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Environmental health issues following the war in Ethiopia

Akeza Awealom Asgedom (PhD)^{1,2}

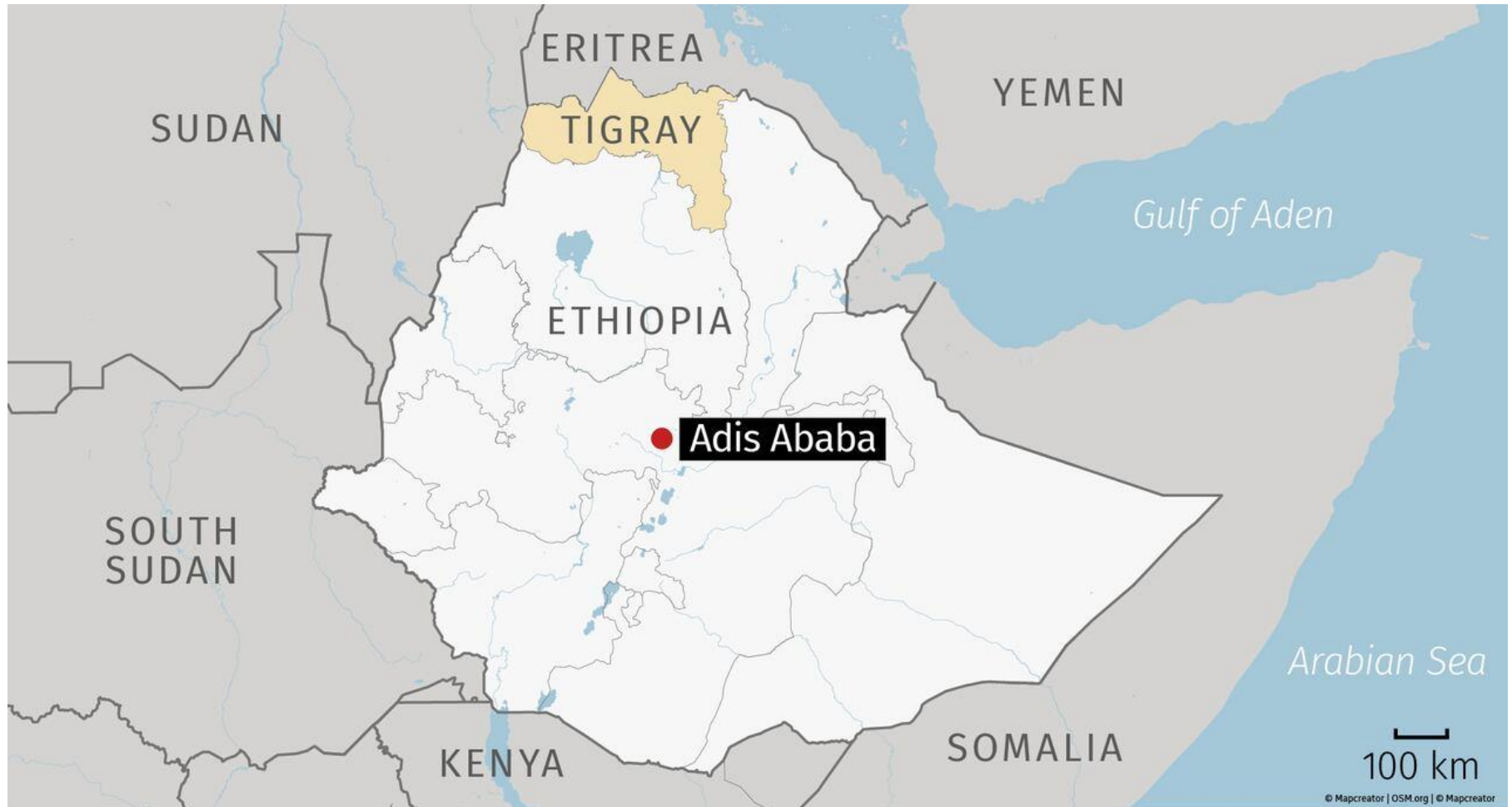
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October 2, 2026

Background



CBC NEWS

Map of Ethiopia

02/10/2026

Tigray Health System (Pre-war)

- Physical access to basic health care services was 95%
- It was one of the stronger performing region
 - Health extension program
 - Preventive and promotive services

Tigray war (2020-2022)

- The Tigray war erupted in November 2020
 - Ethiopian National Defence Force (ENDF)
 - Amhara Special Forces (ASF)
 - Eritrean Defence Forces (EDF)

AND

- Tigray Security Forces



Timeline of the war

⚔️ Nov 2020

War Begins

📶 2021

Escalation & Humanitarian Crisis

📵 2021-2022

Blackouts & Restricted Access

🤝 Nov 2022

Cessation of Hostilities Agreement



Barriers to research in conflict setting

- Destruction of health facilities
 - 80% damage of health facilities
- Communication blackout
- Insecurity and restricted access
- Displaced health workforce
- No cash
- No fuel
- Publication bias



Community WASH



Community WASH

www.nature.com/scientificreports

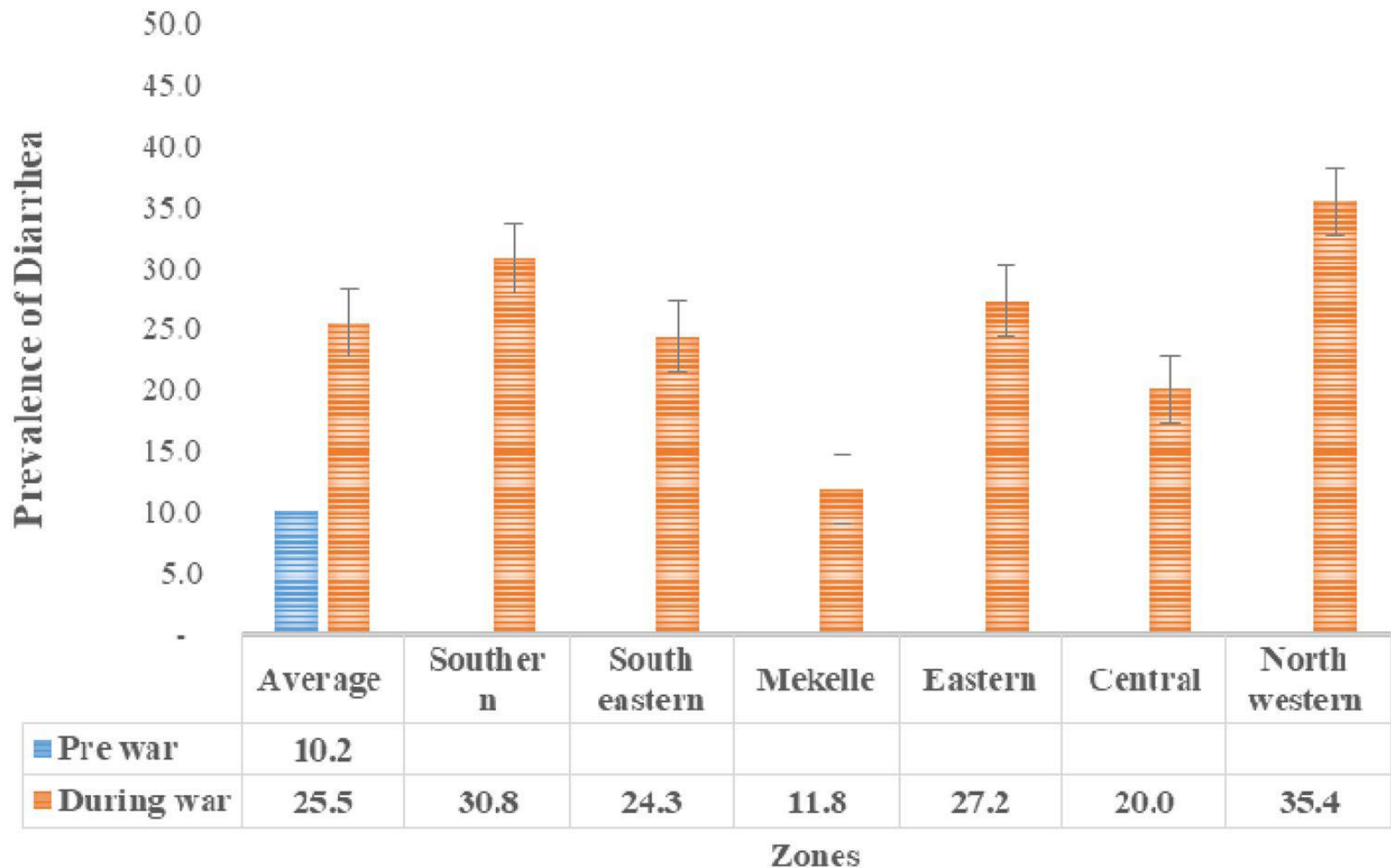
scientific reports



OPEN **Unimproved water and sanitation contributes to childhood diarrhoea during the war in Tigray, Ethiopia: a community based assessment**

Akeza Awealom Asgedom^{1✉}, Birhanu Tewoldemedhin Abirha², Askual Girmay Tesfay², Kelali Kaleaye Gebreyowhannes³, Hayelom Birhanu Abraha², Gessesew Bugssa Hailu⁴, Mesele Bahre Abrha¹, Mache Tsadik⁵, Tesfay Gebregziabher Gebrehiwet⁶, Aregawi Gebreyesus⁷, Tilahun Desalew⁸, Yibrah Alemayehu⁹ & Afework Mulugeta¹⁰

4,381 households from 52 districts



Diarrhea increased by **2.5X**

Functionality of water sources: declined from 93% to 27%

- Water source (improved vs unimproved)
- Latrine type (improved vs unimproved)
- Solid waste disposal (improved vs unimproved)
- Health extension worker visits (Yes/No)
 - Predictors of the likelihood of diarrhea in children

