Ethiopian Medical Journal 2025 63(01)
ISSN 0014-1755 eISSN 2415-2420 Tilahun e t al.
Open access articles distributed in terms of Creative Commons Attribution Licence [CC by 4.0]

Original Article

Description of Clinical Trials in Ethiopia: Insights from the WHO International Clinical Trial Registry Platform Database

Shiferaw Tesfaye Tilahun[1,2]* Dawit Getachew Asefa[3], Medhin Selamu[1]

[1]Center for Innovative Drug Development and Therapeutic Trials for Africa (CDT-Africa), College of Health Sciences, Addis Ababa University, Addis Ababa, Ethiopia
[2] Ethiopian Public Health Institute, Addis Ababa, Ethiopia
[3]Department of Nursing, College of Health Science and Medicine, Dilla University, Dilla, Ethiopia.

Corresponding authors*: sheftilahun@gmail.com

Abstract

Introduction: *Over the past few years, there has been a noticeable surge in clinical trials and investments in research worldwide. However, close observation reveals that research activities, especially clinical trials, lag in Ethiopia and Africa. As per the data provided by Clinical Trials.gov, Ethiopia stands at the 8th position in Africa with just 85 registered trials, which is relatively low compared to other countries. The Pan African Clinical Trials Registry (PACTR) Consistently ranked Ethiopia 5th in Africa, with 74 registered trials. In contrast, the International Standard Randomized Controlled Trial Number Registry (ISRCTN) has placed Ethiopia in the 9th position with only 18 registered trials.*

Methods: *We searched the World Health Organization (WHO)International Clinical Trial Registry Platform for all trials with at least one recruitment center in Ethiopia. The results were exported in XML format, and a descriptive rational database was formed.*

Result: *As of March 3, 2025, 502 trials have been registered in the World Health Organization International Clinical Trial Registry Platform. It was found that 41.6% (209) of the trials were registered at Clinicaltrials.gov. Most registered trials completed recruiting; approximately 45.8% (230) and 56.4% (283) of the studies were registered retrospectively. Our update found a shift in the disease focus. Infectious and other disease conditions (including surgical, endocrine, and anesthetic) accounted for more than 50% of the trials. There has been an introduction of pragmatic and other designs. Local investors' involvement in sponsoring trials increased by 10%.*

Conclusions: *We described the landscape of trials conducted in Ethiopia between January 2017 and March 2025. The number of registered clinical trials tripled compared with the period from 2000 to 2016. Although the country is the second most populous in Africa, it remains underrepresented in the number and diversity of clinical trials available. There is a need for more investment from governmental bodies in clinical research in Ethiopia. Furthermore, collaborations are needed to find solutions to the current infectious disease threats faced by the country.*

Keywords: Clinical Trials, Clinical Research, International Clinical Trial Registry Platform (ICTRP), Ethiopia
Citation : *Tilahun ST , Asefa DG, Selamu N. Description of Clinical Trials in Ethiopia: Insights from the WHO International Clinical Trial Registry Platform Database.. Ethiop Med J 63 i01*
Submission date : *7 June 2024 Accepted: 21 March 2025 Published: 1 April 2025*

Introduction

Several studies have highlighted the challenges of conducting clinical trials in Ethiopia and other African countries. These issues stem partly from clinical trials' specific requirements and relate to broader obstacles affecting research in general. Such obstacles include inadequate physical infrastructure, lower prioritization of research in academic institutions, limited university-industry partnerships, scarce funding sources, minimal experience with clinical trials, a lack of fair incentives for researchers, and insufficient institutional support structures to facilitate clinical trials at various levels (1–3).

There are many opportunities in Africa despite the presence of serious diseases such as HIV/AIDS, malaria, tuberculosis, acute respiratory infections,

and diarrheal diseases. These diseases affect approximately 25% of the population and have high mortality rates (4). This presents an opportunity for researchers to trial new drugs and treatments to help those living with chronic conditions and battle serious illnesses.

Recently, there has been an increase in the number of clinical trials and research investments. However, research in general and clinical trials in Africa has fallen behind (1). Despite Africa's high population, there is a significant underrepresentation of clinical trials in this region (5). A 2018 report showed that only 20–30% of global clinical trials were conducted in lower- and middle-income (LMIC) countries and less than 10% in sub-Saharan Africa (6). This signifies a similar range of 3% to a recent report published in 2024 (7). By 2050, Africa's population is projected to be 2.5 billion, more than 25 % of the world's population (8). This highlights the urgent need for increased investment in research and clinical trials in Africa to ensure that healthcare services are tailored to meet the needs of the continent's diverse populations.

According to Global Data figures, the global percentage of clinical trials started and completed in Africa between December 9, 2012, and March 8, 2023, was 2.2%. Of the 5,071 clinical trials conducted during this period, the majority occurred in Egypt, totaling 2,910. Focusing solely on clinical trials in sub-Saharan Africa, the total amounts to 1,925 or 1.45% of the global total. Within sub-Saharan Africa, the most trials were recorded in South Africa with 930. Nigeria was the next highest, with 169, followed by 163 in Kenya and 160 in Uganda (9).

