Commentory

Elimination of Urinary Schistosomiasis in Iraq: A Historical Review and Path to WHO Certification

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Abstract

Context: Urinary schistosomiasis, caused by Schistosoma haematobium, was once a major neglected tropical disease (NTD) endemic across sub-Saharan Africa, the Nile Valley, and parts of the Middle East, including Iraq. The disease relies on freshwater snails of the genus Bulinus as an obligate intermediate host. This review aimed to characterise the full epidemiological trajectory of S. haematobium in Iraq from earliest records to the present day.

Methods: Epidemiological databases (Communicable Diseases Control Center/Iraq, PubMed, ISI, Scopus) were searched for records spanning 1919 to July 2025.

Results: Iraq's National Schistosomiasis Control Programme achieved a dramatic decline in infection prevalence — from 27% in 1954 to 0.02% in 2002 — through integrated strategies encompassing mass treatment with praziquantel, molluscicide-based snail control, engineering interventions, and sustained health education. No locally acquired cases have been recorded since 2011, and comprehensive vector surveillance has confirmed the absence of Bulinus truncatus from all 19 governorates. Iraq is currently in the WHO-guided elimination certification process.

Conclusions: Urinary schistosomiasis has been effectively eliminated as a public health problem in Iraq through decades of coordinated national and international effort. Pending WHO/EMRO formal verification, Iraq stands as a regional model for NTD elimination in the Middle East.

Keywords: Urinary schistosomiasis; Schistosoma haematobium; neglected tropical diseases; Iraq; elimination; epidemiology; Bulinus truncatus; vector control

Introduction

Schistosomiasis—clinically known as bilharzia or 'snail fever'—is a major neglected tropical disease (NTD) caused by parasitic trematodes of the genus *Schistosoma* [1, 14]. The disease is transmitted to humans through contact with freshwater bodies harboring infected intermediate host snails, specifically those of the genus *Bulinus* for the urogenital form [3, 11]. *Schistosoma haematobium*, the primary agent of urogenital schistosomiasis, remains endemic across sub-Saharan Africa, the Nile Valley,

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and specific foci in the Middle East, including the river basins of Iraq [9, 12].

Infection typically occurs during routine agricultural, domestic, occupational, or recreational activities that bring individuals into contact with cercariae-infested water [11, 13]. On a global scale, the disease exerts a substantial public health burden that is frequently underestimated in morbidity statistics [2]. Chronic infection can lead to severe, long-term clinical sequelae, including:

- **Obstructive uropathy** and hydronephrosis.
- **Squamous cell bladder carcinoma**.
- **Chronic anaemia** and significant productivity loss in endemic communities [3, 15].

To combat this, the **World Health Organization (WHO)** has established a strategic roadmap aimed at eliminating schistosomiasis as a public health problem, with critical milestones set for 2025 and 2030 [4].

Iraq represents a particularly significant case study in the global effort to eradicate NTDs. Historically, the disease was highly endemic across the country's central and southern irrigation networks and marshlands [6]. However, through seven decades of rigorous national control programming, Iraq has reached the threshold of WHO-verified elimination [10]. As of **July 2025**, official surveillance and joint reports indicate that Iraq has successfully maintained the interruption of local transmission [5, 8].

This review synthesizes the epidemiological trajectory of *S. haematobium* in Iraq, spanning from the earliest documented records of the 20th century to the current 2025 data. It further evaluates the multi-sectoral methods, public health milestones, and the remaining formal requirements for the official certification of Iraq as a schistosomiasis-free nation [6, 8, 10].

Methods

This historical review searched epidemiological databases including the Communicable Diseases Control Center/Iraq (CDCC Iraq), PubMed, ISI Web of Science, and Scopus. The search covered publications, surveillance reports, and programme records from 1919 to July 2025. Iraqi Ministry of Health annual reports, WHO/EMRO technical documents, and field survey datasets from the Institute of Endemic Diseases (Baghdad) were additionally reviewed. Official permission was obtained to access surveillance data from CDCC Iraq.