IDP WASH

www.nature.com/scientificreports

scientific reports

 Check for updates

OPEN **WASH services and menstrual hygiene management among reproductive age females in the IDPs camps of Shire town in Tigray region of Ethiopia: a cross-sectional study**

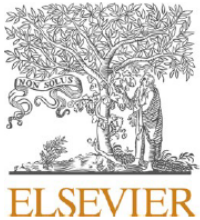
Equbit Tesfay¹, Gebru Hailu Redae^{1✉}, Gidey Goitom² & Akeza Awealom Asgedom¹

633 reproductive age females in Shire town (IDP site)

- Three out of five lacks menstrual hygiene management
- Predictors were:
 - Access to sanitary materials
 - Educational level
 - Availability of continuous water supply
 - Sex-separated latrines

Post war WASH

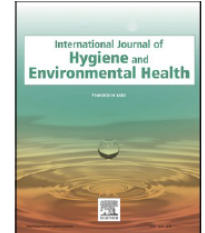
International Journal of Hygiene and Environmental Health 263 (2025) 114460



Contents lists available at ScienceDirect

International Journal of Hygiene and Environmental Health

journal homepage: www.elsevier.com/locate/ijheh



Post-war status of water supply, sanitation, hygiene and related reported diseases in Tigray, Ethiopia: A community-based cross-sectional study

Akeza Awealom Asgedom^{a,*}, Gebru Hailu Redae^a, Hailay Gebretnsae^b, Mengistu Hagazi Tequare^c, Hagos Degefa Hidru^d, Gebregziabher Berihu Gebrekidan^c, Abadi Kidanemariam Berhe^{b,e}, Mohamedawel Mohamedniguss Ebrahim^f, Mulugeta Cherinet^g, Gebremedhin Gebreegziabher Gebretsadik^h, Haftom Gebrehiwot Woldearegay^{b,i}, Yemane Berhane Tesfau^j, Tedros Bereket^k, Muzey Gebremichael Berhe^d, Meresa Gebremedhin Weldu^l, Gebrekiros Gebremichael Meles^m, Micheale Hagos Debesayⁿ, Rieye Esayas^o, Mache Tsadik^p

Data was collected from 2, 338 households (24 districts)

Poll # 1

Drinking water from an improved source, provided collection time is not more than 30 min for a round trip, including queuing.

A. Basic service

B. Limited service

One in four had access to a basic water supply

SAFELY MANAGED	Drinking water from an improved water source that is located on premises, available when needed and free from faecal and priority chemical contamination
BASIC	Drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip, including queuing
LIMITED	Drinking water from an improved source for which collection time exceeds 30 minutes for a round trip, including queuing
UNIMPROVED	Drinking water from an unprotected dug well or unprotected spring
SURFACE WATER	Drinking water directly from a river, dam, lake, pond, stream, canal or irrigation canal

Poll # 2

Use of improved sanitation facilities that are not shared with other households

A. Basic service

B. Limited service

Less than a tenth (7.7%) had access to basic sanitation

SAFELY MANAGED	Use of improved facilities that are not shared with other households and where excreta are safely disposed of in situ or transported and treated offsite ⁷
BASIC	Use of improved facilities that are not shared with other households
LIMITED	Use of improved facilities shared between two or more households
UNIMPROVED	Use of pit latrines without a slab or platform, hanging latrines or bucket latrines
OPEN DEFECATION	Disposal of human faeces in fields, forests, bushes, open bodies of water, beaches or other open spaces, or with solid waste

Poll # 3

Availability of a hand washing facility on premise with soap and water

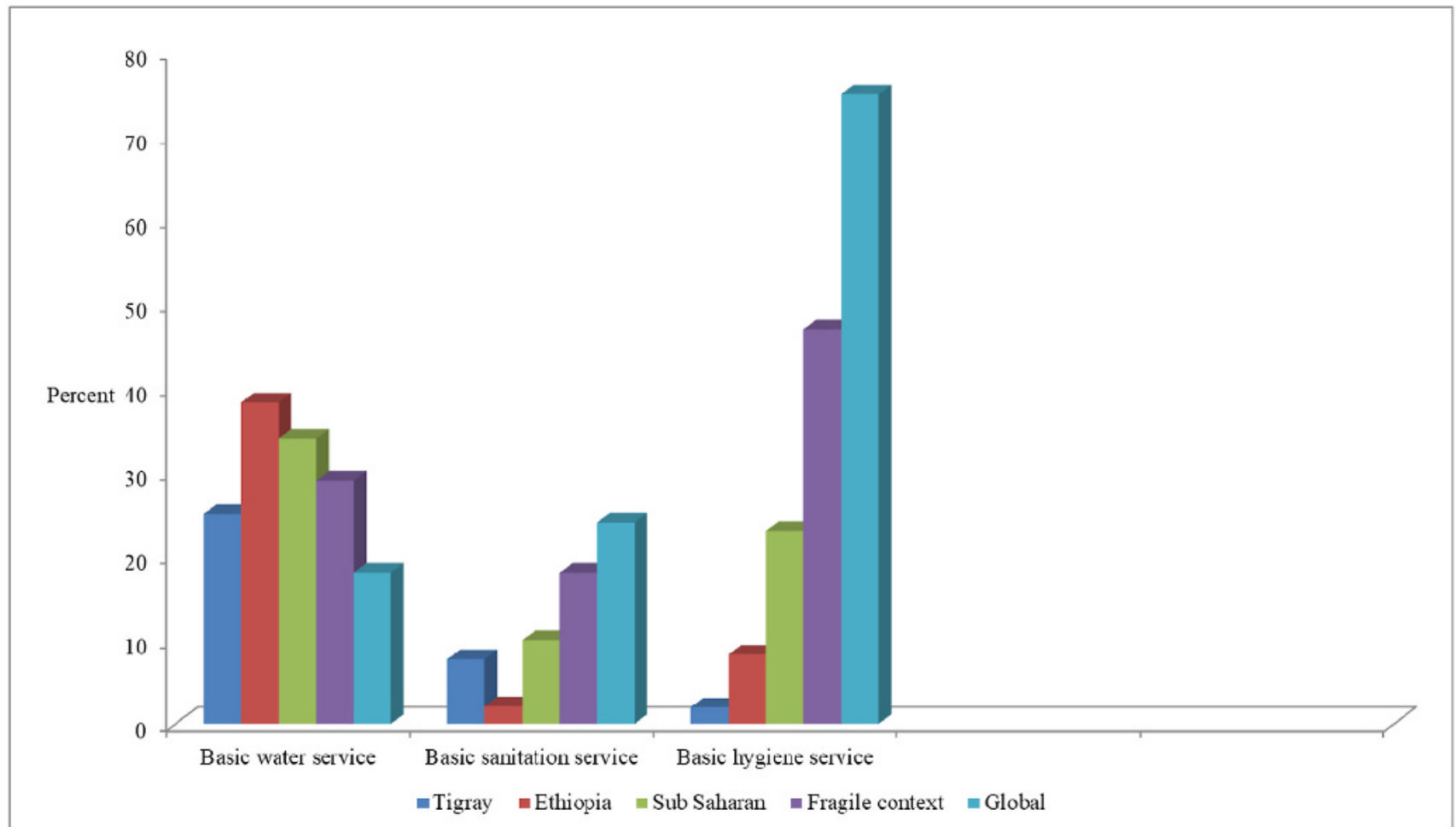
A. Basic service

B. Limited service

Basic hand washing was in 2% of households

BASIC	Availability of a handwashing facility on premises with soap and water
LIMITED	Availability of handwashing facility on premises without soap and water
NO FACILITY	No handwashing facility on premises

WASH service ladders



School WASH

Journal of
Water, Sanitation & Hygiene for Development



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Journal of Water, Sanitation and Hygiene for Development Vol 00 No 0, 1 doi: 10.2166/washdev.2026.246

Assessment of water, sanitation, and hygiene infrastructure in educational institutions and its implications in war-affected Mekelle city, Ethiopia: a cross-sectional study

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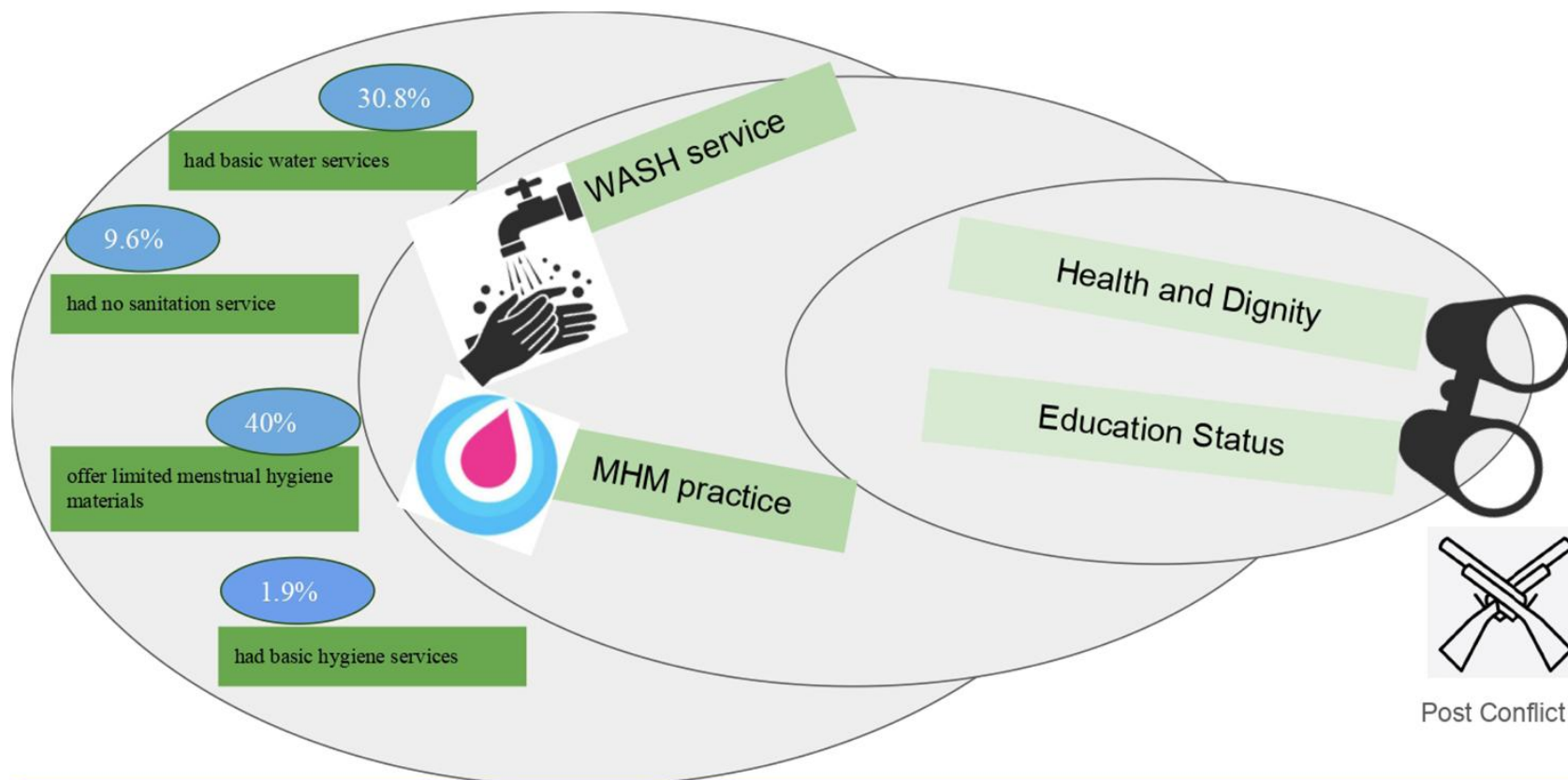
^f Department Obstetrics and Gynaecology, Faculty of Medicine, College of Health Sciences, Mekelle University, Mekelle, Ethiopia

