The cost-effectiveness of health education in improving knowledge and awareness about intestinal parasites in rural Bangladesh

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
Health education in improving knowledge, attitude and practices in the control of intestinal parasites was compared with no intervention. In all studied areas, the index child and all other household members received chemotherapy (400 mg albendazole) at the beginning (baseline) and at the end of the study. Health education was organised through a team of six local health assistants and a supervisor. It included home visits once a month, focus group discussions, and visits to schools. The aims of the health education programme were:

to increase the awareness of worm transmission and the disabilities caused by intestinal parasites;
to improve personal hygiene by washing one's hands before eating and preparing food, and after defecation;
to encourage regular nail trimming; and
to promote routine the wearing of shoes, use of a latrine, and the use of clean water in cooking and washing of utensils.

An additional analysis was done to evaluate the prevalence of parasites in four intervention groups:
1) chemotherapy at the beginning and end;
2) chemotherapy at 6-month intervals;
3) health education plus chemotherapy at the beginning and end; and
4) chemotherapy at 6-month intervals plus education.

Type of intervention
Health education, primary prevention, and treatment.

Economic study type
Cost-effectiveness analysis.

Study population
Discrete rural geographical areas were chosen, all located within a radius of about 80 km from Dhaka, the capital of Bangladesh. Areas were chosen because the health education programme involved the whole community.

Setting
The setting was the community. The study was undertaken in four rural areas in Bangladesh.

Dates to which data relate
The dates to which the effectiveness evidence and resource use data referred were not reported. The price year was also not stated.

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

**Link between effectiveness and cost data**
The costing was carried out on the same sample of communities as that used for the effectiveness analysis.

**Study sample**
Each of the four areas was randomly assigned to a different regimen, involving different education or treatment strategies. Only the education effects were reported in the paper. All participants were pre-treated to ensure that all four groups were free of worms at the beginning of the study. Areas where health education was given were Palash and Mirzapur; Bhaluka and Kaliganj acted as control areas. Of the total of 2,149 households, 1,073 (52%) were located in the two areas receiving health education. No household number was given for each separate area (that each received a different mix of interventions). No power calculations were reported.

**Study design**
This was a randomised intervention survey involving four random, rural, geographical areas. The unit of analysis was the household. The duration of follow-up was 18 months. Loss to follow-up was not reported, nor was blinding of the outcome assessment.

**Analysis of effectiveness**
The authors did not report if the study analysis was conducted on an intention to treat basis or for treatment completers. They also did not report if there were baseline differences in socio-demographic or education in the different areas. The primary outcome was to improve education about intestinal parasites, although baseline and follow-up parasite prevalence were also evaluated.

**Effectiveness results**
For knowledge of public health and transmission of intestinal parasites, percentage differences between baseline and 18-month follow-up responses for seven key knowledge variables were reported:

- if worms are good for health;
- if worms are associated with the consumption of sweet foods;
- consumption of unwashed green vegetables;
- defecation in the courtyard;
- defecation in bushes;
- walking barefooted;
- whether removal of all worms is good.

Highly significant improvements in knowledge were found in the health education areas when compared with the control areas (all differences at p<0.001). In particular, increased awareness of the likelihood of infection arising from eating unwashed green vegetables (74.4% versus 2.2% improvement in intervention versus control communities).
In terms of water and sanitation facilities, the proportion of households with a tube-well in the compound increased by 19.6% and access to a latrine by 33.5% in the health education areas, while in the control areas there was a decrease of 5.3% in households with a tube-well and latrine access only increased by 11.2%, (p<0.001).

In terms of personal hygiene, significant improvements were found in the health education areas in washing with soap after defecation and before food preparation and serving. Only 0.6% of households reported using water only after defecation, an improvement of 11.6%. In the control areas, the percentage of respondents using water only after defecation was reduced by 3.1%. Substantial improvements in nail trimming were observed in the health education areas. Index children with all their nails trimmed increased by 55.6% (versus 13.9% in the control areas), and the percentage without trimmed nails dropped by 24.5% (versus only 5.9% in the control areas). At the 18-month follow-up, two thirds of the index children in the health education areas were wearing shoes compared with only a third of children in the control areas.

The following reductions in prevalence were observed for Ascaris, Trichuris and hookworm, respectively:

- 25%, 41% and 61% for chemotherapy at the beginning and end;
- 17%, 20% and 75% for chemotherapy at 6-month intervals;
- 23%, 12% and 55% for health education plus chemotherapy at the beginning and end; and
- 90%, 94% and 98% for chemotherapy at 6-month intervals plus health education.

Clinical conclusions
After the 18-month follow-up, households receiving health education showed highly significant improvements in knowledge, water and sanitation facilities, and personal hygiene than households in control areas, all located in rural Bangladesh. The area that received chemotherapy at 6-month intervals plus health education showed the greatest reduction in parasite prevalence.

Measure of benefits used in the economic analysis
The percentage improvements in knowledge, changes in water and sanitation facilities, and personal hygiene were used as the units of benefits for this study, both in average and relative improvement per household. The relative percentage refers to the difference between the areas with health education and the control areas. All items of the different areas were averaged to estimate the improvement in each one (knowledge, changes in water and sanitation facilities, and personal hygiene). In addition, weighted prevalence reductions of the three parasites (Ascaris, Trichuris and Hookworm) were evaluated.

