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de Jong, Josta; Bos, Herre; de Vries, Tjalling W; de Jong-van den Berg, Lolkje T W

Published in:
Archives of Disease in Childhood

DOI:
10.1136/archdischild-2011-301150

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Document Version
Publisher's PDF, also known as Version of record

Publication date:
2012

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):

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Antibiotic use in children and the use of medicines by parents

Josta de Jong,1 Jens H J Bos,1 Tjalling W de Vries,2 Lolkje T W de Jong-van den Berg1

ABSTRACT
Objective Antibiotic drugs are frequently used for viral infections in children. It is probable that health beliefs and parental concern have great influence on the use of drugs in children. This study, performed in The Netherlands, investigates whether the use of antibiotics in children is associated with the use of medicines by parents.

Patients and methods In this observational cohort study, the authors selected 6731 children from the prescription database IADB.nl who did not receive antibiotics until their fifth birthday and 1479 children who received at least one antibiotic prescription every year. The authors then selected parents for each group of children (5790 mothers and 4250 fathers for the children who did not receive antibiotics and 1234 mothers and 1032 fathers for the children who regularly received antibiotics). The authors compared the use of antibiotics and other medicines between the two groups of parents.

Results Parents of children who received antibiotics recurrently were found to use more antibiotics themselves compared with parents of children who did not receive antibiotics. Moreover, this group also showed a higher percentage of chronic medication use: (11.3 vs 6.2% (mothers) and 13.1% vs 9.5% (fathers)). Mothers more often use antacids, non-steroidal anti-inflammatory drugs (NSAIDs), analgesics, anxiolytics, hypnotics, antidepressants, drugs for treatment of asthma and antihistamines. Fathers use more antacids, cardiovascular drugs, NSAIDs and asthma drugs.

Conclusions The parents of children who receive antibiotic drugs regularly use more medicines compared with the parents of children who use no antibiotic drugs. Parents’ medicine use may influence that of children and is a factor physicians and pharmacists should take into account.

INTRODUCTION
Children frequently receive antibiotic drugs. In the Netherlands 200–300/1000 children per year receive antibiotics, mainly for upper respiratory tract infections, which are often viral.1 2 Excessive use of antibiotic drugs is a concern due to the risk of bacterial resistance.3 Knowing the determinants associated with prescription of antibiotic drugs in children is valuable if we want to develop intervention programmes to decrease the use of these drugs. The question arises as to whether frequent prescription of antibiotic drugs in children is purely health related or whether social factors such as parental health beliefs and concerns play a part in this.4

Two Swedish studies found that children of lower socio-economic classes or whose parents smoke receive more antibiotic drugs.5 6 Parents of children who receive antibiotics recurrently also tend to take regular sick leave from work and appear to be relatively frequent users of primary care.5 6 Families who have great concerns about infectious diseases and who consult their physician more frequently also demonstrate a higher use of antibiotic drugs.7 Attending a childcare facility, frequent physician visits, formula feeding and severe stress of fathers were found to be factors associated with recurrent antibiotic use in young children in Finland.8 A lower socio-economic status is associated with a higher rate of antibiotic prescriptions.9 10

This raises the question of whether parents of children who receive antibiotic drugs frequently also use more medicines themselves. Similarly, these parents may also use other medicines more frequently. This study was performed to test this hypothesis. We compared the use of several drug classes in parents whose young children receive antibiotics recurrently with parents whose young children did not use antibiotics at all.

PATIENTS AND METHODS
Information on drug use was obtained from the IADB.nl database, which contains dispensing data from 55 community pharmacies in the Netherlands. Dutch patients usually register at one single community pharmacy, which means that these pharmacies are able to provide almost complete listings of prescribed drugs for individual patients.11 Among other data, pharmacy data include information...
Table 1  Characteristics of children, and their parents, who receive antibiotics recurrently versus those who do not receive antibiotics

<table>
<thead>
<tr>
<th>Recurrent use</th>
<th>No use</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boys (%)</td>
<td>55</td>
<td>49</td>
</tr>
<tr>
<td>Chronic use of† (%);</td>
<td></td>
<td></td>
</tr>
<tr>
<td>antidiabetic drugs (A10)</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>dermatological corticosteroids (D07)</td>
<td>0.14</td>
<td>0.24</td>
</tr>
<tr>
<td>antiepileptic drugs (N03)</td>
<td>0.20</td>
<td>0.09</td>
</tr>
<tr>
<td>psychoanaleptics (N06)</td>
<td>0</td>
<td>0.03</td>
</tr>
<tr>
<td>antiallergics (R06)</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>antiasthmatic drugs (R03)</td>
<td>3.6</td>
<td>0.33</td>
</tr>
<tr>
<td>Mothers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=1234</td>
<td>n=1032</td>
<td></td>
</tr>
<tr>
<td>Age at birth of child</td>
<td>29.7±4.5</td>
<td>30.2±4.8</td>
</tr>
<tr>
<td>Chronic drug users† (%)</td>
<td>11.3</td>
<td>6.2</td>
</tr>
<tr>
<td>Number of drug groups used‡</td>
<td>1.32±0.6</td>
<td>1.20±0.5</td>
</tr>
<tr>
<td>Fathers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=1032</td>
<td>n=4250</td>
<td></td>
</tr>
<tr>
<td>Age at birth of child</td>
<td>32.3±4.9</td>
<td>33.1±5.2</td>
</tr>
<tr>
<td>Chronic drug users† (%)</td>
<td>13.1</td>
<td>9.5</td>
</tr>
<tr>
<td>Number of drug groups used‡</td>
<td>1.25±0.7</td>
<td>1.24±0.6</td>
</tr>
</tbody>
</table>

*Significant difference.
†Chronic drug use: at least three times every year.
‡Of the group of parents with chronic drug use.