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JMP School WASH service ladders

Service ladders for WASH in schools

Service level	Drinking water	Sanitation	Hygiene
Basic service	Drinking water from an improved source and water is available at the school at the time of the survey	Improved sanitation facilities at the school that are single-sex and usable (available, functional and private) at the time of the survey	Handwashing facilities with water and soap available at the school at the time of the survey
Limited service	Drinking water from an improved source but water is unavailable at the school at the time of the survey	Improved sanitation facilities at the school that are either not single-sex or not usable at the time of the survey	Handwashing facilities with water but no soap available at the school at the time of the survey
No service	Drinking water from an unimproved source or no water source at the school	Unimproved sanitation facilities or no sanitation facilities at the school	No handwashing facilities or no water available at the school



Recommendations

Collaborative efforts are urgently needed to enhance WASH infrastructure and MHM initiatives, promoting better school attendance, health outcomes, and dignity for students.

WASH related Diseases

Scabies

Asgedom et al. *BMC Infectious Diseases* (2024) 24:1148
<https://doi.org/10.1186/s12879-024-10049-0>

BMC Infectious Diseases

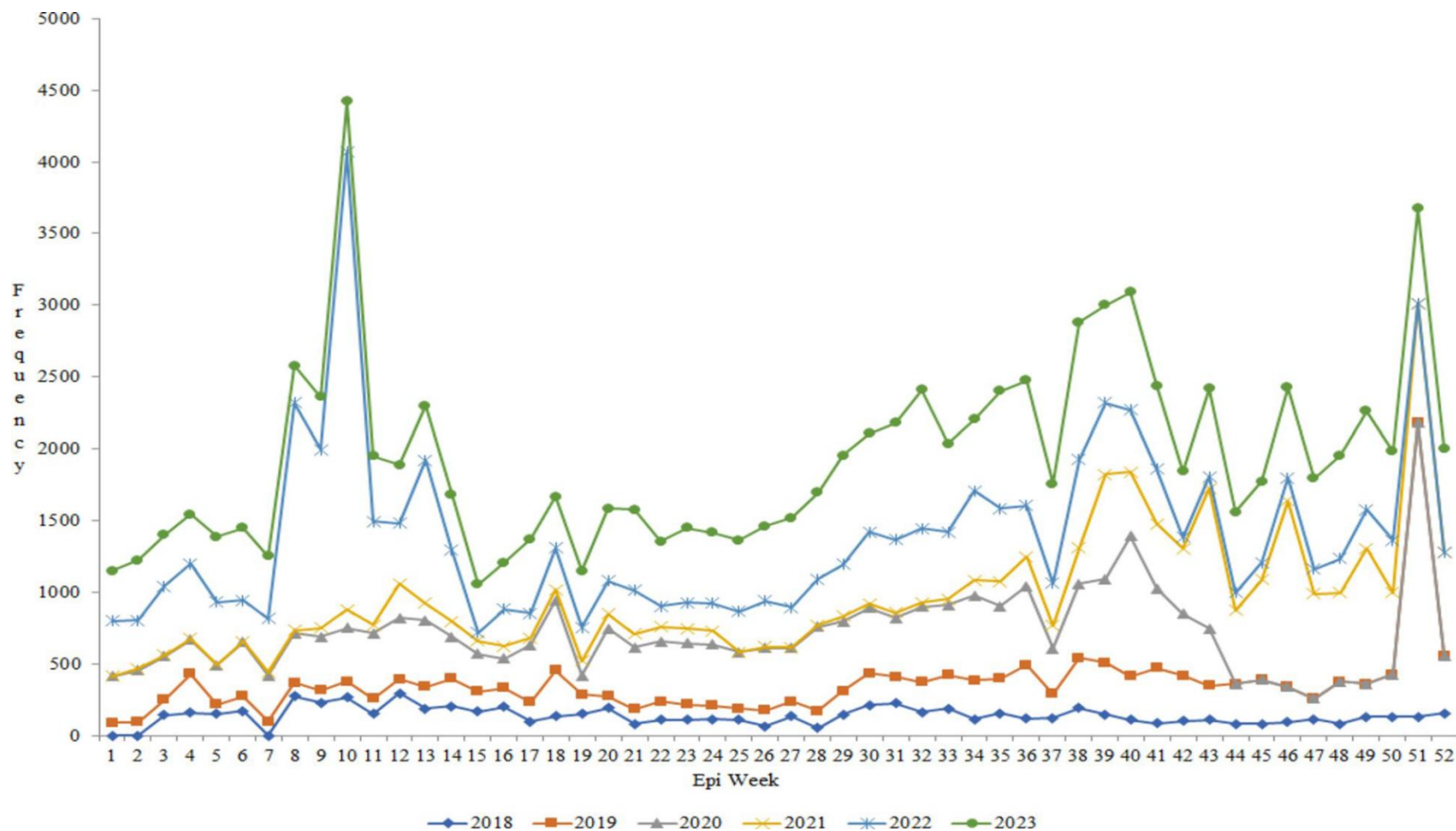
RESEARCH

Open Access

Detecting spatial clusters of human scabies in Tigray, Ethiopia from 2018 to 2023

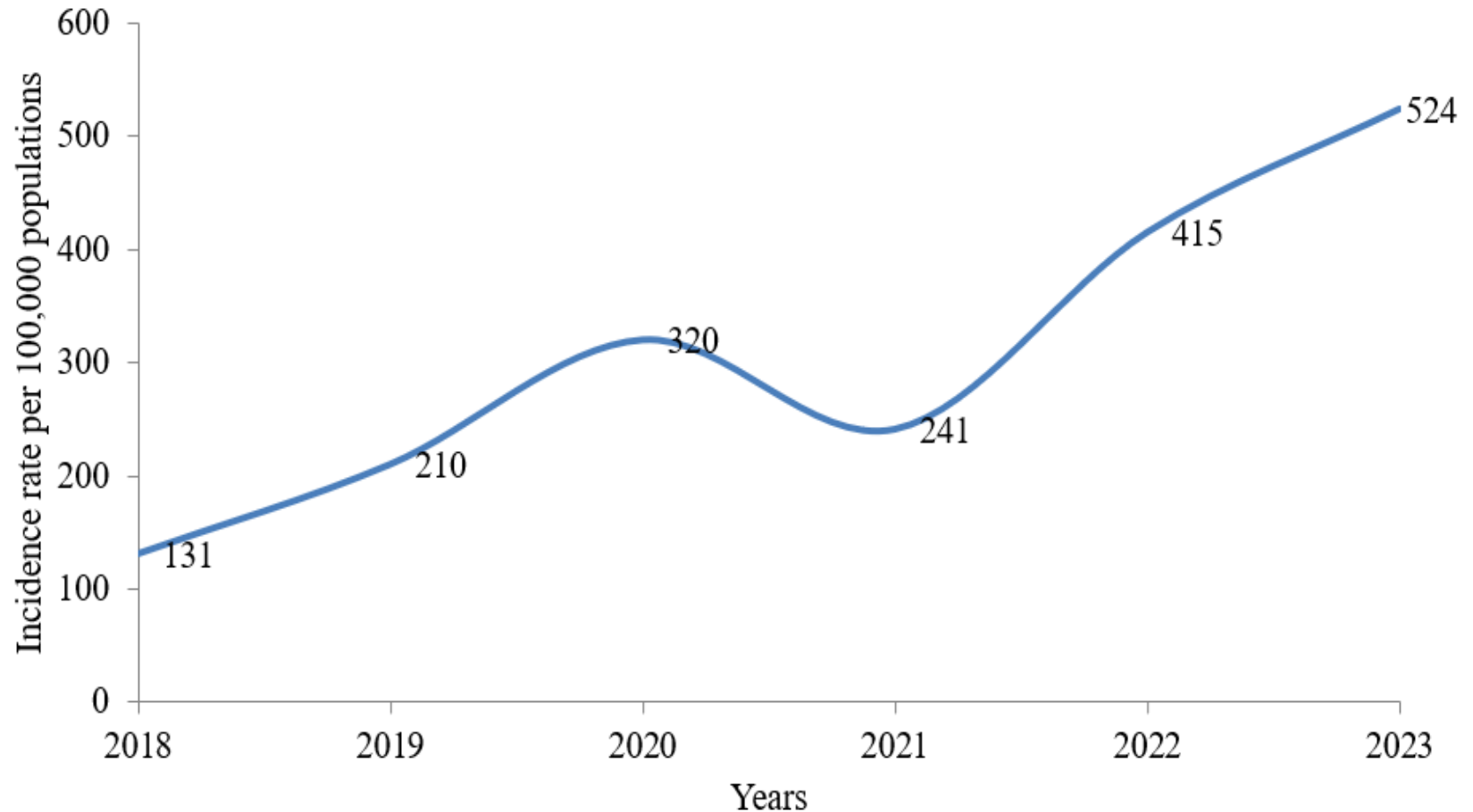


Akeza Awealom Asgedom^{1*}, Micheale Hagos Debesay², Chigozie Louisa J. Ugwu³ and Woldegebriel Assefa Woldegerima^{3,4}



