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Cost-effectiveness analysis of PBO-LLINs compared to Non PBO LLINs in the reduction of malaria among children in Jinja district

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Background: Vector resistance in Uganda has threatened to reverse the present gains in malaria control. To address the challenge of vector resistance, WHO recommends the distribution of piperonyl butoxide (PBO) long lasting insecticide treated nets (LLINs) which are more effective; however, the cost effectiveness of their use is still unknown. Cost effectiveness studies are crucial to help inform governments in resource poor setting on how best to prioritize between the new PBO-LLINs and the Non PBO-LLINs. This study therefore aimed to determine the cost effectiveness of PBO-LLINs and the conventional Non PBO-LLINs in the reduction of Malaria among children in Jinja district.

Methods and materials: A Markov model was used to simulate the sequence of malaria morbidity in a hypothetical Ugandan cohort of children aged 2 years using an 8 year time horizon and two-weeks cycle length. Model parameters were obtained using data from the experts from Ministry of Health (MOH), malaria consortium and published literature. The provider's perspective was used to explore the costs and health outcomes measured as quality adjusted life years (QALYs). Incremental cost-effectiveness ratios (ICERs) were calculated and sensitivity analyses conducted. ICERs less than three times the GDP per capita (\$604.4*3) and less than once the GDP per capita (\$604.04) were classified as cost-effectiveness and very cost-effective respectively following WHO guidelines.

Results: The unit cost of PBO-LLIN program was US\$ 116 and US\$ 71 for Non-PBO LLIN program (incremental unit cost = US\$ 45). The unit QALYs gained under the PBO arm were US 26.9 QALYs and 25.6 QALYs under the Non-PBO (incremental QALYs = 1.3). In the base case analysis, the ICER comparing PBO-LLIN to the non-PBO LLIN was \$ 34.22 per QALY gained. This indicates that the PBO-LLIN were very cost effective as it was less than the Ugandan GDP per capita (US\$ 604.04).

Conclusion: This study showed that PBO-LLINs were very cost effective compared to non-PBO-LLINs. However, cost-effectiveness could be lost if the effectiveness of PBO-LLINs reduced. Efforts to further optimize the effectiveness of PBO-LLINs through proper usage would increase the cost-effectiveness of PBO-LLINs. However, this study needs to be replicated in areas with different malaria endemicity.

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Acceptability and effectiveness of Ujiplus® - a school meal fortified with a natural anthelmintic agent for control of *Schistosoma mansoni*

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Background: Mass chemotherapy is currently the recommended approach for control of schistosomiasis. However, there is concern that this might not be financially sustainable over extended periods and the increasing drug pressure is likely to favor resistant parasite genotypes. We formulated a local and easier to implement alternative; porridge flour fortified with papaya seeds extracts (UjiPlus®) as a potential antischistosoma compound and evaluated its acceptability and efficacy.

Methods and materials: A total of 346 children aged 3–6 yrs. [\bar{x} = 4.5; IQR = 4–5] were enrolled. UjiPlus® was provided daily through a school feeding program for 4 consecutive weeks. Stool samples were collected from each child at baseline (week zero) and follow-up (week 4) and subjected to Kato-Katz microscopic examination for *Schistosoma mansoni* egg/s presence and infection intensity by two independent microscopists.

Results: At baseline 294 participants provided a stool sample. At follow-up (FU) 247 participants provided a stool sample, of these 52 had not provided a sample at baseline. Compliance data to UjiPlus® was available for 237 children; 105(44.3%), 107(45.2%), 18(7.6%), 5(2.1%), and 2(0.8%) missed taking UjiPlus® for 0 days (100% compliance), 1–3 days, 4–6 days, 7–9 days and 10 or more days respectively. Reasons for non-compliance included absenteeism due to minor illnesses not related to UjiPlus® (n = 77), truancy (n = 31), family related issues (n = 16); some participants had been sent home to collect UjiPlus® cooking fuel fee (n = 9) while some refused to take UjiPlus® due to stomach-ache (n = 3) or diarrhoea (n = 1) caused by drinking the porridge. Side effects were observed in 16 children, with 2 reporting 3 and 1 reporting 2 side effects. These included Stomach-ache (n = 5), vomit (n = 4), cough (n = 4), running nose (n = 3), diarrhea (n = 2), nausea (n = 2) and body rash (n = 1). The overall prevalence of *Schistosoma mansoni* infections at baseline and follow-up was 39.8% vs. 30.4% [P = 0.022; RR = 1.31; 95% CI (1.04–1.66)]. Among the infected mean egg counts were 183.2 epg vs. 161.3 epg.

Conclusion: In these preliminary results, UjiPlus® was well accepted and tolerated in the children population. UjiPlus® also yielded a reduction in *Schistosoma mansoni* prevalence and infection intensity.

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