Effectiveness and cost-effectiveness of albendazole in improving nutritional status of pre-school children in urban slums
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Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

Health technology
The use of a treatment involving albendazole powder (600 mg every 6 months). This was intended to improve the nutritional status of pre-school children through periodical deworming, especially in terms of Ascaris lumbricoides.

Type of intervention
Treatment.

Economic study type
Cost-effectiveness analysis.

Study population
The study population comprised children aged between 1.5 and 3.5 years.

Setting
The setting was the community. The economic study was carried out in 32 health centres of the Integrated Child Development Service in Lucknow, North India.

Dates to which data relate
The effectiveness evidence and resource use data were gathered during 1995 to 1997. The price year was not reported.

Source of effectiveness data
The effectiveness data were derived from a single study.

Link between effectiveness and cost data
The costing was performed prospectively on a sample of patients different from that used in the effectiveness analysis.

Study sample
Power calculations were based on a 60% prevalence of underweight or stunting. These indicated that 500 children were needed in each arm of the study to detect a 15% improvement with albendazole in the outcome measure, with 80% power and an alpha-value of 5%. All eligible children registered in the 32 study centres were enrolled in the study. Eligible children were those between 1.5 and 3.5 years of age who were registered with the “Anganwadi” worker and whose parents consented to the study. A sample of 1,061 children was included. There were 610 children in the intervention group and 451 in the placebo group. The mean age in the intervention group was 31.1 (+/- 8.7) months, and 51.8% were boys. The weight was 10.1 (+/- 2.1) kg and the height was 82.0 (+/- 8.1) cm. The mean age in the placebo group was 31.1 (+/- 9.2) months, and 51.7% were boys. The weight was 10.2 (+/- 2.1) kg and the height was 81.7 (+/-
Study design
This was a community-based, single-blind, randomised controlled trial. The unit of randomisation was the child. The 32 participating centres were randomly selected from a possible 150 urban slums. Each child was allocated using a serial number whereby those with odd or non-zero ending numbers were assigned to the placebo group (approximately 40%), and the remainder were allocated to the intervention group. The patients were followed for 2 years and all mothers were blinded to the intervention, but not the providers. However, the technicians who carried out the direct faecal smear test and who assessed the questionnaire were blind to the randomisation status. The assessment was performed every 6 months. The overall compliance rate was high, only 9 children in the albendazole group and 7 in the placebo group were lost to follow-up.

Analysis of effectiveness
The basis for the analysis of the clinical study was intention to treat. The primary health outcomes assessed in the analysis were the changes in the prevalence of underweight and stunted children over 2 years. Both underweight and stunted children were defined on the basis of the World Health Organisation standards. The secondary health outcomes were weight and height gains, haemoglobin levels, illness episodes, developmental status, passage of worms, and the number of deaths. Four trained workers assessed nutritional status using electronic devices. The mothers of the participating children assessed the passage of worms and illness episodes. Developmental status was assessed using the revised pre-screening Denver Questionnaire (R-PDQ) at baseline and at 2 years. The study groups were comparable in terms of the demographics and ethnic characteristics. However, the children in the placebo group had a better measles immunisation status and passed worms more frequently than those in the intervention group.

Effectiveness results
The change in the prevalence of underweight children was -12.02% in the placebo group and -14.45% in the intervention group. The difference of 2.43% (95% confidence interval, CI: -1.90 - 6.76) did not reach statistical significance.

The change in the prevalence of stunted children was 11.44% in the placebo group and 2.06% in the intervention group. The difference of 9.38% (95% CI: 6.01 - 12.75) was statistically significant, (p<0.0001).

In terms of the secondary outcomes, the only significant difference was found in the direct faecal smear. This was positive for Ascaris in 41.2% of the children in the intervention group and in 55.3% of those in the placebo group, (p<0.001). No difference was found in the remaining secondary measures. However, it should be noted that some episodes of crossover were observed. For example, at the first, second, and third follow-up visits, 7.5, 12.6, and 14.5% of children in the placebo group, respectively, were offered albendazole.

Clinical conclusions
The effectiveness analysis showed that the albendazole-based deworming treatment was effective in reducing the rate of stunted children in comparison with placebo.

Measure of benefits used in the economic analysis
The benefit measure was the number of prevented cases of stunted children for a hypothetical cohort of 10,000 children. It was derived from the effectiveness analysis.