Trend of Human Scabies in Tigray from 2018-2023

Dysentery



Yearly trends of dysentery incidence rate per 100,000 population in Tigray, Ethiopia from 2018-2023

Health services

Tsadik et al. *Conflict and Health* (2023) 17:47
<https://doi.org/10.1186/s13031-023-00545-6>

Conflict and Health

RESEARCH

Open Access

Child health services and armed conflict in Tigray, North Ethiopia: a community-based study



Mache Tsadik¹, Hailay Gebretnsae², Asefa Ayalew¹, Akeza Awealom Asgedom¹, Aregawi Gebreyesus¹, Tigist Hagos¹, Marta Abrha³, Kiros Weldegerima³, Birikti Abrha⁴, Gelawdiwos Gebre⁴, Mulubrhan Hagos⁴, Rie Esayas⁵, Mezgebe Gebregeorgis⁶, Hailay Abrha Gesesew^{1,7*†} and Afework Mulugeta^{1†}

Low health services

Urban-rural disparity

Health services



Original Investigation | Public Health

War and Health Care Services Utilization for Chronic Diseases in Rural and Semiurban Areas of Tigray, Ethiopia

Tesfay Gebregzabher Gebrehiwet, MPH, PhD; Haftom Temesgen Abebe, MSc, PhD; Abraha Woldemichael, MSc, PhD; Kibrom Gebresilassie, MD; Mache Tsadik, MSc, PhD; Akeza Awealom Asgedom, MSc, PhD; Girmatsion Fisseha, MSc, PhD; Kiros Berhane, MSc, PhD; Aregawi Gebreyesus, MSc; Yibrah Alemayoh, MSc; Measho Gebresilassie, MSc; Hagos Godefay, MPH, PhD; Hailay Abrha Gesesew, MPH, PhD; Solomon Tesfaye, MD, PhD; Elias S. Siraj, MD, DrMed; Maru W. Aregawi, PhD; Afework Mulugeta, MSc, PhD

- Critical health care service disruption
- High loss to follow-up for patients with chronic disease

Facility IPC-WASH



Gloves ready for re-use (© Mulugeta Atsbeha/Dr Fasika A.)

Poll # 4

IPC-WASH services

- A. Increase Antimicrobial resistance/ AMR
- B. Improve quality of care
- C. Increase Hospital acquired infection/HAI

WASH

Infection Prevention in Practice 6 (2024) 100397



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Available online at www.sciencedirect.com

Infection Prevention in Practice

journal homepage: www.elsevier.com/locate/ipp

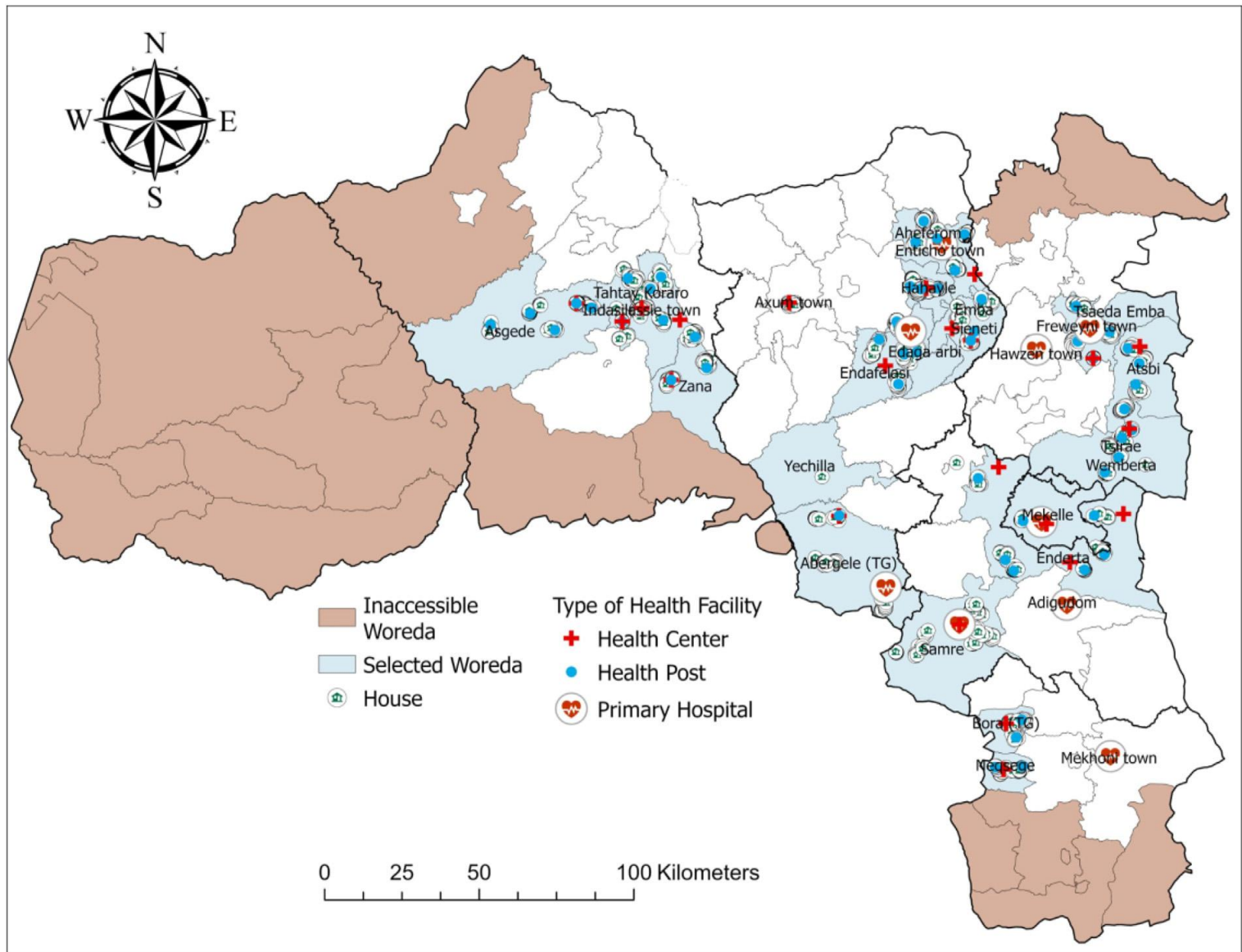


Water, sanitation, hygiene, and waste management in primary healthcare facilities in war-torn Tigray, Ethiopia: implications for infection prevention and control

Akeza Awealom Asgedom*, Gebru Hailu Redae

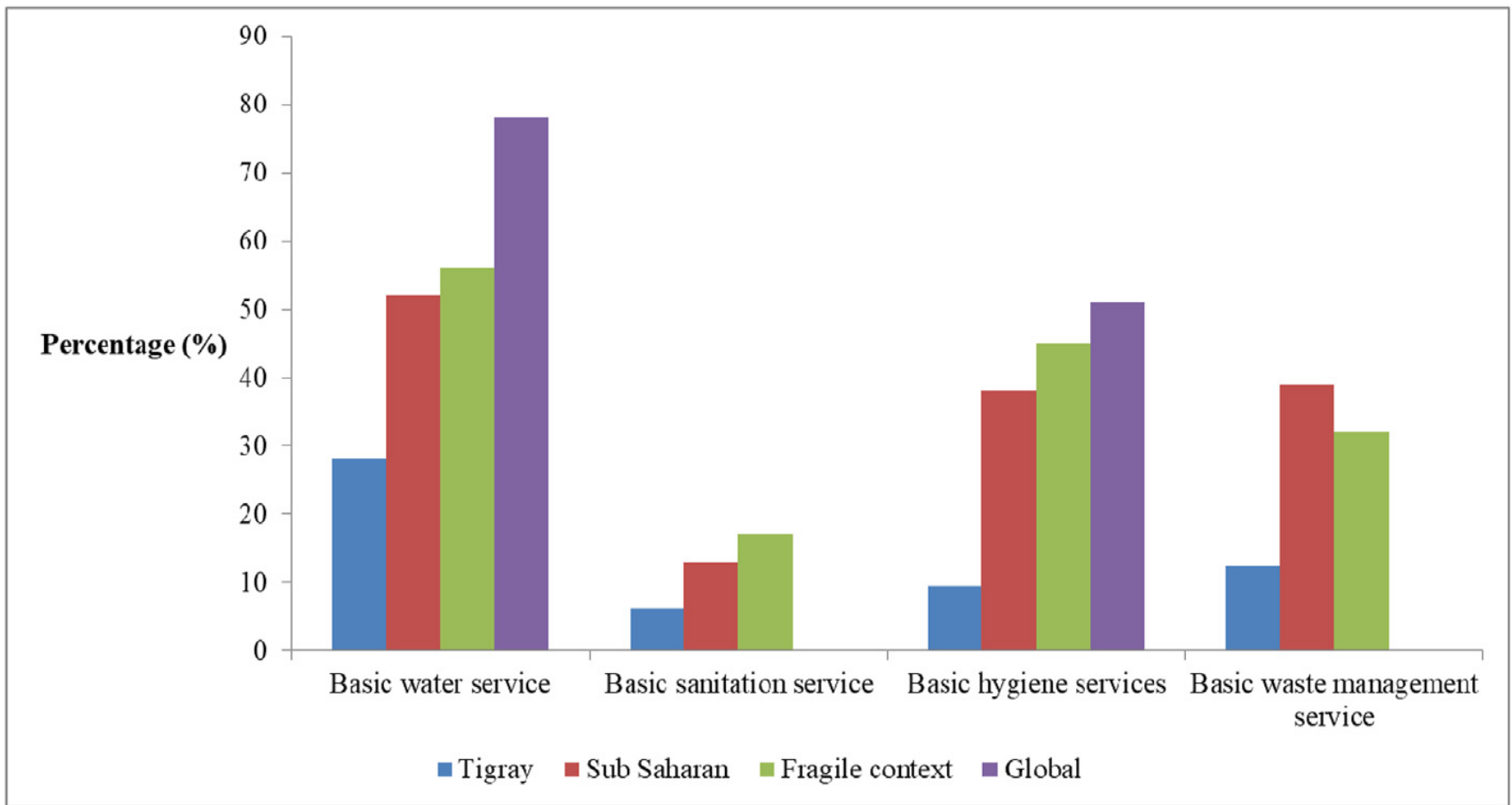
Department of Environmental Health Sciences, School of Public Health, College of Health Sciences, Mekelle University, Mekelle, Ethiopia

