



Image taken from: <u>https://www.economist.com/middle-east-and-africa/2015/12/14/for-most-urban-africans-owning-anything-other-than-a-slum-home-is-out-of-reach</u>

There is therefore a need to better understand to what extent schistosomiasis in peri-urban and urban settings is occurring, has changed over time and to what extent this issue is considered at this stage in research and control activities in order to identify research and mapping gaps.

What is peri-urban

Peri-urbanisation relates to those processes of dispersive urban growth that creates hybrid landscapes of fragmented urban and rural characteristics.



Out of 161 eligible papers

General Findings

- Certain factors were significantly associated with a lower / higher risk of infection:
 - Living in a house further away from a water access point
 - Abstaining from swimming in open freshwater bodies
 - Profession of the parents
 - Uganda: Urban farmers exhibited the highest point-prevalence (23% for S. mansoni), compared to slum dwellers and workers collecting fecal sludge or maintaining drainage channels (5% or above)
- Boys in urban areas also tended to be more affected infected
- Age cohorts between 8-15 years old

Similar patterns as in rural areas with regards to who is most at risk and demonstrates highest infection rates

https://doi.org/10.1186/s40249-018-0431-6)

doi: 10.1371/journal.pntd.0004469

Interestingly, it was found that the socioeconomic status of the family did not influence infection with S. mansoni in Côte d'Ivoire

https://doi.org/10.1186/s40249-018-0431-6)

https://doi.org/10.1371/journal.pone.0195519; https://doi.org/10.1186/s40249-018-0431-6; doi: 10.1186/s13104-017-3023-9.

In order to understand whether and how urban schistosomiasis has changed over time, a comparative study was carried out in Brazil in 2010 (DOI:<u>10.1590/0074-0276130353</u>)

<u>Tanzania 1:</u> doi: 10.1016/j.actatropica.2014.01.012 Tanzania 2: doi: 10.1371/journal.pntd.0006017

Nigeria study: Kinshasa study: doi: 10.1186/s13071-015-1206-6.

The decline again by 2009 was attributed to changes in socio-economic status among residents and irregular transmission.

No explanations given as to why and how infection and transmission was even introduced in the city

Continuous treatment Sanitary improvements Fewer snail habitats as a result of environmental change Better recreational facilities (no more swimming in infected waters)

Continous treatment: suggests that MDA campaigns do take place; not clear whethere solely governmental / ministerial initiatives – funded by whom?! But not necessarily part of the big campaigns – there is uncertainty as to the extent to which classical MDA campaigns address urban areas

More built environments mean fewer water sources; no environment that sustains the snails

Alternatives for swimming e.g.

Recurring Themes: To explain presence and possible risk

- Nearby water sources with snail species acting as intermediate hosts
- Urbanisation unofficial settlements lack of sufficient WASH facilities
- Rural-to-urban migration & other movement patterns
- Environmental changes
- Lower levels of awareness in urban areas

While urbanisation per se was not emphasised to influence urban schistosomiasis, presence to water sources and the lack of adequate sanitary waste disposal were a recurring theme (e.g. doi: 10.1186/1476-072X-11-51.; DOI:<u>10.1590/s0074-02762010000400034</u>). A lack of sanitary infrastructure and clean water supports faecal contamination of natural aquatic environments in new urban areas. Vector snails can thereby get infected leading new sources of disease transmission.

A number of studies explicitly looked at the proximity to water sources in which people lived and their respective levels of infection. In a neighbourhood in Salvador, Bahia, Brazil, for example, the majority of children studied with active infection lived close to natural water bodies ([Urban transmission of schistosomiasis in children from a neighborhood of Salvador, Bahia].). Similarly, in a study looking at the schoolchildren and the professions of individuals with frequent water contact showed that prevalence and intensity of the disease was directly dependent on frequency and duration of water contact (). Schoolchildren showed highest infection rates and affected more children, followed by dry cleaners and vehicle washers. In addition, gender differences were noted with boys and male vehicale wahsers being most infected while among dry cleaners females were more infected.