Direct costs
The cost categories included household costs and project costs. Household costs covered latrine construction, cleaning and maintenance, tube-well purchase, installation and maintenance, cleanliness of the mother and of the index child. Project costs covered salaries of the project managers and field staff, training of field staff, stationery, production of health education material, albendazole, and laboratory costs and transport. Protocol-driven costs (i.e. laboratory expenses, obtaining anthropometric measurements) were also included. Neither the study perspective nor the price year was reported. A cost survey was conducted at the end of the study, and this was the source of the resource use and unit costs. Some unit costs were reported, but the quantities were not reported in detail. Discounting was not performed, which was appropriate as the study period was less than two years.

Statistical analysis of costs
No statistical analysis of the costs was reported.

Indirect Costs
The indirect costs were not included.

**Currency**

US dollars ($). The conversion rates were not reported.

**Sensitivity analysis**

No sensitivity analysis was reported.

**Estimated benefits used in the economic analysis**

The average improvement with health education was 45% in knowledge, 26.6% in water and sanitation, and 33.6% in personal hygiene. The corresponding figures for the relative average improvements were 49.4%, 23.6% and 28.1%, respectively. In terms of the weighted percentage reduction in the prevalence of Ascaris, Trichuris and hookworm in the four intervened areas, these were:

- 39% for chemotherapy at the beginning and end;
- 38% for chemotherapy at 6-month intervals;
- 28% for health education plus chemotherapy at the beginning and end; and
- 95% for chemotherapy at 6-month intervals plus health education.

**Cost results**

Higher project costs were incurred in the areas receiving health education ($45) than in the control areas ($8). The additional cost ($37) was mainly attributed to having the permanent health education teams.

Average household expenditures were reported for different items, but were aggregated for the four areas and not by intervention group.

The cost per household of the intervention varied between $90 (Mirzapur, the area receiving both health education and chemotherapy at 6-month intervals) and $13 (Kaliganj, the area receiving chemotherapy at the beginning and end of the study but no further intervention).

**Synthesis of costs and benefits**

The cost per 1% improvement of health education (using average values) was $0.82 for knowledge, $1.39 for water and sanitation, and $1.10 for personal hygiene. The corresponding figures using relative data were $0.75, $1.57 and $1.32, respectively.

The following weighted percentage of prevalence reduction (of Ascaris, Trichuris and hookworm) per $ were reported:

- 3% for chemotherapy at the beginning and end;
- 2.5% for chemotherapy at 6-month intervals;
- 0.3% for health education plus chemotherapy at the beginning and end; and
- 1.1% for chemotherapy at 6-month intervals plus health education.

No incremental values were reported.
Authors' conclusions
Significant improvements in knowledge, water and sanitation facilities, and personal hygiene were obtained by the health education package, though chemotherapy alone was much more cost-effective in reducing parasite prevalence.

CRD COMMENTARY - Selection of comparators
Although most of the study referred to the evaluation of health education, the study was a four-arm study (one intervention in each community) assessing combinations of chemotherapy regimens and offering health education. The authors pointed out that the findings that relate to the health education intervention are applicable only to the specific package of health education provided; education interventions might have had different results. These were relevant comparators in their setting and you should judge whether they are suitable in your own setting.

Validity of estimate of measure of effectiveness
The study was a randomised controlled trial that offered each rural area a mix of interventions. It was unclear if the study made adjustments for cointerventions, or for possible baseline differences in socio-demographic, education or health in the different areas. No power calculations were reported. This introduces the possibility that the results may be prone to bias.

Validity of estimate of measure of benefit
Several measures of benefit were reported. Both related to change in knowledge and attitude, as well parasite prevalence reduction. Each benefit measure can serve different objectives (the first if deciding on an efficient way of improving knowledge; the second on an efficient way to reduce parasite prevalence), but they cannot be compared with other benefits used in health technology studies. Thus, they cannot inform broader allocation decisions.

Validity of estimate of costs
The cost section of the paper was described briefly. It covered part of the method of costing (household survey at the end of the study) and the included cost categories and items, which were all relevant. The perspective of the study was not stated. Also not reported were the dates of the effectiveness evidence and resource use, the price year, conversion rates and resource quantities, thus making it difficult to transfer the results to other settings and dates. Statistical and sensitivity analyses were not carried out. These factors suggest that the cost results should be treated with some caution. Discounting was not performed, which was appropriate as the study period was less than two years.

Other issues
The authors did not compare their findings with those of other studies. The issue of generalisability to other settings was not addressed. The authors appear to have presented their results selectively. It is not clear whether the conclusions reflect the scope of the analysis, especially in terms of the impact on parasite prevalence. The authors did not report any further limitations of their study.

Implications of the study
According to the authors, the health education package resulted in significant improvements in knowledge, water and sanitation facilities, and personal hygiene, although the package was relatively expensive in terms of manpower and is unlikely to be cost-effective at the national level. Chemotherapy alone was much more cost-effective in reducing parasite prevalence than health education. This study influenced Government of Bangladesh recommendations by proposing that simple messages, such as the importance of hand washing before food preparation, regular nail trimming and the wearing of shoes, should be given at the time of mass chemotherapy.

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