32 primary healthcare facilities



Service ladders for WASH in health care facilities

Service level	Water	Sanitation	Hygiene	Environmental cleaning	Waste management
Basic service	Water is available from an improved source ^a on the premises.	Improved sanitation facilities ^b are usable, with at least one toilet dedicated for staff, at least one sex-separated toilet with menstrual hygiene facilities, and at least one toilet accessible for people with limited mobility.	Functional hand hygiene facilities (with water and soap and/or alcohol-based hand rub) are available at points of care, and within 5 m of toilets.	Protocols for cleaning are available, and staff with cleaning responsibilities have all received training.	Waste is safely segregated into at least three bins, and sharps and infectious waste are treated and disposed of safely.
Limited service	An improved water source is available within 500 m of the premises, but not all requirements for a basic service are met.	At least one improved sanitation facility is available, but not all requirements for a basic service are met.	Functional hand hygiene facilities are available either at points of care or toilets but not both.	There are cleaning protocols and/or at least some staff have received training on cleaning.	There is limited separation and/or treatment and disposal of sharps and infectious waste, but not all requirements for a basic service are met.
No service	Water is taken from unprotected dug wells, springs or surface water sources, an improved source that is more than 500 m from the premises, or there is no water source.	Toilet facilities are unimproved (e.g. pit latrines without a slab or platform, hanging latrines, bucket latrines) or there are no toilets.	No functional hand hygiene facilities are available either at points of care or toilets.	No cleaning protocols are available and no staff have received training on cleaning.	There are no separate bins for sharps or infectious waste, and sharps and/or infectious waste are not treated/disposed of.



Comparison of basic water, sanitation and hygiene with global reports

Water (Basic service): 28.1%

Sanitation (Basic service): 12.5%

Hygiene (Basic service): 9.4%

PPE availability: 21.9%

Hand hygiene/HHSAF

Infection Prevention in Practice 7 (2025) 100490



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Available online at www.sciencedirect.com

Infection Prevention in Practice

journal homepage: www.elsevier.com/locate/ipip



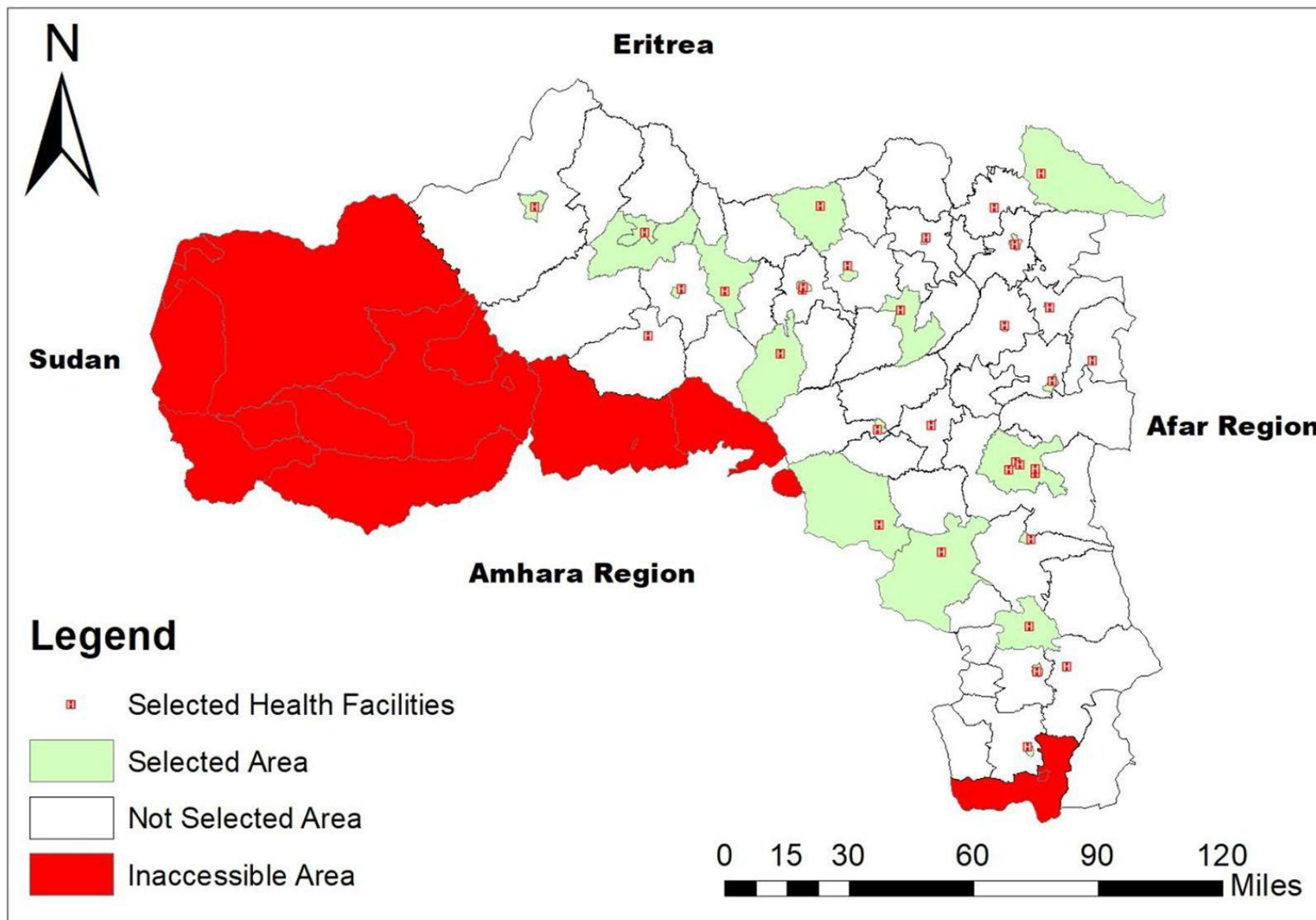
Evaluation of hand hygiene implementation in hospitals in the post-war Tigray region of Ethiopia, using the WHO Hand Hygiene Self-Assessment Framework

Akeza Awealom Asgedom^a, Bente Elisabeth Moen^b, Ana Lorena Ruano^{b,*}

^aDepartment of Environmental Health Sciences, School of Public Health, College of Health Sciences, Mekelle University, Mekelle, Ethiopia

^bCentre for International Health, Department of Global Public Health and Primary Care, University of Bergen, Bergen, Norway