Overall, the presence of nearby freshwater was important to finding disease-relevant mollusc species as well as active infection.

(https://doi.org/10.1371/journal.pone.0195519;) find paper Nigeria where one side of

river more affected than other

Migration

In an interesting literature review by XXX (DOI: <u>10.1590/s0074-02762010000400038</u>) suggest the need for research into different types of migration patterns, in order to fully understand, forecast and assess the risk of future spread of schistosomiasis. The authors mention as a result of socio-economic dynamics and in addition to rural-urban migration, urban-urban, urban-rural movement as well as movements of environmental refugees and tourists. In support of this assessment is the finding by one study (doi:

10.1016/j.actatropica.2008.07.002) that identified A different study similarly found that labor migrations from and periodic return movements to rural areas to be predictors of schistosomiasis.

Environmental changes

Environmental changes were indicated by a number of studies as explanatory factors for the prevalence of schistosomiasis and the risk for the health of residents. In particular, malacological surveys appeared helpful in understand the prevalence of disease-relevant snail species, their infection levels and changes in their distribution (doi: 10.1590/S1678-9946201860076.). Tomaz et al.

(2018; doi: 10.1590/S1678-9946201860076.). Tomaz et al. (2018; doi: 10.1590/S1678-9946201860076.) for example mention the disturbance and degradation of natural areas neighbouring residential zones as culprits for the proliferation of helminths. The situation is worsened by subsequent contamination with human waste, as described above (DOI:10.1590/s0074-02762010000400034) WhenOliveira et al. 2013, studied rainfall patterns and abundance of *Biomphalaria glabrata*. They concluded that with climate change and changes in frequency and intensity of rainfall are likely to interfer with the focus of urban schistosomiasis in the Aracaju metropolitan area, the area studied (doi: 10.1590/0037-8682-1486-2013.)

Awareness

Very little research was carried out into availability of health education amongst urban residents and levels of awareness of schistosomiais in urban settings. Two studies looked at levels of awareness of urban communities around Lake Victoria compared to rural communities, as well as the feasibility of carrying out health education via XXXX (reference) Similarly, it was found in one urban area in Brazil that illiterate individuals (30.1%) were at greater risk for periportal fibrosis and that both an education level of up to 11 years as well as specific prior treatment for schistosomiasis, suggesting an awreness for the disease, were preventive factors for severe periportal fibrosis (doi: 10.1590/0037-8682-0110-2013.) .

Interestingly, a similar study carried out three years prior in Cameroon () also found little schistosomiasis-relevant knowledge amongst community members compared to rural communities (72.5% vs. 3.1%, respectively) as well as between men and women (61.8 vs. 38.2%, respectively) (<u>Schistosomiasis in Cameroon: an assessment of</u> <u>community knowledge pattern.</u>).

Clear definition needed of what constitutes a peri-urban and an urban area would also be helpful to assess to what extent previous MDA and other activities have included peri-urban and urban areas.

To what extent do we know are activities actually already taking place? Mapping by ESPEN, SCI etc. that have just not been published?

While some studies either mentioned explanations for the prevalence of schistosomiasis, others discussed driving factors for new schistosomaisis foci and a spread to urban areas. However, there were no publications that had studied these factors together with changes in prevalence rates in order to establish a clear correlation / causational effect. The majority are, as mentioned, of cross-sectional nature. It may be beneficial to engage in longitudinal studies.

A clear pattern has resulted from this review that shows the relationship between human waste disposal and a lack thereof and the presence of active disease. This has immediate policy consequences and can be a useful starting point for a risk assessment in peri-urban and urban areas for the health of surrounding residents. With two-thirds of the world population living in megacities by 2050, as estimated by the UN (Hotez chapter 2), and many of those megacities being characterised by unorganised settlement, a lack of municipal oversight and infrastructure provision, the problem is only going to be substantiated.