The number of clinical trials in Ethiopia by the end of 2022 was 449, representing 0.06% of the total (10). In 2014, the number of registered clinical trials in Ethiopia accounted for only 1.5% of all clinical trials in Africa, most of which focused on infectious diseases (1). After a thorough review of three different registries published in 2021 found that certain countries in the region had more clinical trials registered than others. According to Clinical Trials.gov, Ethiopia ranks 8th in Africa with 85 registered trials. Additionally, the Pan African Clinical Trials Registry (PACTR) places Ethiopia in 5th position with 74 registered trials. In comparison, the International Standard Randomized Controlled Trial Number Registry (ISRCTN) ranks Ethiopia 9th with 18 registered trials (11). This review aimed to analyze patterns of clinical trials registered in the WHO-ICTRP for Ethiopia from January 01, 2017, to March 3, 2025.

Methods

Data Source

This study provides a surveillance analysis of clinical trials in Ethiopia. The research aims to examine and characterize the clinical trials conducted in the country. Information was sourced from the WHO International Clinical Trials Registry Platform.

Search and inclusion

We thoroughly searched the WHO International Clinical Trials Registry Platform, which includes more than 20 data providers such as CTG, PACTR, and ISRCTN. The initial search was performed between May 1-22024. An updated secondary search was conducted between March 12-13, 2025. Our objective was to identify all clinical trials involving human subjects registered from the WHO International Clinical Trials Registry Platform and conducted in Ethiopia from January 1, 2017, to March 3, 2025.

Data Extraction

Data were extracted from the WHO International Clinical Trials Registry Platform in XML format. They were then used in Microsoft Excel, where descriptive analysis of the elements collected assessed the number of studies or percentages for further categorization and analysis.

Result

Studies were identified from ICTRP databases. An advanced search in the database was employed to facilitate the screening process. As a result, a total of 1,084,680 studies were identified as of March 3, 2025. Out of these, 104,645 were duplicates and removed prior to screening. Following this, the remaining 980,035 records were screened, and none were dropped due to lack of retrieval. The same number of records was sought for eligibility according to the predetermined criteria. During this review, 979,533 records were excluded for the following reasons: records not from Ethiopia (n=979,400) and records registered before January 1, 2017 (n=133).

Finally, 502 records met the inclusion criteria and were retrieved for data extraction and descriptive analysis (Fig 1).

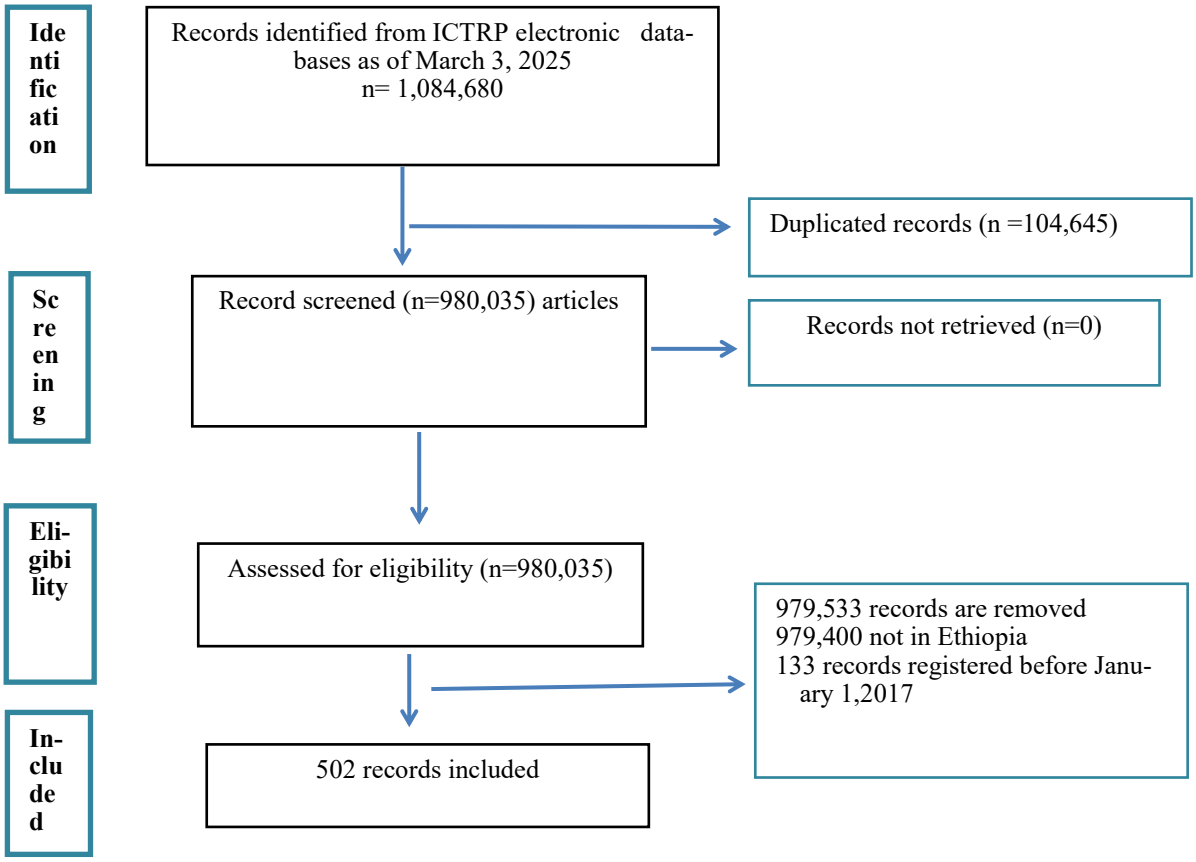

Figure 1: PRISMA flow chart diagram that shows the study selection process

A descriptive analysis was conducted on the included studies. An analysis was performed on the number of clinical trials registered between January 1, 2017, and March 3, 2025. The results are presented in a line graph (Fig 2), which shows that during the year 2023, there were 88 trials registered. This was the highest number of registered trials compared to the previous periods. However, by 2024, there were 74 registered trials, and only 12 were recorded in 2025. It is important to note that these data only account for the first two months of 2025; therefore, the actual number of trials for 2025 is still unknown.