33 public hospitals

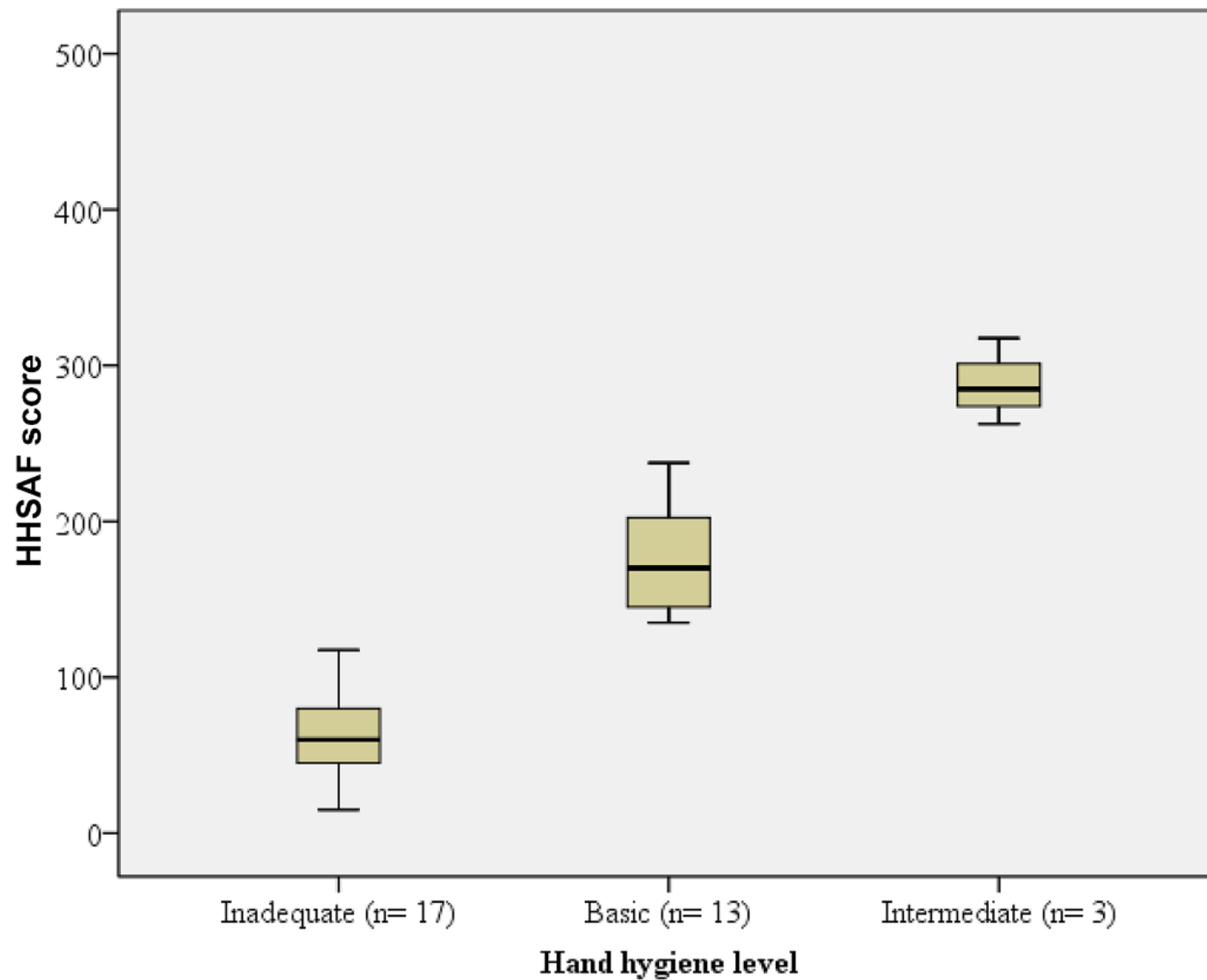


Map of Study Area

Score	
Component	Subtotal
1. System Change	
2. Education and Training	
3. Evaluation and Feedback	
4. Reminders in the Workplace	
5. Institutional Safety Climate	
Total	



Total Score (range)	Hand Hygiene Level
0 - 125	Inadequate
126 - 250	Basic
251 - 375	Intermediate (or Consolidation)
376 - 500	Advanced (or Embedding)



HAI?

Infection prevention and control

Asgedom et al. *Antimicrobial Resistance & Infection Control* (2026) 15:82
<https://doi.org/10.1186/s13756-026-01746-3>

Antimicrobial Resistance &
Infection Control

RESEARCH

Open Access

Assessment of infection prevention and control in public hospitals in the post war Tigray region of Ethiopia using the WHO Infection Prevention and Control Assessment Framework (IPCAF)



Akeza Awealom Asgedom^{1*} , Ana Lorena Ruano² and Bente Elisabeth Moen²

33 public hospitals

Interpretation: A three-step process

1. Add up your points

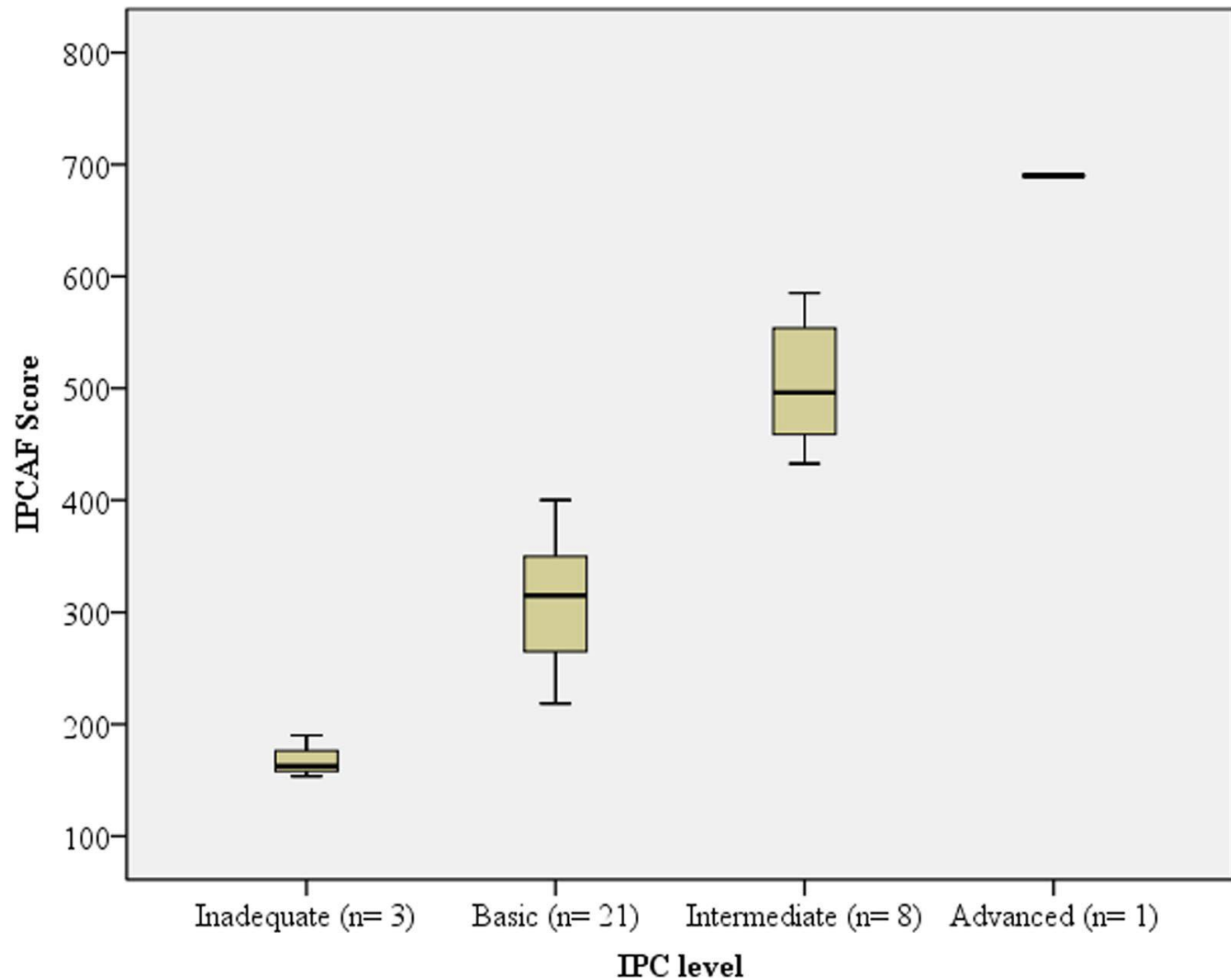
	Score
Section (Core component)	Subtotals
1. IPC programme	
2. IPC guidelines	
3. IPC education and training	
4. HAI surveillance	
5. Multimodal strategies	
6. Monitoring/audits of IPC practices and feedback	
7. Workload, staffing and bed occupancy	
8. Built environment, materials and equipment for IPC at the facility level	
Final total score	/800

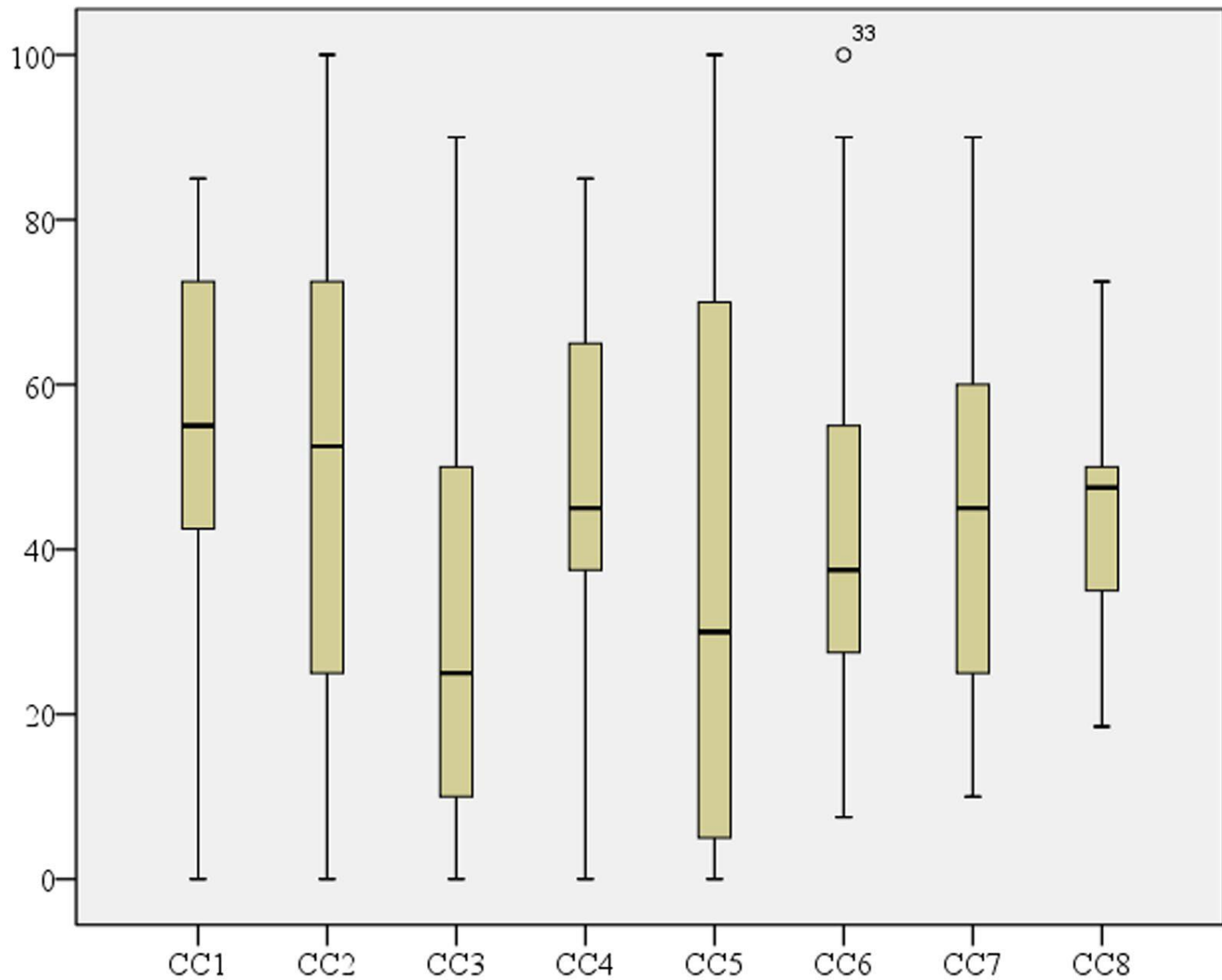
2. Determine the assigned “IPC level” in your facility using the total score from Step 1