Historical Background

Ancient and Early Modern Records

References to urinary schistosomiasis in the Mesopotamian region date to the Assyrian era, with further accounts during the medieval period. The first systematic scientific documentation emerged after World War II, when cases were identified among British forces stationed in Basra, Al-Hindiya, and Kufa. A landmark survey by Boulanger in 1919 across the Euphrates basin recorded infection rates ranging from 20% in Samarra to 85% in Al-Qurna. Hall (1925) subsequently documented rates of 80% in rural Diwaniyah and 47% among school students in Basra. Studies conducted between 1921 and 1928 confirmed cases in most governorates except Mosul and Sulaymaniyah, with the highest burden concentrated in Basra, Nasiriyah, and southeastern Baghdad.

Establishment of the National Control Programme (Post-1950)

Formal institutional engagement began in 1950 with the establishment of the Schistosomiasis Section within Iraq's Institute of Endemic Diseases. Under the leadership of Dr. Watson and subsequently Dr. Stefan Yousefani (from 1951), the section launched the first systematic control campaigns and trained national staff. From 1954, collaboration with WHO led to structured snail surveys using Baghdad province as a model zone. In the 1960s, a formal training programme was implemented in the Hor Rajab area (1962–1966) in partnership with WHO, establishing institutional capacity that would sustain control activities for decades.

Geographical Distribution and Transmission Ecology

The disease was endemic in the central and southern governorates, particularly along the Tigris, Euphrates, Diyala, and Greater Zab rivers. Focal transmission was also documented in northern areas including Nineveh and Erbil. The extensive and complex irrigation infrastructure — including the Dujail, Latifiya, and Mussayib projects — created ideal ecological conditions for the snail intermediate host, Bulinus truncatus, by sustaining slow-moving, heavily vegetated freshwater bodies throughout the agricultural calendar.

Infection rates in the 1950s ranged from 2.7% in Kirkuk to 85% in some southern communities. A nationwide school survey in 1955 found 29.4% prevalence across 10 governorates. By 1970, the national average had declined to approximately 20%, though localised hotspots such as Tel Muhammad in Baghdad still exceeded 80%.

Vector Biology and Control Approaches

The intermediate host, Bulinus truncatus, thrives in marshes, swamps, and irrigation canals across central and southern Iraq. Vector control strategies included the application of molluscicides (principally Baylluside) at a frequency of three to four treatments per year in endemic areas, alongside engineering recommendations to the Ministry of Irrigation to design waterway infrastructure less conducive to snail colonisation, including canal lining and removal of aquatic vegetation.

Evolution of Pharmacological Treatment

Early-generation treatments — antimony compounds (including Stibophen), Niridazole, and Hycanthone — carried significant adverse effect profiles and practical limitations for field deployment. In 1966, Ambilhar tablets were introduced, followed in 1972 by Etrenol (single intramuscular injection) with a reported cure rate of approximately 70%. The pivotal therapeutic advance came in 1982 with the adoption of praziquantel, which offered high efficacy across all Schistosoma species, a favourable safety profile, and suitability for mass drug administration (MDA). Praziquantel remains the cornerstone of treatment to the present day.

Results

Human Surveillance: Epidemiological Trends

Historical Reduction in Prevalence (1954–2002)

National surveillance data spanning nearly five decades demonstrate a sustained and substantial decline in urinary schistosomiasis prevalence in Iraq. As shown in Table 1, the infection rate fell from a peak of 27% in 1954–1955 to 0.02% by 2002 — a reduction exceeding 99%. This trajectory reflects the cumulative impact of the integrated National Schistosomiasis Control Programme, encompassing mass drug administration, vector control, health education, and water resource management.

Notably, the volume of samples examined increased dramatically between 1989 and 1994 — reaching over 2.2 million in 1990 — coinciding with a sharp decline in reported infection percentage, consistent with intensified passive surveillance reaching previously unscreened populations alongside genuine epidemiological decline.

Table 1. Prevalence of Urinary Schistosomiasis in Iraq by Year (1954–2002).

