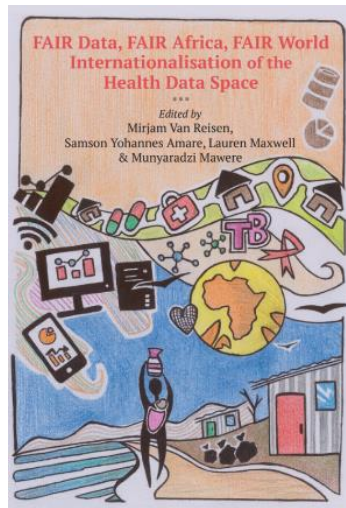# GO FAIR: Ontology Development of Health Semantics with Cultural Specificity: Traditional Health Practices using Tsebel in Conflict Zones

*Bereket Godifay Kahsay, Mirjam van Reisen & Zhengyu Lin*

**Chapter in:**
Fair Data Fair Africa Fair World:
Internationalisation of the Health Data Space



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# Contents

# Chapter 17

## GO FAIR: Ontology Development of Health Semantics with Cultural Specificity:

## Traditional Health Practices using Tsebel in Conflict Zones

*Bereket Godifay Kahsay, Mirjam van Reisen & Zhengyu Lin*

### Abstract

This study underscores the importance of researching traditional health practices in conflict-affected areas, emphasising their cultural significance and influence on health-seeking behaviours. The study is grounded in ethnographic research and expert interactions. The findings reveal how communities adapt and build resilience during crises, as demonstrated by the emergence of tsebel among the Raya community of Southern Tigray during the Tigray War. Integrating these practices into digital health ontologies can enhance their visibility and incorporation into global health systems. This study demonstrates that culturally specific health semantics can be made FAIR-compliant through ontology models, as evidenced by the case presented. Making these health semantics available on digital platforms can support culturally informed healthcare solutions, while also respecting community knowledge sovereignty. By ensuring data sovereignty, applying the FAIR principles to traditional health practices enhances secure, ethical, and interoperable data management, ultimately improving health interventions and strengthening health responses in crisis-affected communities. The study underscores the necessity for a structured methodology in developing ontologies that encapsulate health semantics with cultural specificity, recognising their significant influence on health behaviours.

**Keywords**: traditional health practices, cultural specificity, ontology, conflict zones, Raya community, Tigray, Ethiopia

**Introduction**

Ontologies are widely utilised for various purposes across multiple scenarios and are crucial in promoting interoperability (Poveda-Villalón, 2021). The scientific community acknowledges the importance of properly documenting, versioning, publishing, and maintaining ontologies following Linked Data Principles and adapting the Findable, Accessible, Interoperable and Reusable (FAIR) principles for data (Wilkinson et al., 2016). However, these recommendations do not specify how to apply them to a target vocabulary (Garijo & Poveda-Villalón, 2020).

Digitising indigenous knowledge systems offers significant opportunities for preservation, exchange, and utilisation, but it also presents challenges in ensuring accessibility and long-term preservation (Balogun, 2023). Advancements in automated data processing introduce societal challenges, including concerns related to data stewardship and national autonomy (Stürmer et al., 2021). These challenges are exacerbated by reliance on external funding, foreign entities' dominance, and data extraction to Western cloud platforms (Sivarajah et al., 2017; Van Reisen et al., 2020). Despite substantial efforts to make data Findable, Accessible, Interoperable, and Reusable (FAIR), ontologies and vocabularies often remain difficult to acquire, comprehend, and reuse (Wilkinson et al., 2016; Garijo and Poveda-Villalón, 2020). These issues raise significant concerns regarding health policy, governance, and the protection of private health information (Van Reisen et al., 2020).

The shift toward automated data processing presents significant challenges from a technological perspective (L'Heureux et al., 2017). From a computer science perspective, one of the key research challenges is the need for a standardised reference conceptual model (Sanfilippo, 2020). Additionally, these challenges extend to societal dimensions, as highlighted by Sivarajah et al. (2017). In community engagement, for example, it is crucial to be attuned to local contextual frameworks and cultural perspectives (van Stam, 2017). This sensitivity has led to the development of various practices aimed at enhancing Indigenous peoples' sovereignty over data gathered through community-based monitoring projects (Reyes-García et al., 2022). Indigenous Data Sovereignty refers to the rights of Indigenous

communities to govern data related to their people, lands, and resources, ensuring both individual and collective control over data access and privacy (Carroll et al., 2021). All the above challenges are particularly pronounced in the healthcare sector, where issues such as data privacy, security, and ownership of patient information are of paramount importance (Plug et al., 2022).