Direct costs
A 10% discount rate was applied to the second year costs. The high discount rate was chosen due to the high inflation rates observed in India at the time of the study. The health services included in the analyses were health care provider service, medicines, laboratory investigations and hospitalisations. The unit costs and the quantities of resources were not
reported. Most of the details of the cost analyses were reported in an earlier publication. The cost/resource boundary adopted in the analysis was that of the health service payer. The source of the cost data was not reported, but the authors stated that the estimated costs reflected the actual price of the resource. The quantities of resources used were estimated using actual data derived from the trial during 1995 and 1997. The price year was not reported.

**Statistical analysis of costs**
Statistical analyses of the total costs were performed to test the statistical significance of the results. Standard tests were used.

**Indirect Costs**
The indirect costs were not included in the analysis.

**Currency**
Indian rupees (R).

**Sensitivity analysis**
Sensitivity analyses were performed to assess the robustness of the estimated cost-effectiveness ratios to variations in the change of prevalence of stunted children in the two study groups. No sensitivity analyses of the costs were performed. The type of analysis appears to have been univariate and the range of variation was the 95% CI.

**Estimated benefits used in the economic analysis**
As assessed in the effectiveness analysis, the change in the prevalence of stunted children was 11.44% in the placebo group and 2.06 in the intervention group. The difference was 9.38 (95% CI: 6.01 - 12.75; p<0.0001)

**Cost results**
The annual expenditure was R 743 (standard deviation, SD=662) in the intervention group and R 625 (SD=609) in the control group, (p=0.01).

**Synthesis of costs and benefits**
An incremental cost-benefit analysis was performed to combine the cost and benefits. In the cost-effectiveness analysis only the costs of the drug were used. These were estimated as R 20 per dose (market price of the drug) in a hypothetical cohort of 5,000 children. The estimated cost per case of stunting prevented with albendazole over placebo was R 543. This varied from R 498 to R 629 in the sensitivity analysis when the change in the prevalence of stunted children was varied.

**Authors' conclusions**
In the Indian urban setting, routine deworming with albendazole was effective in reducing the risk of stunted children at a low incremental cost.

**CRD COMMENTARY - Selection of comparators**
The rationale for the choice of the comparator was clear. A placebo was selected as the aim of the study was to assess the active value of the intervention. You should decide whether it represents a valid comparator in your own setting.

**Validity of estimate of measure of effectiveness**
The effectiveness estimates were derived from a single-blind, randomised controlled trial. The internal validity of the
analysis was further enhanced by the performance of power calculations and by the high compliance rate. In addition, the method and unit of randomisation were reported, and the clinical analysis was conducted on an intention to treat basis. Since the study was community-based, the study sample was representative of the study population. However, drawbacks of the analysis were the fact that study groups were not perfectly comparable at baseline and there was crossover between the groups. Finally, the authors stated that the study was powered to detect a statistically significant difference in terms of the main outcome (rate of stunted children), which is a categorical variable. Thus, the effect of the intervention on continuous outcomes could not be assessed.

Validity of estimate of measure of benefit
The benefit measure used in the economic analysis was derived from the effectiveness analysis (see 'Validity of estimate of measure of effectiveness' section).

Validity of estimate of costs
The analysis of the costs was performed from the perspective of the payer. However, although several categories of costs were included in the economic evaluation, only the cost of the drug was relevant for the incremental cost-effectiveness analysis. The process by which the costs were calculated was unclear, although the authors stated that the cost analysis was described in a published study. In addition, no price year was reported and sensitivity analyses were not performed on the cost item.

Other issues
The authors made limited comparisons of their findings with those from other studies. In terms of the generalisability of the study results to other settings, some sensitivity analyses were performed but the results were not reported in detail. The authors stated that the conclusions of the analysis should be limited to the study population and setting considered in their evaluation. The authors acknowledged some limitations of the analysis, which have been highlighted already.

Implications of the study
The authors recommend the use of albendazole to reduce the prevalence of stunted children in India, but note that this conclusion should be limited to age groups and sites similar to those considered in the present analysis.

Source of funding

Bibliographic details

PubMedID
10745385

Indexing Status
Subject indexing assigned by NLM

MeSH
Albendazole /economics /therapeutic use; Analysis of Variance; Anthelmintics /economics /therapeutic use; Child Nutrition Disorders /epidemiology /parasitology /prevention & control; Child, Preschool; Cost-Benefit Analysis; Female; Health Care Costs; Humans; India /epidemiology; Infant; Male; Poverty Areas; Single-Blind Method