Prevalence of *Schistosoma mansoni* infection in Ethiopia: A systematic review and meta-analysis

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Abstract

Background Schistosomiasis is the most predominant helminthic infection in tropics and subtropics mainly in sub-Saharan African countries including Ethiopia. *S. mansoni* infection is still becoming a public health problem since the risk of reinfection and recurrent disease remain, even in areas with high treatment coverage. There is no summarized data regarding prevalence of *S. mansoni* infection in Ethiopia. Therefore, this review was done to determine the pooled prevalence of *S. mansoni* infection in Ethiopia.

Methods: The PRISMA guidelines protocol was followed to perform the systematic review and meta-analysis. Published studies from January 1999 to September 1 2018 were searched in Medline, PubMed, Google scholar, HINARI and Cochrane Library. The study search terms were: "prevalence", "incidence", "schistosomiasis" "Bilharziasis", "Ethiopia". The heterogeneity of studies was assessed using Cochran's Q test and I^2 test statistics. Publication bias was assessed by Egger's test.

Results: Eighty four studies were included in this review and meta–analysis. The pooled prevalence of *S. mansoni* among Ethiopian population was 18.7% (95%CI: 14.7-23.5). Southern regions of Ethiopia had a higher *S.mansoni* prevalence of 33.6% 995% CI: 20.2-50.4). *S.mansoni* was higher in rural areas and among males with a pooled prevalence, 20.8% (95% CI: 14.2-29.4) and 29.4% (95%CI: 23.2-36.6), respectively. Similarly, the prevalence of *S.mansoni* have been increased over the past 15 years.

Conclusion: The review showed a moderate prevalence of *S.mansoni* infection in Ethiopia and disease is still a major health problem. Therefore, integrated control approach could be implemented to reduce the burden of this parasite in Ethiopia. Interventions leading to reduction of open water sources exposure to reduce schistosomiasis transmission, strengthen of deworming program, giving appropriate health education on the risk of schistosomal infection and transmission should be applied.

Keywords**:** Meta-analysis, *S.mansoni*, prevalence, Ethiopia

Author Summary

Understanding summarized data regarding prevalence of *S. mansoni* infection in Ethiopia is essential to inform decisions on appropriate control strategies for schistosomiasis. We searched Published studies from January 1999 to September 1 2018 from Medline, PubMed, Google scholar, HINARI and Cochrane Library. Eighty four studies were included in this review and meta–analysis. The limit of language was English and the limit of study group was human. The pooled prevalence of *S. mansoni* among Ethiopian population was 18.7%. Southern regions of Ethiopia had a higher *S.mansoni* prevalence and the parasite was higher in rural areas and among males. The prevalence of *S.mansoni* have been increased over the past 15 years. Our review showed a moderate prevalence of *S.mansoni* infection in Ethiopia and disease is still a major health problem. Therefore, appropriate controlling approach could be implemented. Interventions leading to reduction of open water sources, strengthen of deworming program, and giving appropriate health education should be applied.

Background

Schistosomiasis is the most widely distributed chronic but neglected tropical disease (NTD) that affects people living in communities where there is poor environmental sanitation and water supply [1, 2]. Human schistosomiasis is the most deadly NTD and Human schistosomiasis is ranked second to malaria in terms of mortality [1, 2]. An estimated 700 million people in 76 countries are at risk of schistosomiasis, and 240 million people are already infected. About 85% of the infections occur in Africa where a yearly estimated death is 280,000 people and an estimated disability-adjusted life years is 3.3 million people [2-4].

In addition to high morbidity and mortality infection caused by *S. mansoni* among school-age children, adolescents and young adults have the consequences of growth delay and anemia, Vitamin-A deficiency as well as possible cognitive and memory impairment, which limits their potentials in learning [5].

Schistosomiasis is more wide spread in poor rural communities particularly in places where fishing and agricultural activities are dominant. Domestic activities such as washing clothes and fetching water in infected water expose women and children to infection. Poor hygiene and recreational activities like swimming and fishing also increase the risk of infection in children [6, 7].