Total score (range)	IPC level
0–200	Inadequate
201–400	Basic
401–600	Intermediate
601–800	Advanced

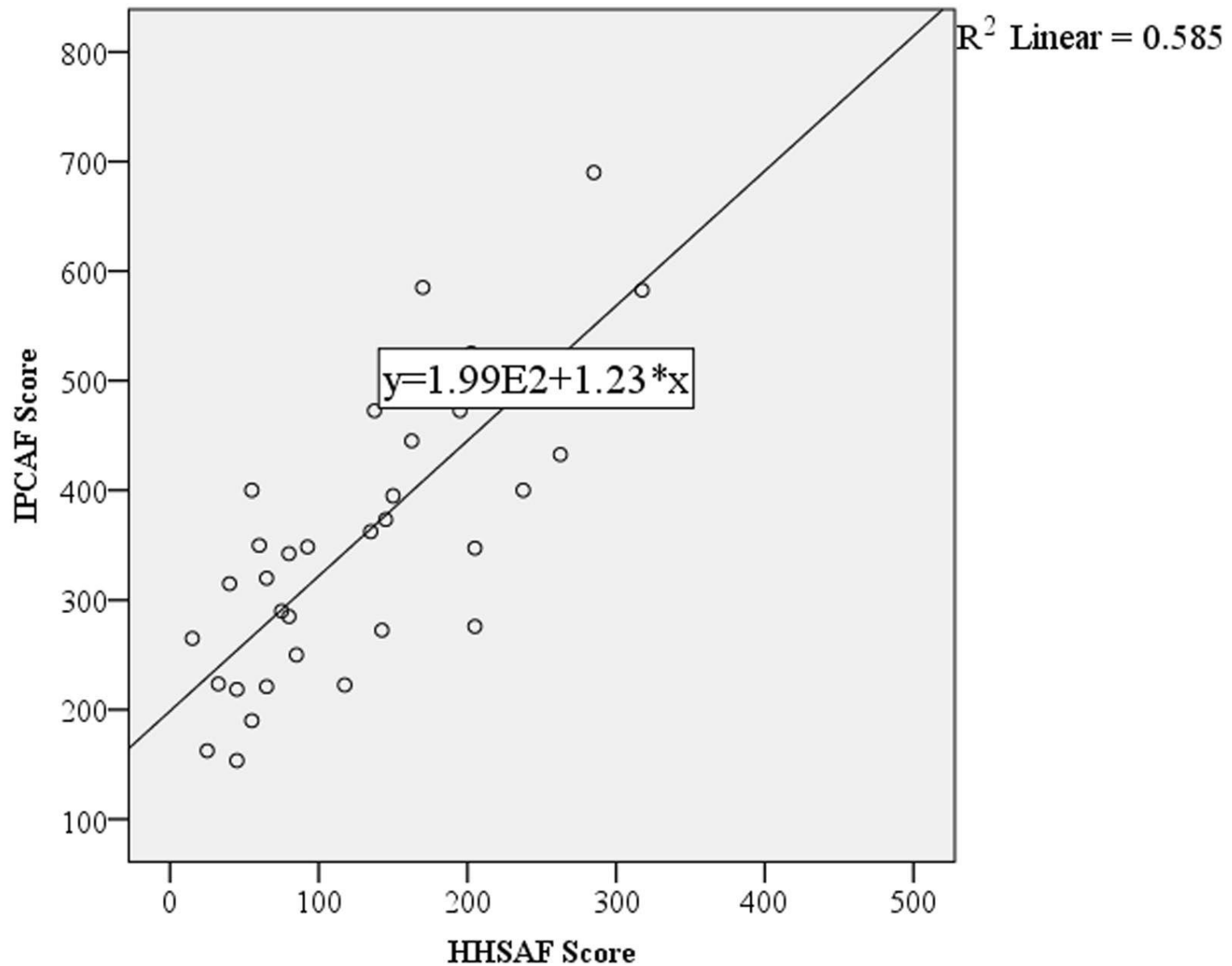
Table 1 Infection Prevention and Control Assessment Framework (IPCAF) score level categories and the interpretation

IPCAF score	Category	Interpretation
0–200 points	Inadequate IPC level	IPC core components implementation is deficient with a significant improvement required
201–400 points	Basic IPC level	Only some aspects of the IPC core components are in place without sufficient implementation. Additional improvement is needed
401–600 points	Intermediate IPC level	Most aspects of the IPC core components are properly implemented. The facility should continue to improve the scope, implementation, and quality and focus on the development of long-term plans to sustain and promote the existing IPC program activities
601–800 points	Advanced IPC level	The IPC core components are fully implemented according to the WHO recommendations and appropriate to the facility's needs





IPCAF score of each core components in 33 public hospitals in Tigray, Ethiopia



Implications of IPC-WASH

- Quality of care?
- Hospital Acquired Infection/HAI?
- Antimicrobial Resistance/AMR?

Research gaps

- Unregulated mining
 - Environmental health?
 - Occupational health?
- Interventional studies
 - IPC-WASH Vs HAI, AMR?
- Unregulated use of agrochemicals
 - Environmental and occupational health?



Another round of war erupted

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War has returned to Ethiopia's Tigray — and former enemies are now fighting together. What changed?

SEP 25, 2026 ▾



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Ethnic tensions and land conflicts lie News

Ethiopia accuses Sudan, Egypt of backing Tigray rebels as fighting rages

Sudan army denies backing Tigray fighters, says rival paramilitary RSF receiving support from within Ethiopia.

02/10/2026

3

Middle East & Africa | Back to bloodshed

A disastrous new war threatens in Africa

Heavy fighting in Tigray could herald a wider regional conflict

Renewed fighting in Ethiopia shows no sign of stopping

Civilian death and injury

Asgedom et al. *BMC Research Notes* (2023) 16:352
<https://doi.org/10.1186/s13104-023-06640-4>

BMC Research Notes

RESEARCH NOTE

Open Access



Prevalence, causes and outcomes of war-related civilian injuries in Ethiopia's war-torn Tigray region: a community-based descriptive study

Akeza Awealom Asgedom^{1*}, Abenezer Etsedingl², Teklehaimanot Tekle Hailemariam³, Mengistu Hagazi Tequare⁴, Tesfay Hailu⁵, Amanuel Tesfay Tsegay⁶, Abraha Gebreegziabher Hailu⁷, Simret Niguse Weldebirhan⁷, Melaku Hailu³, Negash Abreha Weldesenbet⁸, Girmatsion Fisseha⁹ and Yibrah Alemayehu¹⁰

- Prevalence of injury: 6.9%
- Causes: Bullet, Heavy artillery

Civilian death and injury

Gebregziabher et al. *Population Health Metrics* (2025) 23:10
<https://doi.org/10.1186/s12963-025-00373-1>