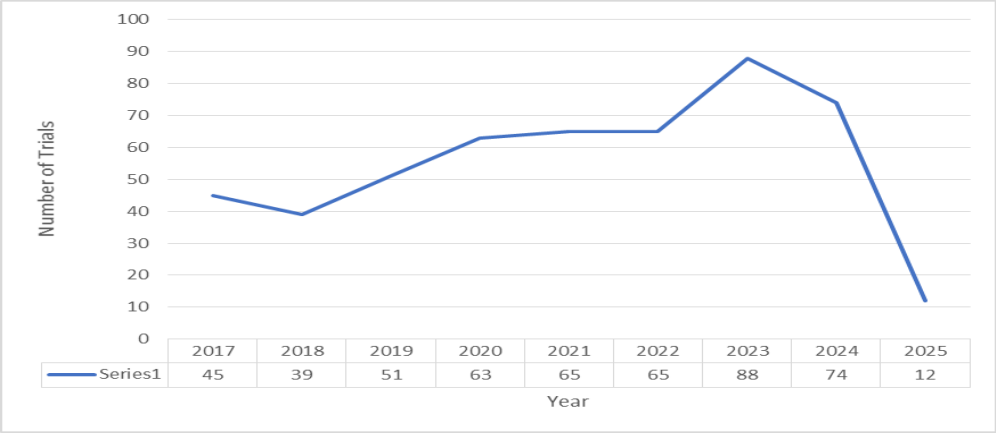

Figure 2: Registered clinical trials per year

It was found that most of the registered trials completed recruiting, which was approximately 45.8% (230). It was also found that 56.4% (283) of the studies were registered retrospectively, while 43.6% were registered prospectively. Of all registered trials, 78.7% (395) had an intervention, while the remaining were observational. Among the interventional trials, the most used study design is a parallel design followed by a factorial design, which constitutes 68.1% (269) and 9.1% (46), respectively (as shown in Table 1).

Table 1 shows that 27.5% (138) of registered trials had a patient sample size of over 1001, whereas 50% of reported trials had a sample size of 200 or more patients. Among the registered trials, 12% (60) are completed with results.

Among interventional trials, 14 were conducted in Phases 0. However, Phase IV had the highest number of trials, with a total of 39, which was significantly more than that of any other phase. It is important to note that no registered trials were conducted in Phase I/II, as indicated in Figure 3.