In Ethiopia, about 5.01 million peoples are infected with schistosomiasis and 37.5 million people are at risk of the parasite [8]. *S. mansoni* is widespread and its presence has been recorded in all administrative regions and is rapidly spreading in connection with water resource development and intensive population movements [9].The optimal altitude category for the transmission of *S. mansoni* is between 1000 and 2000 meters, and most endemic localities in the country are located in this altitudinal range and its prevalence was reported as high as 90% in the country [10, 11]. Two species of fresh water snails (*Biomphalaria pfeifferi* and *Biomphalaria sudanica)* are responsible for the transmission of this parasite in Ethiopia *[12]*.

Reports from the regional mapping survey conducted by the Ethiopian Public Health Institute on schistosomiasis and soil-transmitted helminths across the country showed high distribution of S. mansonia *[13,14]*.The national control programm is designed to achieve elimination for neglected diseases and other poverty related infections, including schistosomiasis as a major public health problem by 2020 and aim to attain transmission break by 2025. Providing a global view of the occurrence of this disease has become a high priority, and rigrous efforts were made to eliminate schistosomiasis through the implementation of sustainable control strategies. However, existing evidence suggests that S. mansoni is still a major public health problem causing significant morbidity and mortality in endemic countries, particularly in Ethiopia. In this study, we used data published from Ethiopia between 1999 and 2018 to perform a systematic review and meta-analysis of the prevalence of S. mansoni to provide information that will help in tackling the disease at the national level..

Methods

Search strategy

A comprehensive literature search was conducted from biomedical data bases: Medline, PubMed, Google scholar, HINARI and Cochrane Library using a special index search terms (medical subject headings (MeSH) “prevalence ”,“incidence”, “schistosomiasis” “Bilharziasis”, “Ethiopia”, title and abstract. The limit of language was English and the limit of study group was human. Search was carried out for articles published from 1999 to 2018. Age group categorization was done as follows; children were designated as those of 14 years of age and below; adolescent 15–17 years; and adult 18 years or higher. The Preferred Reporting Items for Systematic Reviews and

Meta-analyses (PRISMA) guideline was used to report the result of this systematic review and meta-analyses (Table S1).

Selection criteria

Abstracts retrieved from the initial search were screened using defined inclusion and exclusion criteria.

Inclusion criteria and Exclusion Criteria

Studies were selected for systematic review and meta-analysis if: 1) they were conducted in Ethiopia, 2) study design was cross-sectional, 3) studies reported the prevalence of *S.mansoni*, 4) studies reported data in humans and were published in the English language.

Studies were examined for eligibility by reading their titles and abstracts. Relevant abstracts were further assessed for inclusion in the list of full text articles. During the article selection process, studies which did not have full texts were excluded since it was not possible to assess the quality of each article in the absence of their full texts.

Data extraction

The data extraction was done by three researchers (S.H T.S and D.A) using a standardized and pretested format. The data abstraction format included first author, study design, region in Ethiopia, publication year, sample size, study population, number who tested positive and prevalence of *S.mansoni*. Disagreement on data extractions between researchers was resolved through discussion and consensus.

Quality assessment

The quality of each article was assessed using 9 point Joanna Briggs Institute (JBI) critical appraisal tools. The tool uses the following criteria: 1) sample frame appropriate to address the target population, 2) study participants sampled in an appropriate way, 3) adequate sample size, 4) study participants sampled in an appropriate way, 5) study subjects and the setting described in detail, 6) data analysis conducted with sufficient coverage of the identified sample, 7) valid methods used for the identification of the condition and the condition was measured in a standard and reliable way for all participants, 8) appropriate statistical analysis; and, 9) adequate response rate. Individual studies were assigned a score that was computed using different parameters in line with the review objectives. The responses were scored 0 for “Not reported” and 1 for “Yes”. Total

scores ranged between 0 and 9 .Studies with medium (fulfilling 50% of quality assessment parameter) and high quality were included for analysis [15]. None of the studies were excluded based on the quality assessment criteria (Additional file S2).

Statistical analysis

Data entry and analysis were done using Comprehensive Meta-analysis (version 3.1). The summary of pooled prevalence of *S. mansoni* infection with 95% CI was obtained using the random effects model, due to the possibility of heterogeneity among the studies.

