Comparison of the thick smear and Kato-Katz techniques for diagnosis of intestinal helminth infections

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ABSTRACT
This study compared the efficiency of Kato-Katz thick smear and thick smear techniques for the diagnosis of intestinal helminths. The sensitivity of the thick smear technique was higher than that of the Kato-Katz method for the diagnosis of all helminths except Schistosoma mansoni.


RESUMO
O objetivo deste trabalho foi comparar a eficiência dos métodos de Kato-Katz e sedimentação espontânea para o diagnóstico das helmintíases intestinais. A sensibilidade da técnica de sedimentação espontânea foi superior aquela encontrada pelo método de Kato-Katz para o diagnóstico de todos os helmintos, exceto para Schistosoma mansoni.


In 1954, Kato and Miura introduced a thick-smear technique for fecal examination3. Soon thereafter, Katz modified and adapted this technique for use in field studies4. This method was adopted by WHO8 for quantitative and qualitative diagnosis of intestinal infections caused by helminths such as Ascaris lumbricoides, Trichuris trichiura, hookworm and Schistosoma mansoni, and has also been used in laboratory diagnosis4. Although the Kato-Katz method is widely used for the diagnosis of intestinal helminths infections, its reported effectiveness varies. Garcia et al2 observed that the Kato-Katz method was more sensitive than the thick smear technique for diagnosing helminths4, while Martin & Beaver5 concluded that the Kato thick-smear technique is reliable and practical for the quantitative diagnosis of hookworm, Trichuris Trichiura and Schistosome infections6. On the other hand, Engels et al1 showed that the Kato-Katz method is not suitable for hookworm, protozoa and filariform larvae detection3; while another study concluded that the Kato method has a low sensitivity for identifying hookworm eggs, and observed that hookworm eggs collapsed and disappeared shortly after the thick smear had cleared9. Here, we present a comparative study of the Kato-Katz and thick smear methods for detection of Ascaris lumbricoides, T. trichiura, hookworm and S. mansoni.

This study was based on 258 stool samples collected from school-children, aged 6-14 years, from Salinas da Margarida County Public School (Bahia State), from January to June 2001. All samples were examined by the quantitative Kato-Katz and the qualitative thick smear methods, according to standardized procedures described elsewhere7. Three slides were prepared per person, and egg-counts from Kato-Katz slides were conducted 24 hours after its preparation. The sensitivity and specificity of each method in isolation and of the two methods together were calculated using Epi-info (version 6) software. The kappa statistic15 was used to assess the concordance of test results obtained with the two individual techniques, and McNemar's test for paired proportions was used to compare the prevalences obtained with each of the individual methods, according to the normal theory test7.

Overall, 89.1% of samples were positive for cysts of protozoa (data not shown) and/or helminth eggs (Table 1). Thick smear identified a larger fraction of patients infected...
with helminths. The difference was most evident for hookworm, where the ratio of positive samples identified by thick smear and Kato-Katz was 73:1. However, combined examination with the thick smear and Kato-Katz techniques gave better results than when the thick-smear was used alone (Table 1). Compared to thick smear, the sensitivity of the Kato-Katz method was 68.2% for *T. trichiura*, 70.8% for *A. lumbricoides* and 1.4% for hookworm, and the specificity was 60.2% for *T. trichiura*, 84.1% for *A. lumbricoides*, and 100% for hookworm (Table 2). However, the infections detected with these different techniques were not necessarily the same, which means that even the sensitivity of these improved individual techniques is far from ideal, and health personnel should be aware that a person is not to be classified as uninfected on the basis of a simple negative examination by one of these techniques conducted in isolation. The Kappa statistic indicated that agreement between the Kato and thick smear methods was good for *A. lumbricoides* (κ = 0.55), and marginal for *T. trichiura* (κ = 0.27) and hookworm (κ = 0.02). In addition, McNemar's test indicated that direct examination was more likely to correctly identify *T. trichiura* than the Kato-Katz method (χ² = 3.64, p = 0.056), although the prevalences of *A. lumbricoides* were not significantly different (χ² = 2.526, p = 0.11).

However, comparison of the individual methods with the McNemar test indicated that direct examination was more reliable for determining infection with *T. trichiura*. Larger sample sizes would be necessary for determining whether the direct examination is also more reliable for detecting *A. lumbricoides*.

The present study found that the Kato-Katz method was less sensitive than thick smear for detecting hookworm infections. Previous reports have suggested that Kato-Katz could be adequate for detecting hookworm. However, these studies only examined a single slide per patient, and the Kato-Katz slides were read immediately after preparation. It is likely that hookworm eggs deteriorate during the standardized 24-hour period before slide reading, which would explain the low prevalences identified by Kato-Katz in this study. Nevertheless, we concluded that the Kato-Katz method, when used with the thick smear, would be particularly appropriate for large-scale surveys because of its simplicity, lower cost, and rapidity.

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**REFERENCES**