

Pauline Grys
Dr. sc. hum.

The role of diagnostics and human resources in eliminating schistosomiasis japonica in Wuhan, China

Promotionsfach: Öffentliches Gesundheitswesen
Doktorvater: Prof. Dr. Andreas Ruppel

Introduction: Over the past 50 years, the People's Republic of China made huge progress in the control of schistosomiasis japonica, and some previously endemic areas are now aiming for interruption of transmission or complete elimination of the disease. Further progress on effective schistosomiasis control depends on factors including performance of stakeholders at the grass roots level, the availability of human resources and public health infrastructure in the communities, the adaptation of effective surveillance systems with substantially intensive monitoring methods and the rigorous implementation of sustained control measures in endemic villages. This study examined in detail the practical implementation of the national control strategy at grass root level in the city of Wuhan in the province Hubei, central China, with a focus on availability and composition of human resources for control efforts and on the performance of sero-diagnostic tests for case detection for effective surveillance.

Methods: For human resource assessment, a cross-sectional survey using structured questionnaires was conducted between June and October 2010. In total, data from 216 respondents involved in schistosomiasis control (100 non-clinical staff, 104 clinical staff and 12 leaders of control stations) was analysed using descriptive, univariate and bivariate analyses. Results were triangulated with information obtained through interviews and observations to provide an overall understanding of the situation of health workers in schistosomiasis control in Wuhan. Analysis of performance of diagnostic tests was performed using a population-based, retrospective longitudinal approach. For this study, we compiled results of individual indirect haemagglutination assays (IHA) and Kato-Katz tests (KK) in a schistosome-endemic village in Wuhan. Annual CDC survey data from 2003-2010 were retrospectively analyzed individually for 1,217 persons, using STATA 9 software package. The sero-reactivity of individual persons was longitudinally assembled with a focus on identification and examination of sero-conversions and sero-reversions. Individual patterns of titre courses were investigated over a period of several years. This study is largely based on documents and interviews in Chinese language, thus allowing for insights, which are rare or in-existent outside China. Approval by the Heidelberg Medical Faculty had been obtained.

Results: The network of the complex local institutional control infrastructure was elucidated from documents of the Ministry of Health and through personal interviews. The investments in human

resources were found to be extensive, but also necessary to achieve the control targets. Statistically, one health worker was available for every two to three confirmed schistosomiasis patients. Local distribution of health personnel corresponded to the respective populations at risk and infection cases, with almost two thirds of all personnel employed at district level facilities. The self-perceived work situations differed between clinical staff in hospitals and non-clinical staff working at control institutes and departments. Personnel responsible for hospital treatment of schistosomiasis patients were considered sufficient, with workloads being reduced due to lowering prevalences. The situation was reverse for non-clinical staff with most labour and time-intensive activities oriented towards prevention, including snail surveillance, spraying molluscicide, health education, treatment of patients in endemic areas. Thus, the number of available clinical staff becomes apparently less crucial for the success of schistosomiasis control, compared to the number of non-clinical staff.

Analysis of surveillance data showed that infection rates remained at a low level, and sero-prevalence apparently declined over the years according to dropping numbers of IHA-positive cases and sero-conversions. Similarly, infection intensities and schistosome antibody levels in the population remained low. Most cases sero-converted to low titre values with the probability of converting to higher titres rising with age. Two thirds of all cases were observed to have sero-reverted one year after chemotherapy and thus, can then be considered cured of infection. However, an “immunological scar” persisted in a third of people beyond this time, but in the large majority of people (80%) no longer than 2 years (which also implies two cycles of treatment). Patients with lower pre-treatment titres became sero-negative after one year more likely than patients with higher pre-treatment titres. Sero-reversion was also found to be associated with age, with cases in younger age-groups being more likely to sero-revert already one year after chemotherapy than cases in older age groups. Several individuals were identified, whose titer levels after acquisition of infection remained positive despite repeated chemotherapy. A sub-population of around 1% of the total population showed persisting titers for up to more than four consecutive years.

Conclusion: This is the first analysis of post-treatment schistosome-specific antibodies based on a large endemic cohort and an unusually long time span of 8 years. An “immunologic scar” was found to occur, but normally no longer than for 2 years after treatment. This study also highlights the need and benefit to invest considerable financial resources and man power to achieve the goal of schistosomiasis elimination. Contrary to high prevalence situations, which occurred historically in China and persist in large parts of Africa, the success of control leading to low endemicity - as in this study population – necessitates a change in paradigms: interventions based on mass drug administration at relatively low cost per schistosomiasis patient are now substituted by complex and relatively expensive surveillance activities. These, however, allow to proceed from control to elimination of schistosomiasis in Wuhan.