Sub-group analysis

Sub-group analysis was performed based on geographical region; (Amhara, Oromia, Southern Ethiopia, Tigray, Harari and Afar), Year of study; (1999-2003, 2004-2008, 2009-2013, and 2014-2018), laboratory dagnostic test: (Kato-Katz, Kato-Katz & wet mount, wet mount & formol-ethe, Formol-ether, Kato-Katz & formol-ether, Kato-Katz &SAF and wet mount),age groups: (all age groups, children, Children & adolescent, adolescent &adult and Adult), sex (male and female), and study setting (Rural and Urban).

Heterogeneity and publication bias

Statistical heterogeneity was assessed by Cochran's Q test, which indicated the amount of heterogeneity between studies and I^2 statistic. The I^2 offers an estimate percentage of the variability in effect estimates, that is due to heterogeneity rather than sampling error or chance differences. Therefore, the existence of heterogeneity was confirmed using Cochran's Q test ($P < 0.10$ shows statistically significant heterogeneity) [16]. And I^2 test that measures level of statistical heterogeneity between studies (values of 25 %, 50 % and 75 % are low, medium and high heterogeneity, respectively) [17]. The Egger weighted regression test methods was used to statistically assess publication bias ($P<0.05$) [18].

Results

Identified studies

A total of 140 records were retrieved through electronic database searching. A total of 42 articles were excluded using their title and abstract review. Ninety eight articles were assessed for eligibility and 14 articles were excluded (eight articles are not cross-sectional study and six have no prevalence data). Finally, 84 studies were found to be eligible and were included in the meta–analysis (figure1).

Study characterstics

In this systematic review and meta-analysis, a total of 60,725 study population was screened for *S. mansoni* infection. Geographically, the population screened for *S. mansoni* infection in six administrative regions of Ethiopia: Amhara, Oromia, Southern Ethiopia, Tigray Harar and Afar (Table 1). The sample size of study population varied from 85 to 16,955 participants (Table 1). The pooled prevalence of *S. mansoni* infection among Ethiopian population was 18.3% (95%CI: 14.3-23.1) (figure 1). There was a high level of heterogeneity, random effect model methods (I^2 = 99.29, $p < 0.001$); however, no evidence of publication bias was shown with Egger's regression intercept (p= 0.639) (s1 figure). The symmetry of funnel plot shows a small publication bias and insignificant effect as portrayed graphically (figure S2). Studies included in this systematic review and meta-analysis were published from 1999 to 2018 and reported from six regions of Ethiopia. The highest and lowest prevalence of *S. mansoni* infection was reported in Amhara (89.6%) and Southern Ethiopia (0.12%), respectively (Table 1).

Subgroup analysis

Subgroup analysis revealed a broad inconsistency in the prevalence of *S. mansoni* infection among the different parameters used (table 2). By the year of publications, prevalence was highest in 2014 to 2018 publications at 20.9% (95% CI, 15.5-27.5), and the least prevalence was in studies published between 2004-2008 (14.5%, 95% CI, 3.7-42.7). Prevalence was higher in the southern region of Ethiopia (33.6%, 95% CI: 20.2-50.4) (Table 2). Prevalence was also higher in rural areas 20.8% (95% CI: 14.2-29.4) than urban areas 14.9% (95% CI: 9.5-22.8).

The subgroup analysis was done on the prevalence *S.mansoni* by type of diagnostic test. Pooled prevalence of *S.mansoni* was 33.3% (95%CI: 26.5-40.8) using Kato-Katz, 7.4% (95%CI: 2.1-23.0) using Kato-Katz & wet mount, 5.1% (95%CI: 2.5-10.0) using wet mount & formol-ether, 10.7% (95%CI: 6.1-18.2) using Formol-ether, 25.6% (95%CI: 14.3-41.5) using Kato-Katz & formol-ether, 19.4% (95%CI: 0.9-86.4) using Kato-Katz &SAF, and 3.2% (95%CI: 1.7-6.2) using wet mount (Table 2). While grouping the pooled prevalence by sex: 29.4% (95%CI: 23.2-36.6) among males and 22.4% (95%CI: 17.3-28.5) in females.

In this review prevalence of *S. mansoni* was highest in children and adolescents (18.1% (95% CI: 10.3-29.9)), compared to children 10.9% (95% CI: 4.3-25.1) and adolescent & adult 0.5% (95% CI: 1.1-19.8) (Table 2). Meta-regression analysis showed that prevalence of *S. mansoni* had significant association with geographic region (p= 0.0035), study setting (p=0.0242), and with laboratory diagnostic technique (p=0.0001) (figure S3).