To address systemic issues in health services, African governments are implementing health policies in partnership with private industry and international organisations (Van Reisen et al., 2020). While data-driven technologies offer significant benefits and potential, they also pose challenges for various stakeholders in retaining control over their data (Hummel et al., 2021). Obstacles to the creation of a FAIR Data Point (FDP) include inadequate expert training, a lack of legal frameworks for data ownership, and poor integration of information communication technology (ICT), digital data, and health responsibilities (Van Reisen et al., 2020).

When ontologies are produced as research outputs, they must be treated as other research artefacts, such as data, software, techniques, and tools (Poveda-Villalón, 2021). Hence, to ensure that religious and cultural practices contributing to resilience in conflict and post-conflict situations are discoverable within health practice data, it is essential to incorporate the culturally used vocabularies into FAIR ontologies.

The insufficient comprehension of traditional health practices during crises constitutes a significant deficiency that may intensify the challenges faced by communities during and after conflict. The failure of humanitarian actors, medical experts, academics, and policymakers to recognise or understand these practices can lead to their marginalisation or devaluation, thereby limiting their potential impact on health outcomes. Operational frameworks guiding data on mainstream health procedures often exclude these behaviours. Panter-Brick and Eggerman (2012) emphasise that cultural settings, frequently overlooked in conventional health data ontologies, are fundamental to resilience.

The insufficient comprehension of traditional health practices within the context of crisis constitutes a considerable deficiency that may

intensify the difficulties encountered by communities during and after war. The failure of humanitarian actors, medical experts, academicians, and policymakers to recognise or comprehend these activities may result in their marginalisation or devaluation, hence constraining their potential impact on health outcomes. Nevertheless, the operational frameworks that direct data on mainstream health procedures usually do not include these behaviours. For example, cultural values support resilience by giving meaning to pain and hope for the future (Panter-Brick and Eggerman, 2012). They stress that cultural settings, which are frequently disregarded in conventional health data ontologies, are fundamental to resilience (Panter-Brick and Eggerman, 2012).

This study, therefore, focuses on the ontology creation of health data with cultural specificity, particularly examining traditional health practices in conflict zones. It aims to develop a structured framework that accurately represents indigenous and community-based medical knowledge, ensuring its semantic interoperability within digital health systems. By assessing the feasibility of FAIRifying traditional health practices, it establishes procedures to enhance humanitarian data interoperability and integrate data relevant to humanitarian contexts. This study aims at securing procedures for data handling of data created in sensitive situations, with clear procedures linked to the protection and security of the data and clarity on responsibility for data handling. This study is based on the case study of traditional health practices among the Raya community in southern Tigray, particularly the recently emerged holy spring water, and addresses the following research questions:

- How can relevant ontologies improve the representation and interoperability of indigenous health practices in a crisis context?
- What procedures are required to FAIRify traditional health practices?
- How can community knowledge sovereignty be ensured while maintaining secure and ethical data handling in ontology creation?

By answering these research questions, the study provides insights on how traditional health practices and their associated religious and

cultural beliefs can be integrated into FAIR ontologies to enhance data interoperability and support health interventions and humanitarian assistance in war and post-war contexts so that they provide culturally appropriate life-saving assistance.

**Research approach**

The study is being conducted among the Raya community of southern Tigray. The study aims to provide an ethnographic study on religious syncretism and its value in the health practices of the Raya Community with a focus on traditional health practices in a crisis context. This study seeks to understand the religious beliefs that influence the health practices of the community, highlight the religious rituals that contribute to the community's health-seeking behaviours, and elucidate how religious syncretism influences the community's health practices before, during, and following the Tigray War.

