Effect on weight gain of routinely giving albendazole to preschool children during child health days in Uganda: cluster randomised controlled trial

Harold Alderman, Joseph Konde-Lule, Isaac Sebuliba, Donald Bundy, Andrew Hall

Abstract

Objective To estimate the effectiveness of delivering an anthelmintic through a community child health programme on the weight gain of preschool children in Uganda.

Design Cluster randomised controlled trial.

Setting Eastern Uganda.

Participants 48 parishes participating in a new programme for child health: 24 offered children an additional service of anthelmintic treatment. The outcome is based on measurements from 27 995 children.

Intervention Treatment of children aged between 1 and 7 years with 400 mg albendazole added to standard services offered during child health days over a three year period.

Main outcome measure Weight gain.

Results The provision of periodic anthelmintic treatment as a part of child health services in Uganda resulted in an increase in weight gain of about 10% (166 g per child per year, 95% confidence interval 16 to 316) above expected weight gain when treatments were given twice a year, and an increase of 5% when the treatment was given annually.

Conclusion Deworming of preschool children in Uganda as part of regularly scheduled health services seems practical and associated with increased weight gain.

Introduction

Many children in low income countries are commonly infected with parasitic helminths and this can have important consequences for their development.1 Treatments at home may not be practical and sustainable, and periodic mass deworming without diagnosis, as recommended by the World Health Organization in areas with more than 50% of children infected, may be needed to have an effect on growth during a programme or health project.

The Ugandan government has established a programme of regular child health days during which health and nutrition interventions are delivered to preschool children. We assessed whether including anthelmintic treatment in such a programme could result in additional weight gain in young children.

Participants and methods

In 25 districts of Uganda, the parents of children aged less than 7 years were offered a range of health services at child health days.

The study was a cluster randomised effectiveness trial in which the unit of randomisation was the parish, the administrative unit at which child health days were organised within each district. Five districts in eastern Uganda were selected (see bmj.com) because a survey had indicated that about 60% of children aged 5-10 years were infected with nematodes, most commonly hookworm.2 Fifty parishes selected by the local governments were randomly allocated into two groups (see bmj.com): 25 were assigned to standard services and 25 to standard services plus albendazole. One parish from each group was subsequently removed from the project. Albendazole was offered as a 400 mg tablet (Zentel: GlaxoSmithKline) to all healthy children aged 1-7 years attending any child health day. Anthelmintics were not then a standard treatment offered by the government, thus the other parishes without treatment constituted the control group. The children's weight and height (children older than 2 years) was measured at each child health day.

In a parallel data collection on service delivery we administered a household questionnaire in the same parishes between January and March 2000. Each caregiver was asked if the child had been treated for worms, the source of the treatment, and how much it cost. The questionnaire was readministered during repeat visits between January and March 2003.

The main outcome measure was weight gain—the difference in weight between the first and last child health day. We used EpiInfo to calculate Z scores of weight and height for age. We controlled for the effect of personal and environmental factors on weight gain (see bmj.com) by using multivariate regression models in Stata. We also examined alternative models. See bmj.com for further details of the statistical methods.

As some children attended more child health days than others and received more treatments, in a portion of the analysis we divided the treatment group into three based on intervals between attendance: ≤ 7.5 months, 7.5-13 months, and ≥ 13 months. These intervals corresponded to practical targets of bimannual, annual, or less frequent treatment during a programme, and were used to indicate the potential benefit of treatments given at those frequencies.

Results

The study was undertaken between November 2000 and June 2003 during which five child health days occurred in each parish. Table 1 presents descriptive statistics on the child health days and the percentage of children classified as underweight at each round. The absence of any apparent difference in the percentage of underweight children or in the mean Z scores
between the groups does not indicate the absence of an effect, as new children entered the project at each round, whereas others did not always attend.

At least two measurements of body weight were made on 14 940 treated children and 13 055 control children (table 2). A statistically significant difference was found in extra weight gained of 154 g (95% confidence interval 96 to 214, P < 0.01). This is equivalent to an extra 166 g per year (163 to 16 g) or nearly 10% of average initial body weight.

See bmj.com for the results of six regression models, five using total weight gain and the sixth using weight gain per month. In model 1 weight gain was greater in children who attended more child health days but children in the treatment parishes gained 55 g (9 to 104 g) more weight per visit than children in control parishes.

Model 2 controls for the interval between the first and last measurements, which was highly correlated with total weight gain, but the difference in total weight gain per visit between groups did not change.

Model 3 shows the effect of attending child health days in which the treatment effect is divided into about twice a year, annually, or longer. The children treated twice a year gained more weight than children treated less often.

Model 4 controls for initial weight. No biological interpretation can be assigned to the coefficient of initial weight in this model since any measurement error in the initial weight is also in the dependent variable, total weight gain, leading to a bias towards minus one for that coefficient. This initial weight variable, however, picks up unexplained variance without biasing the variable of interest.

Model 5 repeats model 4 but uses a value for initial weight predicted from the height of children aged up to 16 years elsewhere. A meta-analysis of deworming in young people found a similar magnitude of effect of treatment may have been underestimated because about a third of children in the control parishes were dewormed by their parents. As the predominant helminth was hookworm, and infections in young children in the same districts were generally light, a greater effect of treatment may be achieved elsewhere.