Discussion

Efforts to reduce the epidemiological and clinical consequences of this parasitic infection through the deworming program of the Ethiopian Enhanced Outreach Strategy targeting children below five years of age has been in progress since 2010. However, the burden of S. mansoni infection still remains a public health problem since the risk of reinfection and recurrent disease still exist even in areas with high treatment coverage in the country. We recommend the World Health Organisation's new focus on transmission control which involves the examination of the efficacy of snail intermediate host control for the prevention of human-snail-human parasite transmission. Different studies have been carried out in different parts of Ethiopia at different times to document the epidemiology of *S. mansoni* infection. However, there is no summarized prevalence data of this parasitic infection at country level to help in the formulation of appropriate intervention methods .Therefore, the present study is the first of its kind and aimed to determine the pooled prevalence of *S. mansoni* in Ethiopia.

In this study, the pooled prevalence of Schistosoma mansoni among Ethiopian population was 18.3% (95%CI: 14.3-23.1). This shows an endemicity and moderate prevalence of *S. mansoni* infection found in Ethiopia [101]. This is comparable with meta-analysis studies conducted in Brazil [102]. However, this finding is higher than the pooled stool S *S.mansoni* estimated from migrants [103]. The difference in prevalence may be due to the different in geographical and ecological variations, periodical cleaning of the irrigation canals, long time endemicity of study area, study design, sampling techniques, sample size, behavior of the study participants, environmental sanitation, and distribution of snails.

Southern Ethiopia had the highest regional prevalence (33.6%), followed by Tgray (20.3%) and then Oromia (18.2%). The variations across regions may be explained by the differences in environmental conditions such as temperature and humidity, rainfall patterns and environmental sanitation which influence parasite transmission. Other factors may include availability and abundance of snail intermediate hosts, socioeconomic conditions, levels of community awareness of the disease, variations in study period, and methods of diagnosis among others. In-spite of the efforts in place towards the control of Schistosomiasis in Ethiopia, our study revealed an increase in the prevalence of the disease during the last 4 years (2014-2018) reviewed probably due to

recent water resources development for irrigation and intensive human migration [104]. Furthermore, climate change and global warming which usually result in increased temperature may be additional factors [105]. For instance, a study from Nigeria showed that a rise in ambient temperature from 20-30 OC will lead to an increase in the mean burden of *S. mansoni* [106].

In this study, the pooled prevalence of *S. mansoni* infection in rural settings was higher than that reported from urban settings. This concurs with the report of a systematic review from Kinshasha, Kongo [107]. The higher prevalence from rural settings may be due to increased exposure to water through different activities such as high irrigation practice, swimming and fishing, limited access to health-care services and lack of safe water for the rural population. The limitations of this study were sample size variations, inconsistency of laboratory diagnostic methods used by the individual studies, study periods and regional heterogeneities.

Another important observation was that pooled prevalence of *S. mansoni* is more prevalent in males than females (29.4% versus 22.4%), respectively. This is in agreement with single previous prevalence studies conducted in Ethiopia [(108,109].The difference in infection rate might be due, males are mostly participated in outdoor activities like irrigation, farming and culturally males exercise swimming and bathing in river water and this may lead to infection by *S.mansoni* cercariae.

Higher pooled prevalence of *S.mansoni* was reported by Kato-Katz tests. Pooled prevalence of *S.mansoni* which used wet mount, wet mount & formol-ether for the diagnosis was low. This could be possibly explained by the high sensitivity of Kato-Katz test for the diagnosis of *S.mansoni* infection. This is in line with WHO 2002 report that have high sensitivity of kato-katz test with a high sensitivity when infection intensity is high in community [110].

The prevalence of *S.mansoni* infection rate was high in children and adolescent than adolescent and adult or adults. This could be associated with children and adolescents are part takers in swimming and recreation. Similar results was reported in in review conducted in Nigeria [11].

Limitation

The current review and meta-analysis used data which are over-representative of urban populations with greater access to *S.mansoni* prevention and treatment services than rural populations and may underestimate the true burden of this disease in the rural community. Moreover, most of studies which were included in the analysis were clinic/hospital-based studies, and the data might not be representative of the population/community-based prevalence of *S.mansoni* infection. Further, sample size variations, inconsistency of the laboratory diagnostic methods used in the studies as well as study time and regional heterogeneity may affect review of the study.