Assessments into whether health care facilities can detect infection adequately and respond to the health needs of particulary the urban poor may be helpful in order to initiate necessary policy steps to prevent further disease foci in settlements that are likely to grow further in the future. As the urban health services must deal with the rise in parasitic diseases, appropriate control strategies for the urban setting must be developed and implemented.

https://en.wikipedia.org/wiki/Provinces_of_China

As a result – very little learning can take place from large-scale activities in China

Shanghai Large-scale and extensive control and elimination programmes

- 1955: control programme was started
- 1975: Schistosomiasis was under effective control
- 1985: the criteria for schistosomiasis elimination in the whole municipality area were reached
- By 2000: whole city had remained free from acute infection, infected snails for 26 years & free from new infection in humans and cattle for 22 consecutive years

https://www.china-briefing.com/news/shanghai-industry-economics-policy/

Approach to surveillance and consolidation during past 15 years after elimination of schistosomiasis in Shanghai.(2002)

Shanghai was one of the most heavily endemic areas of schistosomiasis in the People's Republic of China. A schistosomiasis control program was started in 1955. In 1975, schistosomiasis was under effective control and in 1985, the criteria for schistosomiasis elimination in the whole municipality area were reached. Some 99.99% of the original schistosomiasis patients had been treated and cured. The positive rate of stool examination among the human population was reduced to 0.03%. Since 1986, after the elimination of schistosomiasis, an overall surveillance and consolidation work was unfolded in Shanghai. The general goals and strategy are: actively implementing the policy 'putting prevention first' in health work; conscientiously carrying out the principal 'integrated management and control in a scientific way' in schistosomiasis control in the People's Republic of China; and to sustain the achievements of elimination of schistosomiasis in the whole city area. The specific methods are as follows: (1) adhering to integrated control and management; and (2) carrying out control work in a scientific way and putting the main direction of attack as a key problem. By the year 2000, the whole city area had remained free from acute schistosome infection as well as infected

snails for 26 consecutive years, free from new infection both in humans and in cattle for 22 consecutive years and the achievement of elimination of schistosomiasis had been consolidated for 15 consecutive years.

Goal and Strategy

- Actively implementing the policy 'putting prevention first' in health work;
- Conscientiously carrying out the principal 'integrated management and control in a scientific way' in schistosomiasis control in the People's Republic of China;
- To sustain the achievements of elimination of schistosomiasis in the whole city area

https://www.china-briefing.com/news/shanghai-industry-economics-policy/

Significant environmental changes to marshlands of the Xiangjiang River Smoothing and cultivating in beaches In sections with scarce distribution of snails, lowering parts of beaches and raising other parts. Since 2003 the average snail density declined by Snail Control 99.83% by simply smoothing beaches and subsequent cultivation **Activities** The average snail density declined by 100% with lowering parts of beaches and raising other parts followed by cultivation 2006: Infection rate in residents was 0.31% with a declined rate of 93.84% 2010: Infection rate was 1.03%; the test result of water contamination was negative

Effect of cultivation for snail control on schistosomiasis in Changsha urban section of Xiangjiang River] (2011)

To study a reliable, friendly environmental and sustainable Oncomelania snail control method in marshlands of the Xiangjiang River. METHODS:

According to the special characteristics of the marshlands of the Xiangjiang River, smoothing and cultivating in beaches were applied for snail control. In sections with scarce distribution of snails, lowering parts of 4.4 beaches and raising other parts were added.

RESULTS:

Since 2003, the project has been practiced for 8 years. The average snail density declined by 99.83% with the simple smoothing beaches and then cultivation there. The average snail density declined by 100% with lowering parts of beaches and raising other parts and then cultivation. The schistosome infection rate was 0.31% with a declined rate of 93.84% in residents in 2006. The schistosome infection rate was 1.03% in 2010. The test result of water contamination was negative.

CONCLUSIONS:

The method of simple smoothing beaches and then cultivation can control the density of snails in marshlands and the method of lowering parts of beaches and raising other parts and then cultivation is more effective.