A meta-analysis of deworming in young people aged up to 16 years found a similar magnitude of weight gain, but the studies lacked consistency in trial design and follow-up. A review of randomised trials of anthelmintic treatment in preschool children found that growth was improved (four trials), unaffected (n = 4), and had an inverse relation with treatment (n = 1). Although only one study showed an increase in linear growth, the four trials with positive results

### Table 1

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of children weighted</td>
<td>37 165</td>
<td>33 711</td>
<td>21 124</td>
<td>20 787</td>
<td>20 443</td>
</tr>
<tr>
<td>Percentage of girls</td>
<td>50.0</td>
<td>50.3</td>
<td>50.6</td>
<td>51.1</td>
<td>50.7</td>
</tr>
<tr>
<td>Percentage receiving treatment</td>
<td>50.7</td>
<td>51.2</td>
<td>51.9</td>
<td>53.8</td>
<td>54.8</td>
</tr>
<tr>
<td>Mean (SD) age (years)</td>
<td>3.69 (1.66)</td>
<td>3.64 (1.80)</td>
<td>3.69 (1.77)</td>
<td>3.63 (1.63)</td>
<td>3.54 (1.54)</td>
</tr>
<tr>
<td>Proportion underweight:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment parishes</td>
<td>0.26</td>
<td>0.24</td>
<td>0.23</td>
<td>0.23</td>
<td>0.24</td>
</tr>
<tr>
<td>Control parishes</td>
<td>0.26</td>
<td>0.25</td>
<td>0.25</td>
<td>0.23</td>
<td>0.24</td>
</tr>
<tr>
<td>Mean (SD) Z scores of weight for age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treatment parishes</td>
<td>1.06 (1.52)</td>
<td>1.07 (1.45)</td>
<td>1.14 (1.32)</td>
<td>1.23 (1.28)</td>
<td>1.20 (1.25)</td>
</tr>
<tr>
<td>Control parishes</td>
<td>1.14 (1.48)</td>
<td>1.17 (1.44)</td>
<td>1.17 (1.39)</td>
<td>1.23 (1.25)</td>
<td>1.13 (1.29)</td>
</tr>
</tbody>
</table>

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### Discussion

Treatment with albendazole twice yearly as a part of child health services in Uganda led to a 10% extra gain in weight of about 166 g per child per year compared with untreated controls—an extra weight gain of around 5% if children were treated annually. This study involved nearly 30 000 children, and the data were collected as part of routine growth monitoring to minimise the effect of the study on implementation. The effect of treatment may have been underestimated because about a third of children in the control parishes were dewormed by their parents. As the predominant helminth was hookworm, and infections in young children in the same districts were generally light, a greater effect of treatment may be achieved elsewhere.

A meta-analysis of deworming in young people aged up to 16 years found a similar magnitude of weight gain, but the studies lacked consistency in trial design and follow-up. A review of randomised trials of anthelmintic treatment in preschool children found that growth was improved (four trials), unaffected (n = 4), and had an inverse relation with treatment (n = 1)). Although only one study showed an increase in linear growth, the four trials with positive results

### Table 2

<table>
<thead>
<tr>
<th>No of children with repeated measurements</th>
<th>Treatment parishes (n=14 940)</th>
<th>Control parishes (n=13 055)</th>
<th>All (n=27 995)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD) weight gain (g)</td>
<td>2413 (2538)</td>
<td>2259 (2474)</td>
<td>2341 (2589)</td>
</tr>
<tr>
<td>Mean (SD) months in programme</td>
<td>16.9 (7.7)</td>
<td>16.2 (7.5)</td>
<td>16.6 (7.6)</td>
</tr>
<tr>
<td>Mean (SD) visits to child health days</td>
<td>2.7 (0.9)</td>
<td>2.6 (0.8)</td>
<td>2.7 (0.9)</td>
</tr>
</tbody>
</table>
Reliability of self reported form of female genital mutilation and WHO classification: cross sectional study

Susan Elmusharaf, Nagla Elhadi, Lars Almroth

Abstract

Objective To assess the reliability of self reported form of female genital mutilation (FGM) and to compare the extent of cutting verified by clinical examination with the corresponding World Health Organization classification.

Design Cross sectional study.

Settings One paediatric hospital and one gynaecological outpatient clinic in Khartoum, Sudan, 2003-4.

Participants 255 girls aged 4-9 and 282 women aged 17-35.

Main outcome measures The women’s reports of FGM, the actual anatomical extent of the mutilation, and the corresponding types according to the WHO classification.

Results All girls and women reported to have undergone FGM had this verified by genital inspection. None of those who said they had not undergone FGM were found to have it. Many said to have undergone “sunna circumcission” (excision of prepuce and part or all of clitoris, equivalent to WHO type I) had a form of FGM extending beyond the clitoris (10/29 (34%) girls and 20/35 (57%) women).

Of those who said they had undergone this form, nine girls (39%) and 19 women (54%) actually had WHO type III (infibulation and excision of part or all of external genitalia). The anatomical extent of forms classified as WHO type III varied widely. In 12/32 girls...