Conclusion and Recommendation: The review showed a moderate prevalence of *S. mansoni* infection in Ethiopians and the diseases is still a major health problem. Therefore, integrated control approach could be implemented to reduce the burden of *S. mansoni* in Ethiopia. Interventions leading to reduction of open water sources exposure to reduce schistosomiasis transmission, strengthening of deworming programs, giving appropriate health education on the risk of schistosomal infection and transmission are suggested.

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Figure legends

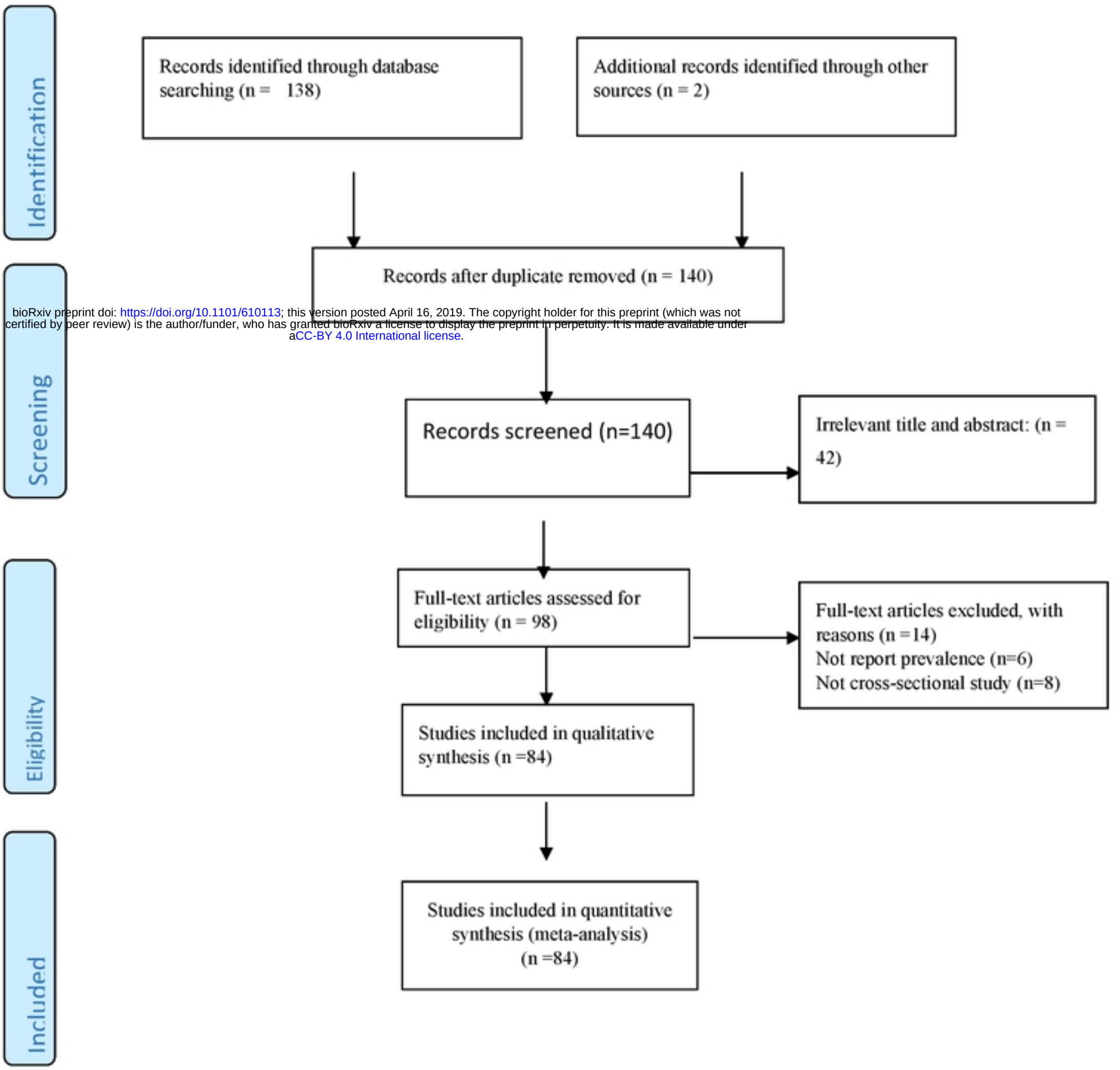
Figure 1: Flow diagram of the studies included in the Meta-analysis