The study considers two essential elements of the research context. The study explores two critical aspects of the research context. First, the study area exhibits religious syncretism, reflecting a blending of diverse religious practices and beliefs. Second, it is situated in a conflict-affected environment marked by ongoing warfare and its profound impact on the community and their way of life. Drawing on the interplay between traditional health practices and crisis dynamics through an ethnographic lens—and considering the situation in Tigray during the war as an information 'black hole' due to the siege, the study underscores the critical need for humanitarian organisations and health professionals to engage effectively with affected populations during times of war for more impactful interventions. While the broader study encompasses a wider scope, this paper focuses specifically on the phenomena of *tsebel* (sacred water source) as a case study to examine its definition and value. The value is studied particularly in the context of maternal healthcare. The study investigates the need to formalise such traditional practices in digital health ontologies.

*Research methods*
The study area is a war-affected area, the study context is characterised by a culture rich in religious beliefs and rituals, which

contain elements of syncretism. These beliefs and rituals play a significant value in the health practices of the study community. Methodologically, the study aims to identify relevant types of ontologies by exploring potential procedures, followed by testing and validating a proposed procedure. To achieve this, fieldwork interviews and interactions with experts were conducted. The following table (Table 1) provides details on the research methods and timeframe.

**Table 1. Research methods and timeframe**

| Method | Details | Selection | Timeframe |
|---|---|---|---|
| Fieldwork interviews | Fieldwork I: Interviews with 8 (4 females) community members | Opportunistic and purposive | January 2024 |
| | Fieldwork II: interview with 5 (2 females) community members | Opportunistic and purposive | January 2025 |
| | Observation at the *tsebel* site | Purposive | January 2025 |
| Interactions with experts | Interviews with four experts on FAIR semantic ontologies | Purposive | January 2025 |
| | Interviews with one expert on community epistemic sovereignty | Purposive | January 2025 |
| | Interviews with three health practitioners and two anthropologists | Purposive | January 2025 |

The fieldwork was conducted in two phases: a pilot study from January 4 to 14, 2024, and fieldwork from January 8 to 18, 2025. During both phases, the researcher visited three *tsebel* points and conducted interviews. Specifically for this study, during the pilot phase, interviews were conducted with eight participants (four female). This was followed by an additional five interviews (two female) during the fieldwork in January 2025. In January 2025, an observation was conducted at the recently emerged *tsebel*.

In addition to the interviews, interactions with experts were conducted in January 2025. The experts included health professionals with qualifications as medical doctors, public health officers, midwives, digital health experts, and anthropologists. The interactions centred on key themes, including FAIR semantic ontologies, community epistemic sovereignty, and the pressing need for a comprehensive vocabulary inventory related to traditional health practices, along with precise documentation of their meanings.

### *Location and context of the study*

The study was conducted in the Raya-Ch'erch'er woreda, located in the southern part of Ethiopia's Tigray Region. Data collection took place in two villages: Dodota and Adi-Mokoni. Administratively, Dodota is classified as a *Qushet*, while Adi-Mokoni is one of the *got'* (ጎጥ) under *Qushet* Erba, both within *T'abya* Erba. Dodota is a sizeable and diverse village where both Muslim and Orthodox Christian communities coexist. In contrast, Adi-Mokoni is inhabited by Orthodox Christians.

While the two organised religions practiced in the study community are Islam and Christianity (Alemu and Sisay, 2017; Kibrom, 2013), there are traditional faiths, rituals, and customs that are not connected to any of these two monotheistic religions (Kibrom, 2013; Alemu and Sisay, 2017, Desale, 2003). The two religions coexist with the traditional belief and ritual systems creating a religious syncretism in the context (Alemu and Sisay, 2017). This has resulted from several historical factors including the Oromo expansion to this area and cultural contact of the adjacent Amharic, Tigrinya, and Afar-speaking communities, that the study context has seen the manifestation of cultural elements from these communities (Mahder, 2019; Kibrom, 2013; Alemu and Sisay, 2017), which has ultimately helped to create distinctive cultures in the area (Kahsay, 2021).

The study is set in a war-affected area where the community has endured an extensive humanitarian crisis, alongside the destruction of basic services and infrastructure, including health service centres, destruction of religious and cultural heritage sites, violation of human rights, etc. This unique positioning provides an intriguing setting to

explore the interactions and dynamics of religious and cultural practices in a war-affected setting.