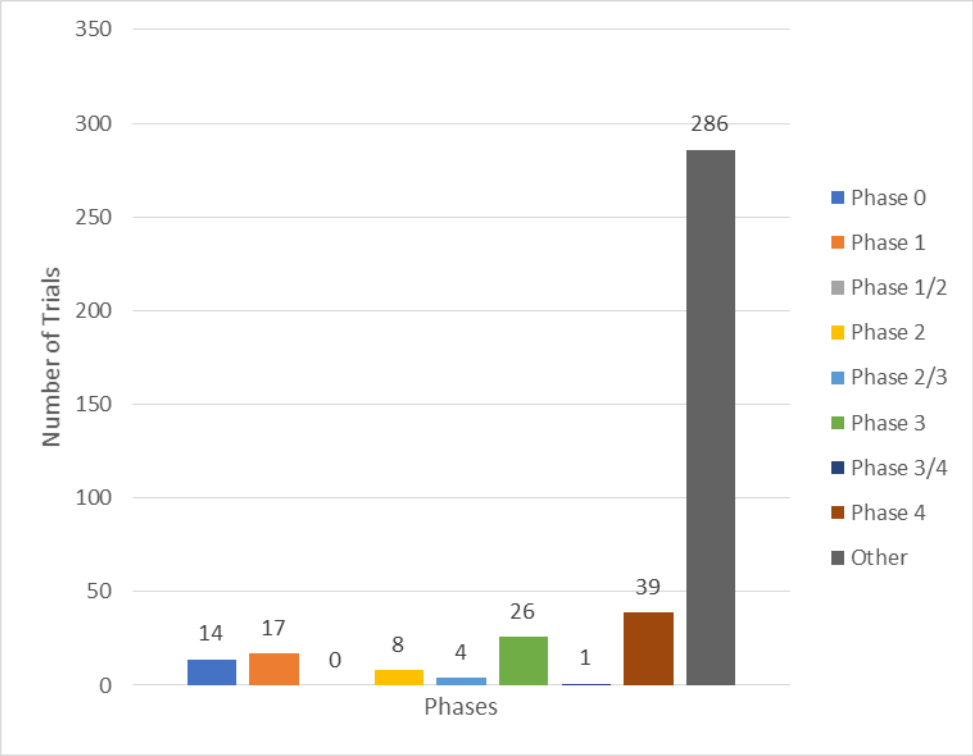

Figure 3: Phases of Clinical Trials in Ethiopia

Table 1: Characteristics of Studies

Recruitment Status	**N**	**%**
Completed	230	45.8
Ongoing	103	20.5
Enrolling by invitation	8	1.6
Pending	92	18.3
Active but not recruiting	36	7.2
Withdrawn	8	1.6
Unknown	25	4.9
Registration Status		
Prospective	219	43.6
Retrospective	283	56.4
Study Type		
Interventional	395	78.7
Observational	107	21.3
Study Design from Interventional		
Single group	24	6
Parallel-	269	68.1
Factorial	46	9.1
Crossover	16	4
Sequential	10	2.5
Step wedge	1	0.3
Pragmatic	2	0.5
Not specified	27	6.8
Sample Size		
0-100	92	18.3
101-200	70	13.9
201-500	117	23.3
501-1000	85	16.9
>1001	138	27.5
Current Status		
Ongoing	442	88
Completed with result	60	12

Many of the trials, accounting for 41.6% (209), were registered on clinicaltrials.gov, closely followed by those registered on the Pan African Clinical Trials Registry (PACTR), which represented 40.4% (203). In contrast, the fewest trials were registered with the European Union Clinical Trials Register (EU-CTR), REBEC (Brazilian Clinical Trials Registry), and Thailand Clinical Trials Registry (TCTR), with each registry hosting only 0.2% (1) of the total trials.

Furthermore, an analysis of the geographical distribution of the included trials in Ethiopia revealed that 75.5% (379) were conducted exclusively within Ethiopia. In comparison, only 5.8% (29) of the trials were conducted in Ethiopia and other African countries, as shown in Table 2.

Table 2: Source of register and Trials per location

Source Register	**N**	**%**
ANZCTR	10	2
Clinicaltrial.gov	209	41.6
CTRI	26	5.1
European Union	1	0.2
ISRCTN	38	7.5
PACTR	203	40.4
REBEC	1	0.2
ChiCTR	3	0.6
GCTR	5	1
IRCT	5	1
TCTR	1	0.2
Trials per location		
Ethiopia	379	75.5
African Countries	29	5.8
Global	94	18.7

Legend and links:
ANZCTR (Australian New Zealand Clinical Trials Registry) - http://www.anzctr.org.au/
ClinicalTrials.gov (United States Registry) - https://clinicaltrials.gov/
CTRI (Clinical Trials Registry- India) - http://ctri.nic.in/Clinicaltrials/login.php
EU Clinical Trials Register (European Union) - https://www.clinicaltrialsregister.eu/
ISRCTN (National Institute for Health Research) - https://www.isrctn.com/
PACTR (Pan African Clinical Trials Registry) - http://www.pactr.org/
REBEC (Brazilian Clinical Trials Registry) - http://www.ensaiosclinicos.gov.br/
ChiCTR (Chinese Clinical Trial Registry)- https://www.chictr.org.cn/indexEN.html
GCTR (German Clinical Trial Register)- https://drks.de/search/en
IRCT (Iranian Registry of Clinical Trials)- https://irct.behdasht.gov.ir/
TCTR (Thai Clinical Trials Registry)- https://www.thaiclinicaltrials.org/

44.8% (225) trials were conducted in an adult population of, while 12.7% (64) were conducted at multiple ages. However, only a small percentage of trials have been undertaken in neonates4.4% (22) and school-aged adolescents 8.5% (43). A small number of trials conducted research in under five age groups, which is 10.5% (53) (Table 3).

As Table 3 shows, 64.9% (326) of the trials were conducted with both males and females. However, only 1.8% (9) of studies were conducted with male participants.

Table 3: Characteristics of participants

Gender	N	%
Male	9	1.8
Female	138	27.5
Both	326	64.9
Unspecified	29	5.7
Age		
Neonates	22	4.4
Under 5 years of age	53	10.5
School-age and adolescents	43	8.5
>18 years	225	44.8
Multiple age group	64	12.7
Not Specified	95	18.9

Ethiopian academic institutions that largely funded 32.8% of the total (165) were the primary funding source of trials in Ethiopia. Non-Ethiopian Universities were the second dominant funder, with 24.1% (121) funded trials. International foundations funded 18.9% (95) of clinical trials in Ethiopia, making them the third dominant primary funder. Government bodies funded 3.0% (15) of trials. A notably small number of trials, 3.9% (20), were self-funded (Figure 4).