Figure 2: Forest plot for the prevalence of Schistosoma mansoni in Ethiopia

Figure S1: Egger regression intercept for the prevalence of Schistosoma mansoni in Ethiopia

Figure S2: Funnel plot for the prevalence of Schistosoma mansoni in Ethiopia

Figure S3: Met regression analysis for the prevalence of Schistosoma mansoni in Ethiopia



Model	Study name	Statistics for each study			Events/Total	Event rate and 95% CI	Weight
		Event rate	Lower limit	Upper limit	Total	-0.50 -0.25 0.00 0.25 0.50	Relative weight
	Leykun J, (19)	0.173	0.149	0.199	152 / 878		1.25
	Leykun J, (20)	0.194	0.166	0.225	133 / 687		1.25
	Degu G et al.,(21)	0.508	0.432	0.584	84 / 165		1.24
	NEGA B et al.(22)	0.734	0.690	0.774	309 / 421		1.25
	NegaBt al., (23)]	0.659	0.640	0.678	1615 / 2451		1.26
	Alemu et al.,(24)	0.379	0.327	0.433	121 / 319		1.25
	Huruy K et al.,(25)]	0.167	0.124	0.221	38 / 228		1.24
	Asrat A et al.,(26)]	0.159	0.134	0.188	112 / 704		1.25
	Essa T et al.,(27)	0.206	0.175	0.241	119 / 579		1.25
	Abera B et al.,(28)	0.073	0.057	0.094	57 / 778		1.24
	Awoke W et al.,(29)	0.008	0.004	0.017	7 / 828		1.16
	Reta B&Erko B,(30)	0.705	0.654	0.751	241 / 342		1.25
	King JD et al.,(31)	0.029	0.023	0.037	68 / 2338		1.25
	Fentie T et al.,(32)	0.167	0.137	0.202	87 / 520		1.25
	Abate A et.al.,(33)	0.089	0.065	0.121	36 / 410		1.24
	Abay SM et .al.,(34)	0.184	0.130	0.254	28 / 152		1.23
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		1.25
	Alebie G et al.,(36)	[illegible]	[illegible]	0.863	318 / 384		1.24
	Aemero M et al.,(37) A	0.896	0.861	0.923	344 / 384		1.24
	Degarege A et al.,(38)	0.531	0.492	0.570	329 / 620		1.25
	Mathewos B et al.,(39)	0.337	0.282	0.397	88 / 261		1.24
	Mamo H et.al.,(40)	0.002	0.000	0.033	0 / 236		0.59
	GetnetA&Worku S(41)	0.028	0.015	0.051	10 / 360		1.19
	BitewAet al.,(42)	0.143	0.111	0.182	55 / 384		1.24
	Gashaw F et al.,(43)	0.490	0.448	0.532	270 / 550		1.25
	Yetemwork A et al.,(44)	0.019	0.008	0.044	5 / 277		1.13
	Getie S et al.,(45)	0.450	0.401	0.500	173 / 384		1.25
	Degarege A et al.,(46)	0.267	0.229	0.308	129 / 484		1.25
	Alemu, A et al.,(47)	0.112	0.070	0.176	16 / 141		1.21
	Amor A et al.,(48)	0.157	0.124	0.196	62 / 396		1.24
	Abdi M et.al.,(49)	0.299	0.257	0.345	122 / 408		1.25
	Feleke D et al.,(50)	0.765	0.712	0.811	213 / 279		1.24
	Shiferaw MB et al.,(51)	0.022	0.008	0.057	4 / 180		1.10
	Eshetu T et.al.,(52)	0.009	0.002	0.035	2 / 223		0.98
	AndargieA&Abera A,(53)	0.167	0.124	0.221	38 / 228		1.24
	NUTE A et al.,(54)	0.069	0.065	0.073	1170 /		1.26
	Hailu T et al.,(55)	0.080	0.057	0.111	33 / 409		1.23
	Leta Get al.,(56)	0.134	0.122	0.148	355 / 2650		1.25
	Gizaw Z et.al.,(57)	0.030	0.014	0.062	7 / 225		1.16
	Hailemariam G et al.,(58)	0.025	0.006	0.096	2 / 78		0.97
	Amare M et al.,(59)	0.015	0.008	0.027	11 / 754		1.20
	AbebeGe et al., (60)	0.106	0.070	0.157	21 / 198		1.22
	MengistuM et. Al.,(61)	0.263	0.227	0.303	136 / 517		1.25
	Mekonnen Z et al.,(62)	0.532	0.486	0.578	241 / 453		1.25
	Dufera M et al.,(63)	0.535	0.495	0.575	322 / 602		1.25
	Yirgalem G/hiwot et	0.088	0.063	0.121	33 / 374		1.23
	Beyene and Tasew(65)	0.004	0.001	0.027	1 / 260		0.82
	Begna Tulu1,(66)	0.126	0.095	0.166	43 / 340		1.24
	Aemero M(37) O	0.599	0.546	0.649	207 / 345		1.25
	HailuT&Yimer M(67)	0.073	0.055	0.097	44 / 604		1.24
	Yimer M et al.,(68)	0.566	0.518	0.613	239 / 422		1.25
	Kure A et al.,(69)	0.605	0.554	0.654	218 / 360		1.25
	Jejaw A et al.,(70)	0.448	0.403	0.494	206 / 460		1.25
	Bajiro M etal.,(71)	0.240	0.205	0.279	120 / 500		1.25
	MekonnenZet al.,(72)	0.006	0.003	0.013	6 / 1021		1.15
	Begna T et al., (73)	0.096	0.073	0.125	47 / 492		1.24
	Bajiro M et al.,(74)	0.084	0.068	0.103	84 / 1000		1.25
	Bajiro M et al.,(75)	0.266	0.213	0.326	62 / 233		1.24