Population Health Metrics

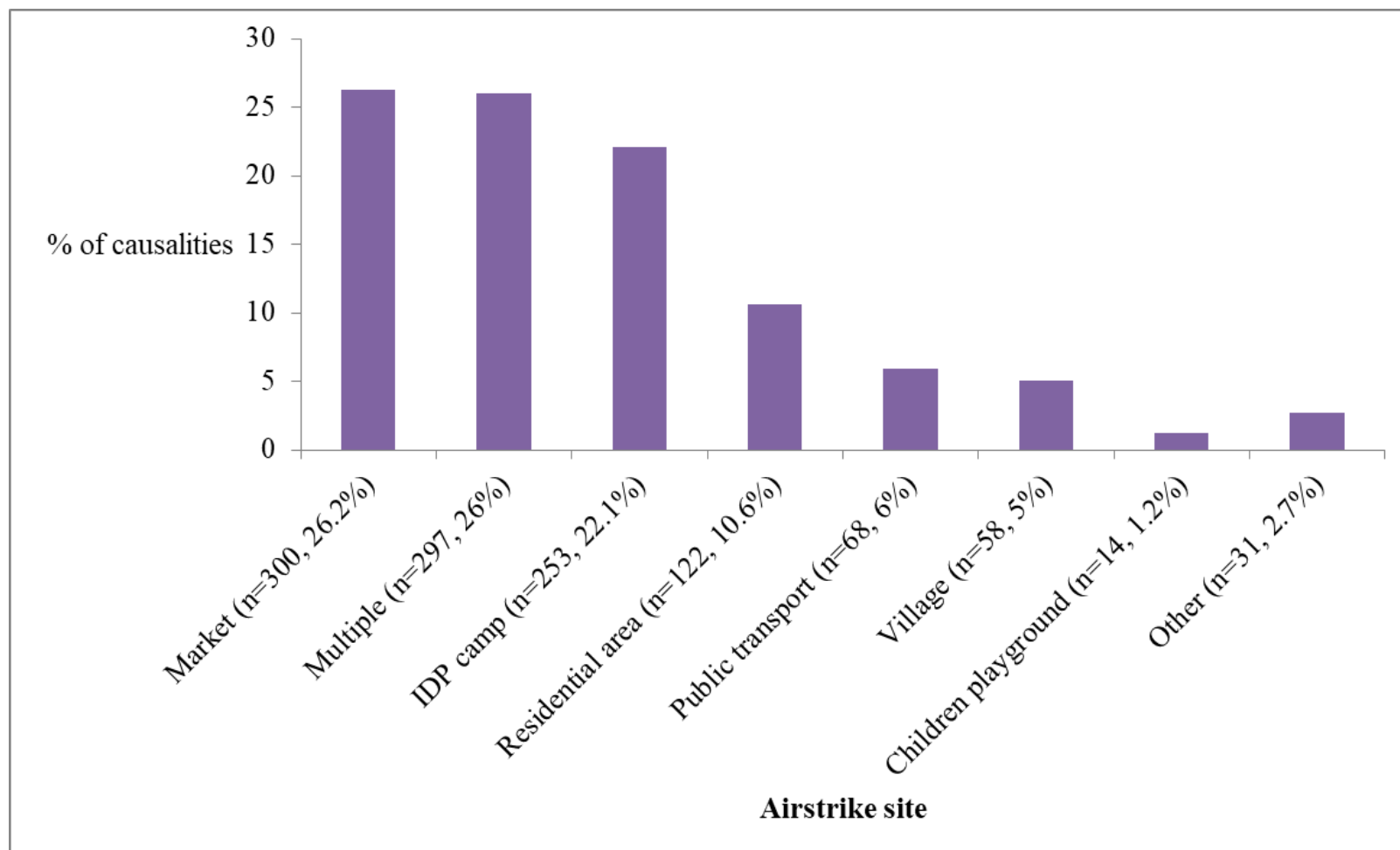
RESEARCH

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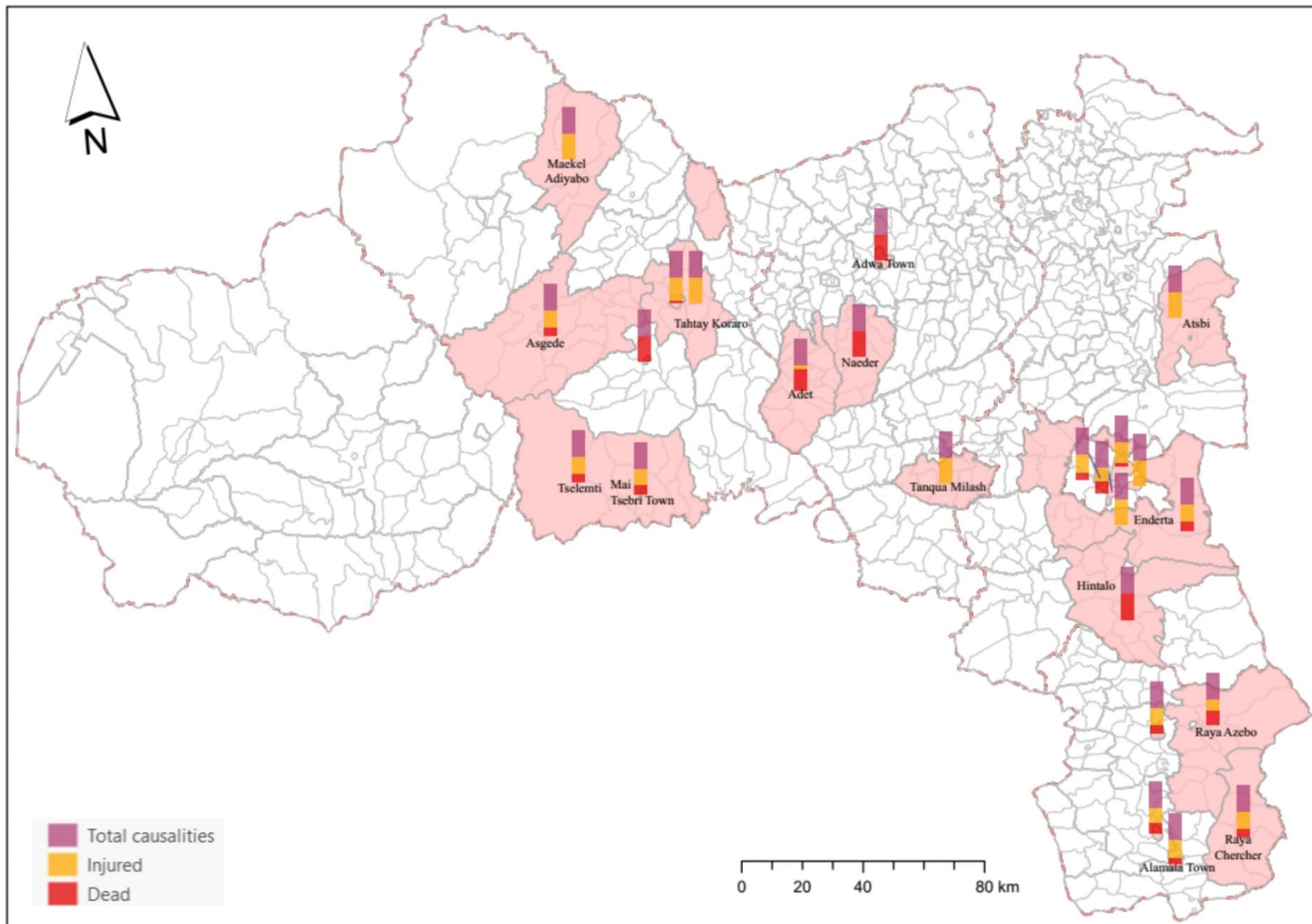
Civilian death and injury from airstrikes: evidence from the war in Tigray, Ethiopia



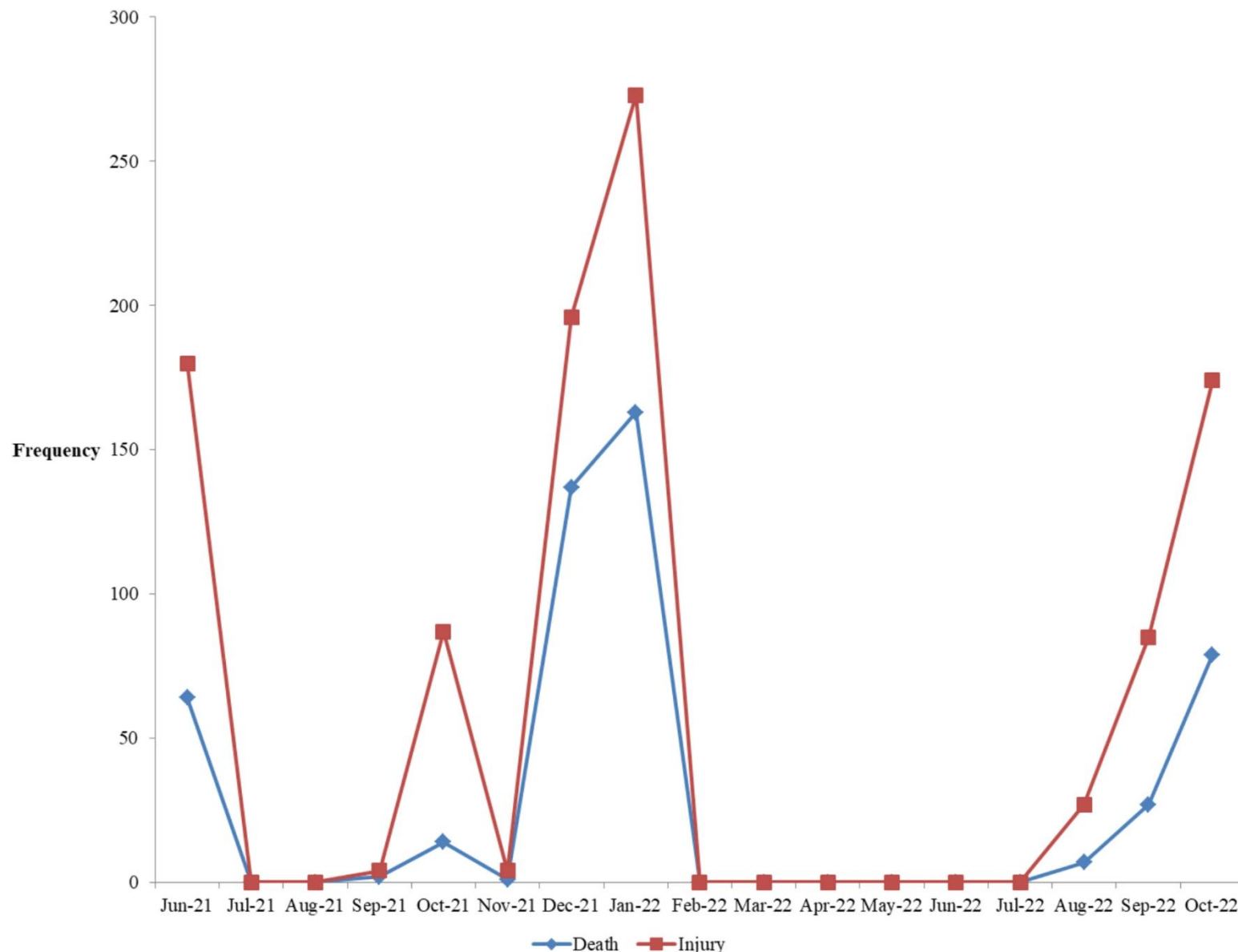
Mulugeta Gebregziabher^{1†}, Akeza Awealom Asgedom^{2*†}, Hiluf Ebuy Abraha^{3,4}, Hale Teka⁵, Abenezer Etsedingl⁶, Tsegay Berihu⁷, Gebru Hailu Redae¹, Nahom M. Gebreselassie⁸, Araya Abrha Medhanyie⁹, Hagos Godefay⁷, Demoz Gebre-Egziabher^{10†} and Hannah Wild^{11,12†}



Site of attack of airstrikes in Tigray, Ethiopia



Geographic distribution of total airstrike affected districts in Tigray, Ethiopia from June 2021 to October 2022



Trend of death and injuries due to airstrikes in Tigray, Ethiopia from June 2021 to October 2022

NO WAR



JUST PEACE