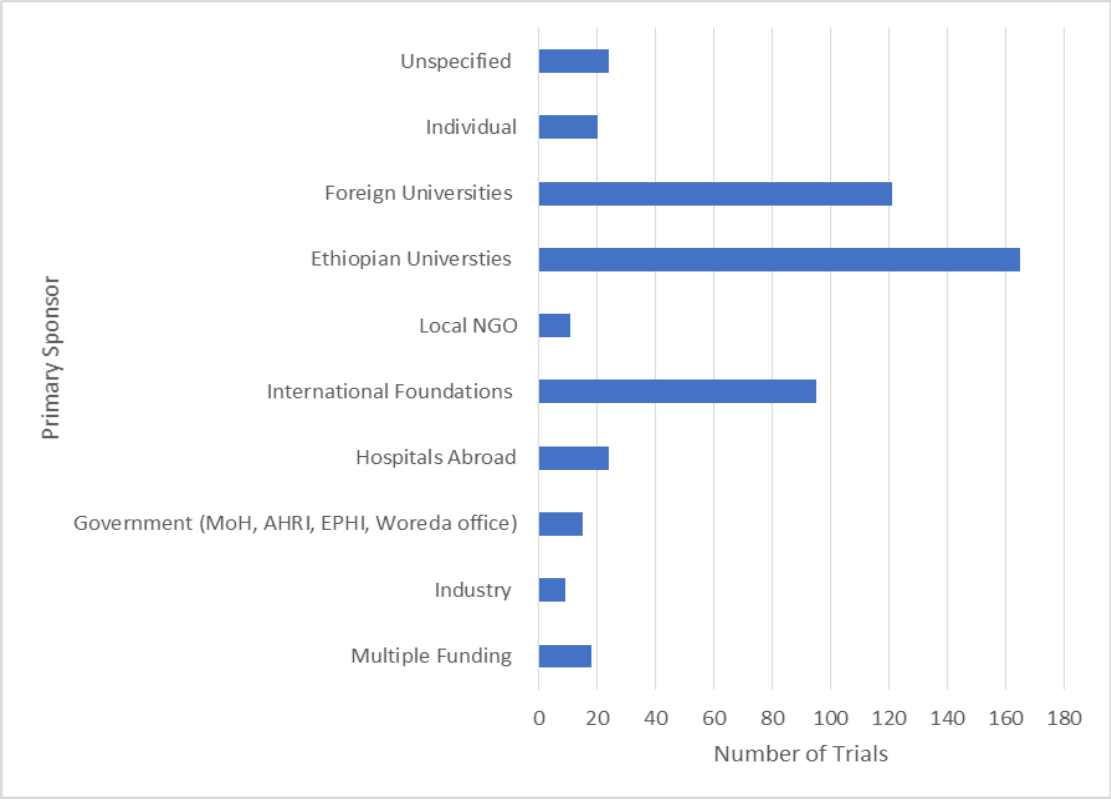

Figure 4: Number of trials by funding type

Infectious and other disease conditions (including surgical, endocrine, and anesthetic) accounted for more than 50% of the trials. There were 20.9% (105) trials in obstetric and gynecologic conditions, and 14.5% (73) indicated malnutrition and nutritional interventions as a condition being studied. In comparison, 5.9% (30) indicated psychiatric and mental health conditions, 4.1% (21) stated neonatology and pediatric diseases, and 3.5% (18) indicated cancer (Figure 5).

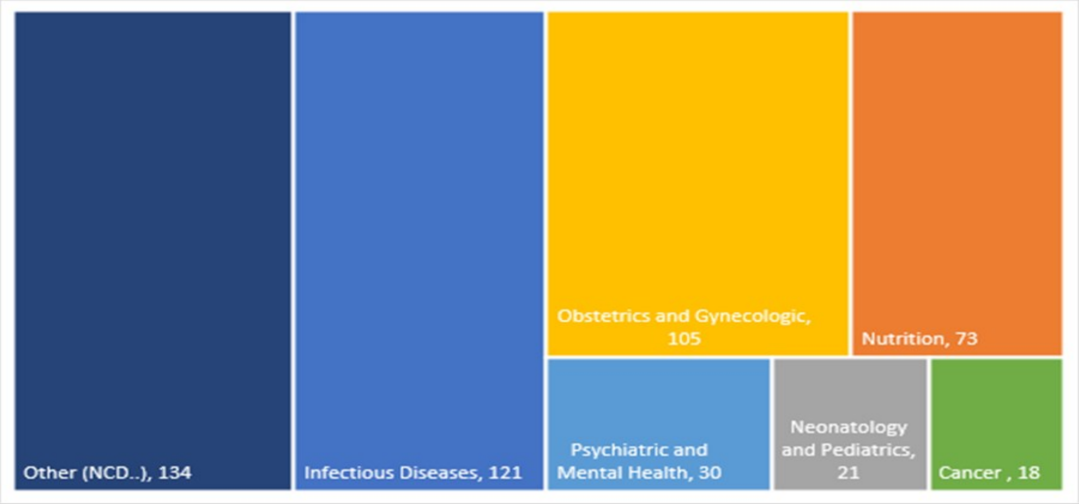

Figure 5: The distribution of clinical trials registered from Ethiopia by health conditions

The Infectious disease conditions investigated found that of the 121 trials, tuberculosis was the most studied condition with 18.1% (22) trials, the second most studied condition was malaria with 16.5% (20) trials, followed by COVID-19 with 14.0% (17) trials. There were 10.7% (13) trials on leishmaniasis and 7.4% (9) trials on HIV. Interestingly, trachoma, intestinal parasitic infections, and bacterial infections occurred in 16.5% (20) of the trials. The minimum number of trials investigating filariasis, leprosy, and diarrhea occurred in 2.5% (3) trials, while pneumonia and hepatitis B each accounted for 4.9% (6) trials. Hepatitis C, undifferentiated fever, measles, and headlice each accounted for 0.8% (1) trials (Figure 6).