Table 2  Chronic drug use of parents of children with recurrent use of antibiotic drugs and no use of antibiotic drugs

<table>
<thead>
<tr>
<th>ATC</th>
<th>Mothers of children with recurrent use of antibiotics (n=1234)</th>
<th>Mothers of children with no use of antibiotics (n=5790)</th>
<th>RR (CI)</th>
<th>Fathers of children with recurrent use of antibiotics (n=1032)</th>
<th>Fathers of children with no use of antibiotics (n=4250)</th>
<th>RR (CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A02 Antacids</td>
<td>11</td>
<td>23</td>
<td>2.2 (1.1 to 4.6)*</td>
<td>30</td>
<td>68</td>
<td>1.8 (1.2 to 2.7)*</td>
</tr>
<tr>
<td>A06 Laxatives</td>
<td>3</td>
<td>11</td>
<td>1.3 (0.4 to 4.6)</td>
<td>1</td>
<td>5</td>
<td>0.8 (0.1 to 7.0)</td>
</tr>
<tr>
<td>A10 Diabetes</td>
<td>4</td>
<td>22</td>
<td>0.8 (0.3 to 2.5)</td>
<td>6</td>
<td>27</td>
<td>0.9 (0.4 to 2.2)</td>
</tr>
<tr>
<td>C Cardiovascular</td>
<td>16</td>
<td>54</td>
<td>1.4 (0.8 to 2.4)</td>
<td>26</td>
<td>67</td>
<td>1.6 (1.0 to 2.5)*</td>
</tr>
<tr>
<td>D05 Antipsychotics</td>
<td>2</td>
<td>1</td>
<td>9.4 (0.8 to 103.4)</td>
<td>0</td>
<td>1</td>
<td>–</td>
</tr>
<tr>
<td>D07 Dermatological corticosteroids</td>
<td>8</td>
<td>37</td>
<td>1.0 (0.5 to 2.2)</td>
<td>8</td>
<td>29</td>
<td>1.1 (0.5 to 2.5)</td>
</tr>
<tr>
<td>M01 NSAIDs</td>
<td>21</td>
<td>22</td>
<td>4.7 (2.6 to 8.6)*</td>
<td>15</td>
<td>32</td>
<td>1.9 (1.0 to 3.5)*</td>
</tr>
<tr>
<td>N02 Analgesics</td>
<td>17</td>
<td>24</td>
<td>3.3 (1.8 to 6.2)*</td>
<td>8</td>
<td>17</td>
<td>1.9 (0.8 to 4.4)</td>
</tr>
<tr>
<td>N03 Antiepileptics</td>
<td>4</td>
<td>21</td>
<td>0.9 (0.3 to 2.6)</td>
<td>4</td>
<td>32</td>
<td>0.5 (0.2 to 1.4)</td>
</tr>
<tr>
<td>N05A Antipsychotics</td>
<td>3</td>
<td>16</td>
<td>0.9 (0.2 to 3.9)</td>
<td>3</td>
<td>14</td>
<td>0.9 (0.2 to 3.1)</td>
</tr>
<tr>
<td>N05B Anxiolytics</td>
<td>14</td>
<td>27</td>
<td>2.4 (1.3 to 4.6)*</td>
<td>8</td>
<td>26</td>
<td>1.3 (0.6 to 2.8)</td>
</tr>
<tr>
<td>N05C Hypnotics and sedatives.</td>
<td>5</td>
<td>7</td>
<td>3.4 (1.1 to 10.5)*</td>
<td>4</td>
<td>11</td>
<td>1.5 (0.5 to 4.7)</td>
</tr>
<tr>
<td>N06A Antidepressants</td>
<td>30</td>
<td>88</td>
<td>1.6 (1.1 to 2.4)*</td>
<td>16</td>
<td>63</td>
<td>1.0 (0.6 to 1.8)</td>
</tr>
<tr>
<td>N06B Psychostimulants</td>
<td>0</td>
<td>0</td>
<td>–</td>
<td>1</td>
<td>4</td>
<td>1.0 (0.1 to 9.2)</td>
</tr>
<tr>
<td>R03 Obstructive airway disease</td>
<td>33</td>
<td>62</td>
<td>2.5 (1.6 to 3.8)*</td>
<td>29</td>
<td>76</td>
<td>1.6 (1.0 to 2.4)*</td>
</tr>
<tr>
<td>R06 Antihistamines</td>
<td>12</td>
<td>15</td>
<td>3.8 (1.8 to 8.0)*</td>
<td>12</td>
<td>36</td>
<td>1.4 (0.7 to 2.6)</td>
</tr>
</tbody>
</table>

*Significant difference.
ATC, anatomical therapeutical chemical; NSAID, non-steroidal anti-inflammatory drug.
DISCUSSION
The results of this study prove that parents of young children who receive antibiotics recurrently use more drugs themselves compared with that of parents of children with no use.

