The effectiveness of insecticide-impregnated bed nets in reducing cases of malaria infection: a meta-analysis of published results

Authors' objectives
To examine the effectiveness of insecticide-impregnated bed nets in preventing malarial infections.

Searching
The Dialog Information Retrieval Service (a database linking around 400 individual databases into one on-line service) was searched, and bibliographies of the identified articles were examined.

Study selection
Study designs of evaluations included in the review
Randomised and non-randomised field trials were included.

Specific interventions included in the review
Insecticide (permethrin or deltamethrin)-impregnated bed nets as a malaria prevention strategy.

Participants included in the review
Children and adults at risk of episodes of parasitemia were included.

Outcomes assessed in the review
The incidence rate ratio of episodes of parasitemia per person-week at risk, documented by the identification of parasites on blood slides between the insecticide-treated bed net group and the control group, was assessed.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
Both the methods and results sections of each article were blinded and assessed using a quality scoring instrument, which assessed possible biases, compatibility of the study groups and the quality of the study design. Ratings on a zero to 100 scale were based on the strength of the epidemiologic and malariologic methodologies of the trial. Each study was independently rated by two reviewers using the quality scoring instrument.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

Methods of synthesis
How were the studies combined?
The Mantel-Haenszel extension method was used to calculate pooled measures of effect and 95% confidence intervals (CIs).

How were differences between studies investigated?
The Rothman-Boice likelihood ratio test was used to assess heterogeneity. Two analyses were carried out, based on pooling the studies using no intervention or untreated bed nets as the controls. The contribution of each study to the pooled estimate was weighted inversely proportional to its variance and directly proportional to the quality score.
Results of the review
There were 10 studies in total: 7 were randomised field trials (4 randomised by village and 3 by household or compound) and 3 were non-randomised.

Overall, when compared with untreated bed nets, the insecticide-impregnated bed nets produced a summary incidence rate ratio for acquiring malarial infections of 0.757 (95% CI: 0.612, 0.938), representing a reduction of 24%. The summary incidence ratio for insecticide-impregnated bed nets compared with no intervention was 0.497 (95% CI: 0.417, to 0.592).

Comparing the permethrin-impregnated and untreated bed net groups, the summary incidence ratio was 0.524 (95% CI: 0.410, 0.691), indicating a reduction of 48% in incidence; for the sub-setted analysis comparing permethrin-impregnated bed nets with no intervention controls, the incidence ratio was 0.501 (95% CI: 0.431, 0.581). With the adjustments for quality score the incidence ratios were 0.522 (95% CI: 0.368, 0.739) and 0.589 (95% CI: 0.513, 0.676), respectively.

The heterogeneity likelihood ratios were significant: for treated versus untreated nets (17.28, p = 0.004) and for nets versus no nets (23.55, p = 0.0003).

Authors’ conclusions
The results suggest that insecticide-impregnated bed nets are effective in preventing malaria, decreasing the incidence rate ratio by approximately 50% in field trials performed to date.

CRD commentary
The studies included in the meta-analysis varied in terms of their study designs, location and populations. The years for the search strategy were not presented and no attempt was made to locate unpublished literature.

Implications of the review for practice and research
Insecticide-impregnated beds could be an effective way of preventing malaria in those at risk.

Bibliographic details

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Subject indexing assigned by NLM

MeSH
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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.