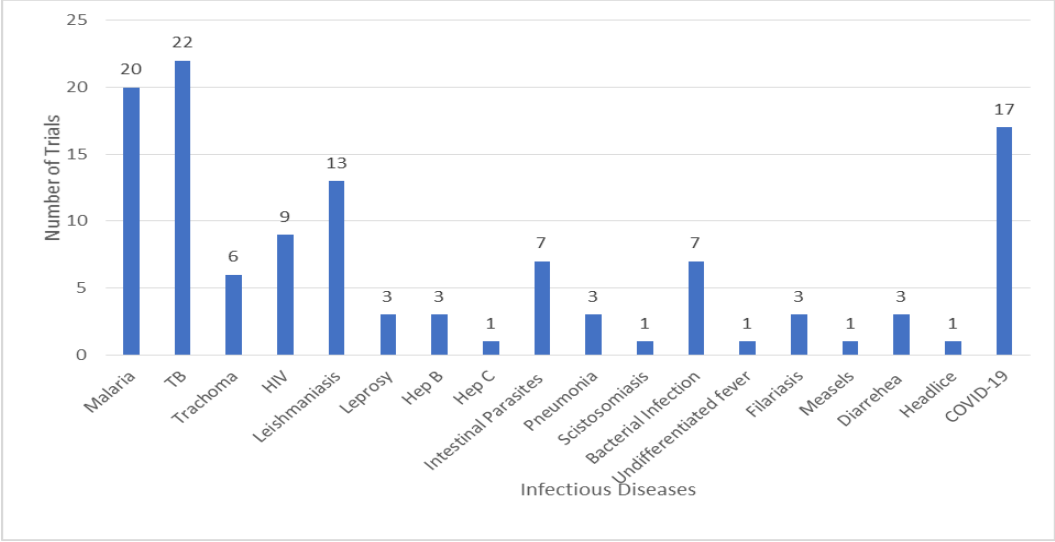

Figure 6: Trials evaluating infectious diseases

Discussion

From 2017 to 2025, there has been a substantial increase in the number of clinical trials conducted in Ethiopia. A comparison of this period with the years 2000-2016 reveals a significant difference in the quantity of registered trials. During the 2000-2016 period, only 145 clinical trials were registered (12). According to our study, the number of registered clinical trials in Ethiopia has increased to 502. This indicates a massive growth and development of clinical research within the country. The data shows that the number of clinical trials has more than tripled in recent years, indicative of positive progress in Ethiopia's healthcare research sector.

However, the update also revealed that approximately 7.2% of these studies had not initiated recruitment. This is a significant decrease from a previous study, in which 12% of the trials were not recruiting (12). There has been a noticeable increase in the recruitment and initiation of trials following their registration. The data also highlight that although the number of registered trials was high, recruitment initiation was comparatively low. This may delay the completion of the studies and affect the overall outcome of the research. Another study also showed that of 2579 eligible trials, 481 (19%) were either terminated for failed accrual or completed with less than 85% expected enrolment, seriously compromising their statistical power (13). The reason for non-recruitment could be over-optimistic recruitment estimates, too narrow eligibility criteria, lack of engagement of recruiters team, lack of competence/training/experience of recruiters, insufficient initial funding, and high burden for trial participants and patients were not randomized due to other reasons (14,15). However, the database does not report the reason for non-recruitment. Methods used to encourage recruitment and retention were also documented by different researchers and categorized as patient contact, patient convenience, support for recruiters, monitoring and systems, incentives, design, resources, and human factors. The utilization of mobile reminders and open trials rather than blinded studies was noted. Implementing these techniques will likely enhance the recruitment rate in clinical trials (16,17). Our study also demonstrated that 52% of trials were registered retrospectively, potentially introducing bias and other methodological issues. Another study similarly indicated retroactive prospective trial registration occurs in one in 50 trials. Furthermore, retrospective registration is disclosed and explained only in a small proportion of retrospectively registered studies (17,18). Transparent registration reporting is crucial for mitigating the introduction of bias in future research.

Ethiopia has a high burden of both communicable (such as malaria, tuberculosis, HIV/AIDS) and non-communicable diseases (NCDs), such as DM, hypertension, cancer, and other cardiovascular diseases (19). The latter was estimated to have caused 43% of deaths in 2019 (20). Many clinical trials conducted in Ethiopia have primarily focused on infectious diseases (1). Our update found that over a quarter of all clinical trials registered in Ethiopia are focused on infectious diseases. Among all infectious diseases, tuberculosis is the most studied, accounting for 18.5% of trials. In the previous study, malaria had been the most frequently researched disease, accounting for 10% of trials (12). The fact that TB is the most common infectious disease being studied is not surprising, given that Ethiopia has one of the highest TB burdens in the world. According to the World Health Organization, Ethiopia ranks seventh among the 30 countries with high TB burdens (21). The country also has a high incidence of malaria, which is the second most common infectious disease being studied (22).

Noncommunicable diseases, such as cancer, mental health disorders, malnutrition, neonatology and pediatric cases, obstetric and gynecological issues, surgical conditions, anesthetic complications, and endocrine disorders, account for more than 70% of the total registered trials. A previous study found that the most common trial was related to malnutrition among non-communicable diseases (12). However, updated data reveal that there has been a significant increase in the number of obstetric and gynecological non-communicable conditions. This highlights the growing need for research and the importance of identifying effective treatments and preventative measures for these conditions.