Year	Samples Examined	Positive Samples	Infection Rate (%)
1954	16,569	4,468	27.0
1955	20,400	5,478	27.0
1957	65,731	10,043	15.0
1958	39,493	8,165	20.7
1959	34,643	4,914	14.0
1960	106,371	12,253	11.5
1961	142,574	14,669	10.0
1964	132,021	9,972	7.5
1965	89,123	7,943	8.9
1966	45,875	3,280	7.0
1967	81,023	5,721	7.0

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Year	Samples Examined	Positive Samples	Infection Rate (%)
1968	73,414	2,995	4.0
1970	73,733	3,613	4.9
1972	124,278	5,470	4.0
1975	137,016	7,247	5.3
1978	232,795	8,968	3.9
1980	218,231	3,338	1.5
1982	116,528	1,721	1.48
1985	95,935	1,250	1.3
1989	803,899	1,955	0.24
1990	2,232,438	1,449	0.06
1991	1,016,474	395	0.04
1994	1,027,125	814	0.08
2002	—	278	0.02

Transition to Elimination (2003–2010)

The post-2003 period posed significant challenges to the control programme, including damage to health infrastructure, marshland reflooding creating new potential snail habitats, and population displacement from endemic areas. Despite these disruptions, the number of confirmed cases continued to decline, falling from 142 in 2003 to just 4 in 2010 (Table 2).

Al-Anbar governorate accounted for the majority of cases in the early part of this period (129 of 142 cases in 2003), likely reflecting geographic and demographic factors including proximity to the Euphrates river system and irrigation infrastructure. Diyala remained the final governorate to record confirmed cases. A national school survey conducted in 2004–2005, covering approximately 2,405 primary school students across four geographic zones, confirmed significantly reduced prevalence consistent with near-elimination status.

Table 2. Confirmed Urinary Schistosomiasis Cases by Governorate, Iraq (2003–2010). Active transmission areas only.

Governorate	2003	2004	2005	2006	2007	2008	2009	2010
Nineveh	0	0	0	0	0	0	0	0
Kirkuk	0	0	0	0	0	0	0	0
Salah Al-Din	0	0	0	0	0	0	0	0
Diyala	13	26	38	19	9	4	2	4
Baghdad	0	3	6	4	0	0	0	0
Al-Anbar	129	72	64	16	48	14	1	0
Babylon	0	0	1	0	0	0	0	0
Wasit	0	0	1	5	0	1	0	0
Karbala	0	4	0	0	0	1	0	0
Najaf	0	0	0	1	1	1	0	0
Al-Diwaniyah	0	0	0	1	0	1	2	0
Dhi Qar	0	21	17	2	0	2	0	0
Maysan	0	0	0	0	0	0	0	0
Basra	0	0	0	0	0	1	0	0
TOTAL	142	126	128	48	58	25	6	4

Current Status: Verification Phase (2022–2025)

No locally acquired cases of urinary schistosomiasis have been recorded in Iraq since 2011. Surveillance activities conducted since 2022 across all 19 governorates have returned uniformly negative results for all investigated urine samples (Table 3). In 2017–2018, a comprehensive two-phase epidemiological survey was conducted covering primary school students in previously endemic areas and internally displaced persons (IDP) camps. Samples were tested by visual inspection, haemastix for haematuria, and urine filtration for egg detection, with samples stored at −20°C for planned ELISA confirmation. However, procurement of ELISA kits was disrupted by the COVID-19 pandemic, and after prolonged storage (approximately five years), the samples were deemed unsuitable for molecular testing and were safely disposed of in 2023. Discussions with WHO/EMRO regarding an updated pathway to elimination certification have since resumed.

Table 3. Urine Surveillance Samples Examined by Governorate, Iraq (2022–2025). All results negative.

Governorate	2022	2023	2024	2025 (Jan–Jul)
Duhok	–	–	1,149	500
Erbil	–	–	16,597	7,193
Sulaymaniyah	–	–	1,525	500
Nineveh	–	1,734	3,160	2,639
Kirkuk	715	600	750	750
Salah Al-Din	3,037	2,895	3,484	2,140
Diyala	649	1,241	735	587
Al-Anbar	5,074	9,191	4,038	5,925
Baghdad (Rusafa)	600	601	600	450
Baghdad (Karkh)	2,341	1,929	2,365	2,639
Wasit	728	1,198	691	544
Karbala	14,759	5,644	16,735	12,634
Najaf	1,200	900	1,300	800
Babylon	450	525	631	575
Al-Diwaniyah	750	660	840	540
Al-Muthanna	–	–	1,200	500
Dhi Qar	–	253	836	320
Maysan	1,889	1,968	1,854	1,934
Basra	481	885	1,064	914