The specific location of the study case—the newly emerged holy spring water—is in Raya-Alamat'a woreda, T'abya Garjale, in the village of Akabake. Raya-Alamat'a is an administratively adjacent woreda to the primary study location, Raya-Ch'erch'er woreda.

## Theoretical concepts and related literature

This section highlights the value of indigenous religious and cultural practices in addressing health challenges within a health framework. It emphasises the importance of FAIR data principles (Findable, Accessible (under well-defined conditions), Interoperable, and Reusable) and explores data sovereignty in protecting indigenous communities' rights over their health and cultural data. Additionally, it examines ways to preserve traditional knowledge while managing digital health data. The section concludes by stressing the need for interoperability among humanitarian organisations, fostering collaboration, and developing data-sharing systems to improve health outcomes.

### *Religious and cultural practices in a health framework*
Religious systems provide individuals with insights into life and death, health, illness, and many adversities through their adhered beliefs (Read, 1966). Religious belief and practice provide explanatory frameworks on the causation, progression, and potential outcomes of effective sickness treatment (Vyas et al., 2014). Numerous organised religious organisations have seen the utilisation of religious faith in the treatment and healing of health conditions, including mental illnesses and physical ailments (Zerihun, 2015).

African traditional religions are present among different ethnic communities throughout the continent (Acquah, 2011). The existence of African traditional religions, with their belief in supernatural power, spirits, and ancestors (Acquah, 2011) operate side by side with monotheistic religions like Islam and Christianity. This results in the attachment of people with multiple belief systems in sub-Saharan Africa (Twumasi-Ankrah, 1994; Njoku, 2013). The supernatural beliefs in the African context provide explanations for calamities like

death, sickness, and economic troubles (Ferdinando, 1995). African traditional religions, in addition to performing a variety of other functions, play an important value in community health. The etiology, prevention, and alleviation of human suffering—a topic with which African traditional religion is most urgently concerned—can be found here as its fundamental interest (Ferdinando, 1995).

The World Health Organization (WHO) states that traditional medicine possesses a lengthy history and encompasses the collective knowledge, skills, and practices rooted in the theories, beliefs, and experiences inherent to various cultures, regardless of their explicability, utilised for health maintenance and the prevention, diagnosis, enhancement, or treatment of physical and mental ailments (WHO, 2013). African Traditional Medicine is a distinctive and occasionally effective approach employed by numerous traditional healers in Africa to address the health concerns of the indigenous population (Atemezing & Pavón, 2008).

The significance of African Traditional Medicine to African communities is immeasurable. However, the lack of a standardised and systematic vocabulary within this domain underscores the need for a well-structured computational framework (Atemezing & Pavón, 2008). Such a framework would enable the effective management and organisation of knowledge and information derived from field practices, ensuring the preservation and advancement of this invaluable tradition (Atemezing & Pavón, 2008).

### FAIR data

The FAIR principles are meant to serve as a framework for making digital resources more Findable, Accessible, Interoperable, and Reusable for both humans and machines (Wilkinson et al., 2016; Jacobsen et al., 2020). The 15 FAIR facets of the guiding principles provide a more detailed and quantifiable description of these four fundamental ideas (Jacobsen et al., 2020). Although each facet can be treated separately and autonomously, the components of the FAIR Principles connect an overall framework. The principles outline qualities that modern digital infrastructures, tools, vocabularies, and data resources should have to facilitate third-party discovery and reuse (Wilkinson et al., 2016).

The FAIR Guiding Principles, introduced in 2016, assist data publishers and stewards in evaluating whether their implementation decisions render digital research artifacts Findable, Accessible, Interoperable, and Reusable (Wilkinson et al., 2016). Since their inception, these principles have gained prominence and have been adopted by numerous public and private organisations worldwide (Poveda-Villalón, 2021).

### Digital data handling and community knowledge sovereignty

Although new data-driven technologies have advantages and promise, they also present difficulties for many agents and stakeholders in maintaining control over their data (Hummel et al., 2021). The study of data sovereignty in information systems is motivated by a deeper understanding of how individuals and organisations technically implement control over data when sharing it, which is essential for all research (von Scherenberg et al., 2024).