Trial registries now contain records of studies that incorporate step wedge, crossover, and sequential designs, which were not previously used. These new designs offer more advanced and sophisticated ways of assigning participants to different groups, going beyond the traditional methods of parallel, factorial, and single-group assignments. These new designs are a marked departure from the conventional parallel, factorial, and single-group assignment techniques. They are gaining popularity owing to their ability to provide more robust and comprehensive results (23). Incorporating these designs into clinical trials is crucial for improving the quality and precision of research. It also offers numerous opportunities for applications in future assessments. However, to ensure that reporting and data analyses are more consistent, a standardized approach is necessary (24).

Traditional randomized controlled trials are designed to answer questions under ideal conditions with strict controls to reduce heterogeneity (i.e., explanatory or efficacy trials). In contrast, pragmatic trials evaluate interventions under typical real-world care conditions

(i.e., effectiveness and implementation trials) (25). While both types of trials have their merits and limitations, it is essential to note that pragmatic trials have been underrepresented in previous studies (12). Our recent update has found a new pragmatic trial that was never mentioned before, underscoring the importance of promoting this methodology in research. Despite their importance, the number of pragmatic trials conducted is still insufficient, and more effort is needed to promote and encourage their use in clinical research.

According to our update, over 60% of the clinical trials conducted in Ethiopia have a primary sponsor outside the country. This means that more than half of the trials were supported by non-Ethiopian organizations. A previous study showed that more than 70% of clinical trials in Ethiopia were supported and/or conducted by non-Ethiopian organizations, mainly academic institutions (12). However, a positive shift has occurred towards local institutions taking a more active role in clinical trials. This is evident from the increase in the number of Ethiopian organizations that are now the primary sponsors of clinical trials (26). This trend is a positive step towards strengthening local institutions' capacity to conduct and sponsor future clinical trials.

It is important to note that the data within the registry had certain limitations. For instance, approximately 20% of the records lack age information, which can potentially restrict inferences drawn from the data. Furthermore, gender specifications were not provided in 5.6% of the records, and the study design was not specified in 4.8%. Lastly, the primary funding sources were unknown in 2.3% of the records. These limitations should be considered when interpreting the results as they may affect the generalizability and robustness of the conclusions drawn from the data.

Conclusions

Between 2017 and 2025, the number of registered clinical trials tripled compared with the period from 2000 to 2016. However, the number and variety of clinical trials available are limited. Pragmatic and other designs have been introduced. Local investors' involvement in sponsoring trials increased by 10%. Our update found a shift in disease focus, with obstetric and gynecologic cases primarily conducted from non-communicable diseases. In terms of infectious diseases, TB is the primary disease, whereas in previous studies, malaria has been noted as the primary disease.

Additionally, COVID-19 trials were included following the pandemic, which was absent in previous studies. These findings highlight the dynamic nature of clinical trials and their significant potential to shape both clinical practices and health policies. As the landscape of clinical research continues to evolve, it becomes increasingly important to understand how these trials can influence decision-making in the health system. To fully grasp the lasting effects of these initiatives on public health, further research is essential, providing insights that can guide future health interventions and policies.

Declarations

Acknowledgment

We want to express our gratitude to the Center for Innovative Drug Development and Therapeutic Trials for Africa (CDT-Africa), College of Health Sciences, Addis Ababa University, for supporting the study.

Ethics consideration

Not applicable.

Consent to publish

Not applicable.

Authors' contributions

STT developed the protocol. For this review, STT, YJ, and DGA reviewed the reference list and extracted data. STT, YJ, AZ, and DGA did the second screening and extraction. STT, YJ, AZ, and DGA conducted the analyses and critical appraisals. STT and YJ were responsible for the conceptualization, quality assessment, and review of the study. DGA and MS reviewed and edited the manuscript. The authors agreed that STT played a correspondence role. All authors read and approved the final manuscript.

Conflict of Interest

We declare that they have no competing interests.

Funding

This review wasn't funded by any organization.

Data availability

Data will be available upon request from the corresponding authors.

References

1. Fekadu A, Teferra S, Hailu A, Gebre-Mariam T, Addissie A, Deressa W, et al. International Clinical Trial Day and clinical trials in Ethiopia and Africa. Trials. 2014;15(1).
2. Amano A, Hanlon C, Medhin G. Assessment of capacity for conducting drug trials in Ethiopia: a cross-sectional situation analysis [Internet]. Addis Ababa University; 2021 [cited 2024 May 4]. Available from: http://etd.aau.edu.et/handle/123456789/28594
3. Conradie A, Duys R, Forget P, Biccard BM. Barriers to clinical research in Africa: a quantitative and qualitative survey of clinical researchers in 27 African countries. Br J Anaesth [Internet]. 2018;121 (4):813–21. Available from: https://doi.org/10.1016/j.bja.2018.06.013
4. Boutayeb A. The Impact of Infectious Diseases on the Development of Africa. Handb Dis Burdens Qual