Vector Surveillance

Historical Distribution of Bulinus truncatus (1954–1994)

Historical snail surveys documented widespread presence of Bulinus truncatus across central and southern Iraqi governorates from the 1950s through the 1970s. Baghdad and Diyala showed the most consistent snail presence during this period. Northern governorates such as Salah Al-Din and Najaf began recording snail presence from the late 1970s and 1980s, coinciding with expansion of irrigation networks. By the late 1980s and early 1990s, snail distribution had become increasingly sporadic, reflecting the impact of sustained molluscicide application and habitat modification.

Verification of Vector Elimination (2011)

A comprehensive national vector survey conducted in 2011 investigated 959 waterways across all 19 governorates of Iraq (Table 4). Despite collection and laboratory examination of 27,612 snail specimens, no Bulinus truncatus was identified in any infested stream. This landmark survey constituted strong field evidence for interruption of transmission and formed a critical component of Iraq's elimination dossier for WHO review.

Table 4. National Vector Survey: Streams Investigated and Snails Collected by Governorate, Iraq (2011). No infested streams identified.

No.	Governorate	Streams Investigated	Infested Streams	Snails Collected
1	Erbil	18	0	280
2	Al-Anbar	55	0	1,025
3	Basra	26	0	1,075
4	Al-Diwaniyah	110	0	2,072
5	Sulaymaniyah	13	0	240
6	Al-Muthanna	29	0	890
7	Najaf	74	0	1,552
8	Babylon	79	0	6,320
9	Baghdad/Rusafa	59	0	1,195
10	Baghdad/Karkh	40	0	870
11	Duhok	6	0	172
12	Diyala	42	0	510
13	Dhi Qar	81	0	2,175
14	Salah Al-Din	65	0	2,225
15	Karbala	31	0	1,890
16	Kirkuk	75	0	525
17	Maysan	53	0	2,921
18	Nineveh	44	0	730
19	Wasit	59	0	945
TOTAL	—	959	0	27,612

Vector control measures applied until 2011 included molluscicide spraying (Baylluside), canal lining to prevent snail adherence, and periodic removal of aquatic vegetation to reduce breeding sites. These engineering and chemical interventions were progressively phased down as transmission evidence declined, with monitoring continuing in their absence.

Recent Vector Surveillance (2024–2025)

Active vector surveillance has continued on an annual basis to ensure against re-emergence of B. truncatus. In 2024, high numbers of snails were collected and examined from key sentinel sites including Baghdad Karkh (1,030 snails), Wasit (970 snails), and Nineveh (900 snails); all investigations confirmed zero Bulinus specimens. Data through July 2025 demonstrates continued monitoring in Baghdad and Wasit, with the status of zero Bulinus maintained consistently across all sites.

POST-PANDEMIC PERIOD AND PATH TO WHO CERTIFICATION (2021–2025)

Based on WHO standards, Iraq has fulfilled the epidemiological criteria for declaring the elimination of urinary schistosomiasis: no locally acquired cases have been documented since 2011, and no infected Bulinus snails have been identified in national waterway surveys. In 2001 — the last year with substantial reported incidence — there were 345 recorded cases at an incidence rate of 1.64 per 100,000 population. The trajectory since then has been consistent with sustained elimination of transmission.

Field surveys conducted among primary school students in previously endemic areas and IDP camps since 2011 have returned no positive diagnoses using conventional diagnostic methods. Formal certification by the WHO Regional Office for the Eastern Mediterranean (EMRO) is pending. Training workshops on ELISA diagnostics were conducted in China to strengthen laboratory capacity for serology-based confirmation, and a renewed survey protocol is under discussion with WHO to replace the COVID-impacted 2017–2018 sample collection.