Teklemariam D et al.,(76)	0.357	0.303	0.415	100 / 280	1.25
Mohammed Jet al.,(77)	0.357	0.328	0.387	361 / 1011	1.25
Kebede T et al.,(78)	0.231	0.205	0.259	210 / 911	1.25
SamsonT et al.,(79)	0.010	0.003	0.029	3 / 330	1.07
Assefa A et al.,(80)	0.239	0.202	0.280	109 / 457	1.25
Mahmud MA,et al.,(81)	0.140	0.114	0.170	84 / 600	1.25
Desta H et al.,(82)	0.424	0.380	0.469	199 / 469	1.25
Abebe N et al.,(83)	0.739	0.692	0.781	274 / 371	1.25
Gebreegziabiher D	0.200	0.128	0.298	17 / 85	1.21
Alemu M et al.,(85)	0.033	0.020	0.055	14 / 427	1.21
Teshale T et al.,(86)	0.385	0.339	0.433	158 / 410	1.25
GebreyohannsAet al.,(87)	0.263	0.223	0.308	108 / 411	1.25
Nyantekyi LA et al.,(88)	0.372	0.318	0.429	107 / 288	1.25
Ashenafi T etal.,(89)	0.737	0.693	0.777	309 / 419	1.25
Erko B et al., (90)	0.749	0.697	0.795	224 / 299	1.24
Wegayehu T et al., (91)	0.001	0.000	0.008	1 / 858	0.81
Mulu A et.al.,(92)	0.284	0.239	0.333	100 / 352	1.25
Aemero M et al.,(37) S	0.316	0.269	0.367	109 / 344	1.25
Degarege A et al.,(93)	0.119	0.093	0.151	57 / 480	1.24
AlemayehuB&Tomass Z	0.813	0.771	0.849	312 / 384	1.24
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.25
Tadege B &Shimelis T,	0.310	0.265	0.359	116 / 374	1.25
Grimes JE et.al.,(97)	0.003	0.000	0.069	0 / 125	0.50
Girum T,(98)	0.043	0.027	0.067	18 / 422	1.22
Teklemariam Zet al.,.(99)	0.008	0.002	0.031	2 / 259	0.99
Negussu N et al.,(100)	0.001	0.000	0.015	0 / 523	0.59
Random	0.183	0.143	0.231		