Compared with other countries, especially in southern Europe, antibiotic prescription in children in the Netherlands is quite low.15 16 We investigated the use of antibiotic drugs in the whole cohort first before we selected the different groups for comparison. To obtain enough children in the group we defined recurrent use of antibiotics as at least one prescription every year.

Significant differences in continuous variables were calculated by using the independent samples t test. To compare percentages, the $\chi^2$ test was used.

RESULTS
There were more boys in the group of recurrent antibiotic users (table 1). In both groups the use of drugs for chronic diseases was very low, with the exception of asthma drugs, which were significantly more common in the group who used antibiotics recurrently.

 Mothers and fathers of children who received recurrent antibiotics were slightly older when their child was born compared with parents of children who did not receive antibiotics. Mothers and fathers of children who received antibiotics recurrently were more likely to be frequent users of medicines themselves compared with parents of children who had not received antibiotics. This applied to antibiotics and other medicines (figure 2). A total of 19.1% of mothers of children who received antibiotics recurrently used antibiotics recurrently themselves compared with 5.5% of mothers of children who did not receive antibiotics (p<0.001, $\chi^2$ test). This difference was also significant among the fathers (9.1% and 3.3%, respectively; p<0.001).

 Mothers of children who used antibiotics recurrently received significantly more prescriptions of antacids, analgesics, non-steroidal anti-inflammatory drugs (NSAIDs), anxiolytics, hypnotics and sedatives, antidepressants, drugs for the treatment of obstructive airway diseases and antihistamines (table 2). For fathers, we found a significant difference in the use of antacids, NSAIDs, cardiovascular drugs and drugs for the treatment of obstructive airway diseases.

To compare chronic drug use among parent groups we calculated the prevalence of drug use for all drug categories together. We also calculated the RR (with CI) of the use of the different drug categories for parents (mothers and fathers separately) of children with recurrent antibiotic use compared with that of parents of children with no use.

Compared with other countries, especially in southern Europe, antibiotic prescription in children in the Netherlands is quite low.15 16 We investigated the use of antibiotic drugs in the whole cohort first before we selected the different groups for comparison. To obtain enough children in the group we defined recurrent use of antibiotics as at least one prescription every year.

Significant differences in continuous variables were calculated by using the independent samples t test. To compare percentages, the $\chi^2$ test was used.
these are parents to whom it would be difficult to explain that antibiotics are not always necessary when their child has an infection because they are possibly less educated. We found that boys were more likely to receive medicines and this is in keeping with a previous Dutch study looking at prescriptions for respiratory symptoms in the first year of life.

Another factor is that parents and their children are usually treated by the same physician. Some physicians prescribe medication more easily than others. Because the number of different physicians in the study group is heterogeneous and large with no information about them, it is not possible to examine the influence of the physician in this study. New studies are needed to look into this.

The mother’s use of medicines is more related to the child’s use than the father’s use. This may be because mothers are usually more involved with the care of the children. Mothers suffering from chronic illnesses like diabetes or cardiovascular disease consult their physician more often, giving them ample opportunity to ask for antibiotics when their child has an infection.

The results of this study indicate that drug use and health beliefs of parents could be an important factor in predicting the prescription of antibiotics in their children. Therefore healthcare professionals have to be very attentive in their communications with parents when they intend to reduce the use of antibiotics in children and decrease the risk of developing resistance.

The advantage of this study lies in its use of large groups and objective data on drug use from a prescription database. However, the use of these data also has some limitations: the factual indications of the drugs are unknown, and the assumed relationship between the child and the ‘parent’ is not validated but is assumed in most cases to be correct.

CONCLUSION

Parents, especially mothers, of children who receive antibiotics recurrently use more medicines compared with parents of children who do not receive antibiotics. This finding also applies to other drug groups like analgesics and psychotropic drugs. Parents’ drug use probably influences that of their children and is a factor physicians and pharmacists should take into account. Parents could be educated to manage their own use of medicines and that of their children.

Contributors Josta de Jong performed the study and wrote the manuscript. Jens Boeck, IT specialist and programmer, developed the databases and assisted in selection and analysis of the data. Tjalling de Vries advised in the study design, analysis and writing of the manuscript. Lokkie de Jong-van den Berg was supervisor and advisor during the performance of this study.

Competing interests None.

Provenance and peer review Not commissioned; externally peer reviewed.

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Arch Dis Child 2012 97: 578-581 originally published online March 29, 2012
doi: 10.1136/archdischild-2011-301150

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