Iraq's current National Plan for schistosomiasis elimination encompasses the following implementation mechanisms:

1. Continued active surveillance for human schistosomiasis infections in schools and residential areas in previously endemic regions.
2. Monthly collection and Epi-Info entry of statistical surveillance forms, with ongoing epidemiological analysis.
3. Coordination with governorate Health Directorates to ensure availability of praziquantel for management of any potential imported cases.
4. Periodic field surveys targeting primary school students aged 6–15 years in historically endemic areas.
5. Capacity building through training workshops for medical and health staff on diagnostic methods and epidemiological updates.
6. Supervisory field visits to governorate Health Directorates to monitor plan implementation (at minimum one visit per directorate per year).
7. Active vector surveillance for B. truncatus coordinated with the Vector Control Division, with prompt response protocols in the event of snail detection.
8. Engagement of health promotion staff in preparation of public health bulletins and community education materials on schistosomiasis.

Summary of results

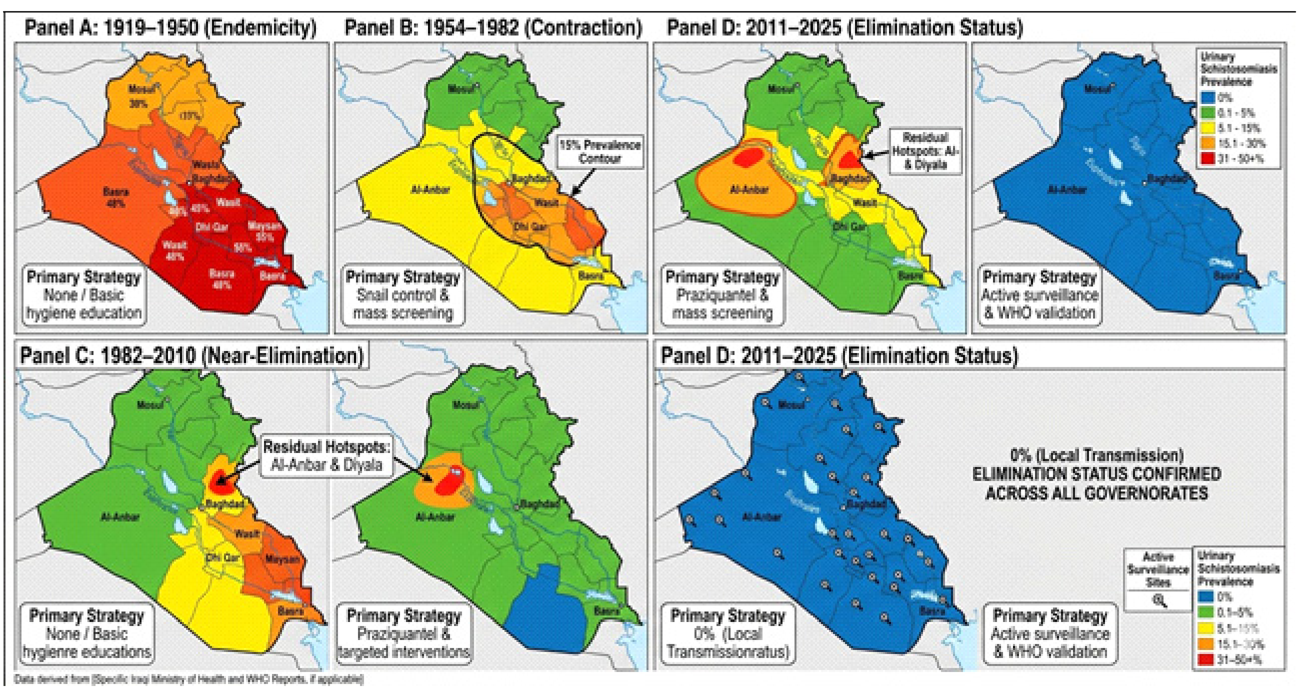

Figure 1: Evolution of Urinary Schistosomiasis in Iraq (1919-2025)

Figure 1. Serial maps of urinary schistosomiasis distribution in Iraq across four time periods. Panel A (1919–1950): distribution of endemic governorates at peak historical burden; community infection rates annotated. Panel B (1954–1982): contraction of endemic foci following establishment of the National Control Programme and snail control campaigns. Panel C (1982–2010): near-elimination of transmission; residual foci in Al-Anbar and Diyala governorates. Panel D (2011–2025): elimination status; active surveillance sites (human and vector) indicated. Governorate boundaries and major river systems (Tigris, Euphrates, Diyala) labelled throughout for reader orientation.

