 (2) | 14 | 6 (1) | 7 |
| Bronchitis | 72 (13) | 127 | 47 (8) | 79 |
| Pneumonia | 68 (12) | 82 | 38 (6) | 44 |
| Eye infection | 231 (41) | 371 | 252 (42) | 409 |
| Gastroenteritis | 354 (63) | 634 | 305 (50) | 544 |
| Infected cut | 48 (9) | 65 | 38 (6) | 73 |
| Urinary tract infection | | | 30 (5) | 49 |
| Total number | 548 (97) | 3 900 | 586 (97) | 3 624 ¹ |

¹ Without urinary tract infections: 3 575

both GP and health clinic (12%). Other sources of information were family, day-care centre, further education, Internet, books and friends. Only 10% were familiar with the brochures from the Norwegian Institute of Public Health and 5% had received brochures at the health clinic. Three in four parents knew about the disadvantages of antibiotic treatment. Of these, 50% mentioned the development of resistant bacteria; 45% knew about infections where antibiotics are of no use and of these 90% specified virus infections.

Discussion

Antibiotics seemed to be used less frequently in Oslo's child day-care centres in 2006

than in the same type of cohort in 2000. Our findings also show that the number of infections, with the exception of eye infections, was lower and that the number of medical consultations per child was lower. Antibiotics were given to one in two children who saw a doctor in 2006 and four in five children in 2000.

The low response rate, great variation among the day-care centres and the study's retrospective character may have affected the reliability of the findings. The level of education seems to be higher for our cohort than for this age group in Oslo's total population. Education beyond secondary level has not, however, been specified so it is hard to say how representative the study group is

Table 3 Number of children and number of infections treated with antibiotics in 2000 and 2006

| Type of infection | Children treated with antibiotics | | | | Infections treated with antibiotics | |
|-------------------------|-----------------------------------|-----------------------------------|---------------------|-----------------------------------|-------------------------------------|-----------|
| | Year 2000 (N = 563) | | Year 2006 (N = 605) | | Year 2000 | Year 2006 |
| | n (%) | Mean treatment per child [95% CI] | n (%) | Mean treatment per child [95% CI] | n (%) | n (%) |
| Cold | 59 (12) | 1.9 (1.6-2.2) | 35 (6) | 1.6 (1.4-1.8) | 112 (6) | 59 (3) |
| Ear infection | 157 (75) | 2.1 (1.7-2.4) | 99 (62) | 1.6 (1.4-1.8) | 316 (76) | 155 (56) |
| Sore throat | 127 (85) | 1.6 (1.5-1.8) | 77 (53) | 1.4 (1.2-1.6) | 204 (71) | 110 (43) |
| Sinusitis | 10 (77) | 1.3 (0.8-1.8) | 2 (29) | ¹ | 14 (93) | 2 (29) |
| Bronchitis | 59 (82) | 1.7 (1.4-2.0) | 23 (49) | 1.3 (1.1-1.5) | 98 (77) | 29 (37) |
| Pneumonia | 68 (100) | 1.1 (1.1-1.2) | 33 (87) | 1.2 (1.0-1.9) | 77 (94) | 40 (90) |
| Eye infection | 138 (58) | 1.6 (1.5-1.8) | 166 (66) | 1.5 (1.3-1.6) | 227 (61) | 244 (60) |
| Gastroenteritis | 13 (4) | 1.8 (1.3-2.4) | 1 (0.3) | ¹ | 24 (4) | 1 (0.2) |
| Infected cut | 35 (73) | 1.4 (1.1-1.7) | 22 (58) | 1.9 (0.5-3.2) | 48 (65) | 41 (56) |
| Urinary tract infection | | | 24 (80) | 1.4 (1.0-1.9) | | 34 (70) |
| Total | 365 (65) | 3.1 (2.8-3.4) | 330 (55) | 2.1 (2.0-2.4) | 1 121 (29) | 714 (20) |

¹ Numbers too small to calculate

in this respect. As for retrospective studies in general; the medical diagnoses must be interpreted with care, standardized terms have not been used but often rather trivial descriptions and the parents' «diagnoses». The same considerations expressed in the previous study also apply here (3).

Fewer infections per child may be due to annual variation in climate and weather, which can affect the frequency of respiratory infections. Annual epidemics such as influenza vary both in length and virulence and may directly or indirectly influence the prevalence of infections. Recent studies indicate that the annual incidence of ear and respiratory infections in general may have declined in recent years. Fewer consultations may partly be explained by fewer episodes of infection, but may also be caused by a higher threshold for contacting a doctor (indicated by other studies) (8, 9). The number of children and infections treated with antibiotics is anyhow significantly reduced, which may be explained in many ways. As very few parents were familiar with the information brochures, these do not seem to be directly linked with the reduction in consumption but, indirectly, they may have had functioned as information and reminders to doctors and other medical staff. Previous information campaigns have been shown to affect both medical staff and parents (10, 11), but it is not always easy for parents to remember where they have heard what.

Mass media focus on bacterial resistance in recent years may have had an indirect influence. At the same time, the Internet seems to become increasingly important as a source of knowledge and help in medical questions. A recent interview survey shows

that 58 % of the population uses the Internet for medical matters, and that women do so more frequently than men (12). Increased knowledge and information about childhood infections will probably make the parents feel more confident about their own competence so they do not consider it necessary to see a doctor or use antibiotics for uncomplicated infections. Moreover, greater job flexibility and better chances to work from home means less stress in dealing with sick children. The fact that the cohort was well-educated may also have led to a lower demand for antibiotics. A lower mean age for the children may have been an important reason for fewer courses of treatment.

The implementation of a regular GP scheme in 2001 probably contributed to a reduction in consumption. Doctors participating in out-of-hours services and other doctors who do not know the patient have previously shown a tendency to prescribe antibiotics more frequently than regular GPs (13, 14). Fewer parents claimed that they had seen a new doctor in 2006 than was the case in 2000 (3). Also, more than half of the parents stated that they had received information on the subject from their doctor and, in their comments concerning medical consultations, parents wrote that regular GPs are more restrictive than out-of-hours doctors. This is confirmed by the fact that fewer parents now than in previous studies believe doctors prescribe too many antibiotics. Furthermore, «wait and see» prescriptions may have been used more, although this was not specifically mentioned. Other studies have shown that such prescriptions contribute to use of less antibiotics (15, 16).

Our results from Oslo's day-care centres show that the consumption of antibiotics

among children is reduced, which indicates a more restrictive prescription practice. Yet the numbers indicate that some infections are still being treated unnecessarily. On a worldwide basis, the problem of resistance will probably increase in the years ahead, which further emphasizes the need for a cautious use of antimicrobial agents.

Conclusion

Antibiotic treatment of day-care children in Oslo was lower in 2006 than in 2000. This may indicate more restrictive prescription practice, to which the regular GP scheme may have contributed. A large percentage of parents with small children are well informed about infections and possible disadvantages of antibiotic overuse. But this study indicates that virus infections and rapidly self-healing bacterial infections are still being treated and that the use of antibiotics could be further reduced.

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The manuscript was received 14.12.2006 and accepted 15.7.2007. Medical editor Preben Aavitsland