Life Meas. 2010;1171–88.
5. ClinicalTrials.gov. ClinicalTrials.gov. 2024 [cited 2024 May 4]. Trends, Charts, and Maps - ClinicalTrials.gov. Available from: https://classic.clinicaltrials.gov/ct2/resources/trends
6. Toto N, Douglas E, Gmeiner M, Barrett LK, Lindblad R, Makhaza L, et al. Conducting clinical trials in sub-Saharan Africa: Challenges and lessons learned from the Malawi Cryptosporidium study. Trials. 2020;21(1):1–8.
7. Philpott J. Clinical Trials Arena. 2024 [cited 2024 May 4]. Clinical trials in Africa: Where there is a challenge, there is an opportunity - Clinical Trials Arena. Available from: https://www.clinicaltrialsarena.com/news/clinical-trials-in-africa-where-there-is-a-challenge-there-is-an-opportunity/
8. Andrew S. African Century. Int Monet Fund [Internet]. 2023;(September):18–9. Available from: https://www.imf.org/en/Publications/fandd/issues/2023/09/PT-african-century
9. GD logo Report Store [Internet]. 2023 [cited 2024 May 4]. Market Research Reports & Consulting | GlobalData UK Ltd. Available from: https://www.globaldata.com/store/
10. World Health Organization (WHO). Global Observatory on Health Research and Development. 2023. p. 4 Number of clinical trials by year, country, WHO region and income group (1999-2022). Available from: https://www.who.int/observatories/global-observatory-on-health-research-and-development/monitoring/number-of-clinical-trials-by-year-country-who-region-and-income-group
11. Edem B, Onwuchekwa C, Wariri O, Nkereuwem E, Nkereuwem OO, Williams V. Trends in clinical trial registration in sub-Saharan Africa between 2010 and 2020: a cross-sectional review of three clinical trial registries. Trials. 2021;22(1):1–11.
12. Deressa B, Rauch D, Vlaskou Badra E, Glatzer M, Jeremic B, Lössl K, et al. Current Status of Clinical Trials in Ethiopia: How Much Is Done? Ethiop Med J. 2018;56(2):167–74.
13. Carlisle B, Kimmelman J, Ramsay T, MacKinnon N. Unsuccessful trial accrual and human subjects protections: an empirical analysis of recently closed trials. Clin Trials [Internet]. 2015 Feb 5 [cited 2025 Feb 14];12(1):77–83. Available from: https://pubmed.ncbi.nlm.nih.gov/25475878/
14. Maxwell AE, MacLeod MJ, Joyson A, Johnson S, Ramadan H, Bellfield R, et al. Reasons for non-recruitment of eligible patients to a randomised controlled trial of secondary prevention after intracerebral haemorrhage: Observational study. Trials. 2017;18(1):1–5.
15. Briel M, Elger BS, McLennan S, Schandelmaier S, von Elm E, Satalkar P. Exploring reasons for recruitment failure in clinical trials: a qualitative study with clinical trial stakeholders in Switzerland, Germany, and Canada. Trials. 2021;22(1):1–13.
16. Treweek S. Trial forge: a systematic approach to making trials more efficient. Trials. 2013;14(S1):1–9.
17. Treweek S, Pitkethly M, Cook J, Fraser C, Mitchell E, Sullivan F, et al. Strategies to improve recruitment to randomised trials. Cochrane Database Syst Rev. 2018;2018(2).
18. Holst M, Carlisle BG. Trials that turn from retrospectively registered to prospectively registered: a cohort study of "retroactively prospective" clinical trial registration using history data. Trials [Internet]. 2024;25(1):1–8. Available from: https://doi.org/10.1186/s13063-024-08029-5
19. Tesfay FH, Zorbas C, Alston L, Backholer K, Bowe SJ, Bennett CM. Prevalence of chronic non-communicable diseases in Ethiopia: A systematic review and meta-analysis of evidence. Front Public Heal. 2022;10.
20. WHO. Country Disease Outlook- Ethiopia 2023. WHO Reg Off Afric. 2023;17(22):4.
21. WHO Regional Office for Africa [Internet]. 2024 [cited 2024 May 8]. WHO releases new global lists of high-burden countries for TB, HIV-associated TB and drug-resistant TB. Available from: https://www.who.int/news/item/17-06-2021-who-releases-new-global-lists-of-high-burden-countries-for-tb-hiv-associated-tb-and-drug-resistant-tb
22. Kendie FA, Hailegebriel W/kiros T, Nibret Semegn E, Ferede MW. Prevalence of Malaria among Adults in Ethiopia: A Systematic Review and Meta-Analysis. J Trop Med [Internet]. 2021 [cited 2024 May 8];2021. Available from: /pmc/articles/PMC7952180/
23. Raine R, Fitzpatrick R, Barratt H, Bevan G, Black N, Boaden R, et al. Challenges, solutions and future directions in the evaluation of service innovations in health care and public health. Heal Serv Deliv Res. 2016;4(16):1–136.
24. Brown CA, Lilford RJ. The stepped wedge trial design: A systematic review. BMC Med Res Methodol. 2006;6:1–9.
25. Campus AM. Modern Study Designs for Pragmatic Translational Research : 2019;
26. Fekadu A, Teferra S, Hailu A, Gebre-Mariam T, Addissie A, Deressa W, et al. International Clinical Trial Day and clinical trials in Ethiopia and Africa. Trials [Internet]. 2014 Dec 19 [cited 2025 Feb 14];15(1). Available from: https://www.researchgate.net/publication/269820337_International_Clinical_Trial_Day_and_clinical_trials_in_Ethiopia_and_Africa