Table 1: Chronological milestones in the epidemiology and control of urinary schistosomiasis in Iraq (1919–2025). Prevalence data derived from national surveillance reports of the Institute of Endemic Diseases, Iraqi Ministry of Health.

Period	Key Intervention / Finding	Prevalence / Cases
1919–1949	First systematic surveys; infection rates of 20–85% along Euphrates and Tigris basins	20–85% (community surveys)
1950	Establishment of Schistosomiasis Section, Institute of Endemic Diseases; first control campaigns	27% (1954 national survey)
1954	WHO collaboration; Baghdad model zone snail surveys initiated	27%
1966–1972	Introduction of Ambilhar (1966) and Etrenol (1972); snail control scaled up	~4–7%
1982	Praziquantel adopted nationally — decisive therapeutic advance	1.5% (1980) → 0.24% (1989)
1990–2002	Intensified passive surveillance; mass drug administration maintained	0.06% → 0.02%
2003–2010	Post-conflict surveillance; cases declined from 142 to 4 nationally	142 cases (2003) → 4 (2010)
2011	National vector survey: 959 waterways surveyed; zero Bulinus truncatus identified	0 locally acquired cases
2011–present	Elimination phase: active human and vector surveillance sustained	0 local cases; 0 Bulinus
2025	Ongoing WHO/EMRO certification process; all surveillance negative	Pending formal verification

Discussion

Iraq's elimination of urinary schistosomiasis represents one of the most significant public health achievements in the Middle East in recent decades. The country's experience illustrates the effectiveness of a sustained, integrated, multi-component control strategy implemented over several generations — from the early molluscicide campaigns of the 1950s through to the mass praziquantel administration era that began in 1982 and the comprehensive surveillance systems of the 2010s and 2020s.

Several factors are particularly instructive for other countries at earlier stages of NTD elimination. First, the introduction of praziquantel in 1982 marked a decisive turning point: infection rates, which had been declining slowly under earlier treatment regimens, fell sharply in the decade following its adoption, reflecting both its superior efficacy and suitability for large-scale deployment. Second, vector control was not simply additive but synergistic — simultaneous reduction in both human reservoir and snail host accelerated transmission interruption beyond what either measure could have achieved alone.

The post-2003 period merits specific attention. Despite the collapse of much of Iraq's health infrastructure following the 2003 conflict, the maintenance of minimal surveillance and treatment capacity, combined with ongoing WHO technical assistance, was sufficient to sustain the elimination trajectory. This resilience underscores the importance of embedding NTD programmes within primary health care systems rather than relying on vertical, specialist-dependent structures vulnerable to disruption.

The primary outstanding challenge for Iraq is completion of the WHO certification process. The disruption to the 2017–2018 serological survey by the COVID-19 pandemic introduced a significant delay; however, resumed dialogue with WHO/EMRO and the development of a replacement survey protocol represent constructive progress. Vigilance against importation of cases from endemic neighbouring countries — particularly Syria, which continues to report transmission — remains an ongoing surveillance priority.

Conclusions

Urinary schistosomiasis, once a major communicable disease burden in Iraq with infection rates exceeding 80% in some communities, has been effectively eliminated as a public health problem through seven decades of sustained national programming and WHO collaboration. No locally acquired cases have been recorded since 2011, and comprehensive vector surveillance has confirmed the absence of Bulinus truncatus from all 19 governorates of Iraq.

Iraq is currently on the cusp of formal WHO verification of elimination — a milestone that would position it as a model for NTD control in the Middle East and the Eastern Mediterranean region. Continued active surveillance, sustained laboratory capacity, and readiness for rapid response to any detected re-introduction remain essential to maintaining and formally certifying this achievement.

Declarations

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Ethical Clearance: Official permission was obtained to access surveillance data from the Communicable Diseases Control Center, Iraqi Ministry of Health (24 August 2024).

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