According to Krasner (1988), sovereignty is "the ability to issue authoritative claims, latching onto domestic institutional arrangements, international regimes, and the practices of other states" (cited in Hummel et al., 2021:1). It has also emerged as a useful term to apply to data (Hummel et al., 2021). In practice, data sovereignty is a crucial component of creating secure settings where consumers and data providers can overcome trust concerns while exchanging data (von Scherenberg et al., 2024). Given the importance of handling data according to sovereignty principles, policymakers must ensure "fair data sharing practices" (European Commission, 2022, p. 26) and create secure frameworks (von Scherenberg et al., 2024).

A community is defined by Van Stam as "a gathering of persons who subscribe to a shared set of values" (van Stam, 2021:28). The rights of Indigenous peoples to self-determination and control over their cultural heritage guarantees the community epistemic sovereignty, including related to their data and knowledge systems. These rights are recognised by the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). According to Article 31 of the UNDRIP, Indigenous peoples have the right to preserve, control, safeguard, and advance their traditional knowledge, cultural expressions, and cultural heritage (UN, 2007).

Responsible data handling in the digital age poses a challenge: while data processing offers clear benefits, the concept of data sovereignty has gained prominence as a solution to address issues arising from the development and use of data-driven technologies and infrastructures (Hummel et al., 2021). The Internet Society's principles for responsible data handling focus on transparency, fairness, and respect guiding organisations to communicate data practices, ensure privacy-respecting defaults, balance stakeholder interests, avoid discrimination, and act as stewards of personal data (Wilton, 2019).

While digitising indigenous knowledge systems has opened up new avenues for knowledge preservation, exchange, and use, it has also presented new difficulties for guaranteeing the information's accessibility and long-term preservation (Balogun, 2023). These days, open health data is being promoted more and more by digital health. While there are many advantages to an open approach, there are also conflicts with indigenous data sovereignty (Cordes et al., 2024). The Institute for Circumpolar Health Research (2022) states that controlling indigenous health data is essential to attaining indigenous sovereignty, self-determination, and health reform.

The term "trusted digital repositories" (TDR) refers to both digital preservation and the general trustworthiness of digital documents (Balogun, 2023). The idea of keeping trusted digital repositories has been at the heart of the digital preservation community's emphasis on trust (Corrado, 2019; Balogun, 2023). Indigenous organisations have established principles for data sovereignty and governance to uphold their rights. These principles emphasise indigenous control over data related to their lands and communities, encompassing both individual and collective rights to data access and privacy (Institute for Circumpolar Health Research, 2022).

Significant improvements in patient care and medical research have been made possible by the quick uptake of technologies like wearables, health apps, and electronic health records (Yigzaw et al., 2022). However, these technologies also bring up serious privacy and security issues because of the personally identifiable health data they incorporate (Yigzaw et al., 2022). Hence, health data security and privacy must effectively balance two conflicting interests: the necessity to gather, use, and distribute data for legitimate and

advantageous reasons, and the right of a person or community to have their information protected (Institute for Circumpolar Health Research, 2022).

### Enhancing interoperability across humanitarian organisations

Effective humanitarian efforts in times of crisis depend on timely and high-quality information Gray & Colling, 2021). It is recognised that digital identities and data exchange are essential to humanitarian responses such as cash and voucher aid and help impacted individuals overcome obstacles (IFRC, 2023). However, the sharing of personal and non-personal data between humanitarian organisations and systems is complicated by divergent systems, different data protection regimes, a lack of common data models, and dangers to data security and protection (IFRC, 2023). Additionally, there are still barriers to its comprehension, sharing, and capture in both intra- and inter-agency contexts (Gray & Colling, 2021).

Thus, high-quality information can enhance various humanitarian activities throughout all stages of the crisis management lifecycle (Gray & Colling, 2021). One such crucial component of humanitarian networks is interoperability, which influences how well coordinated, resilient response, planning, and decision-making work (Vasconcelos et al., 2005).

The International Federation of Red Cross states that several overarching themes are beginning to emerge that may promote better data sharing and interoperability, such as enhancing cross-sector coordination to allow for a more people-centred approach and efficiency, effectiveness, and high-quality programming (IFRC, 2023). However, digitalisation is not a solution for every humanitarian issue, and digital instruments carry serious threats if they are not properly safeguarded (Veron, 2022).

Interoperability within humanitarian networks remains challenging due to the diverse, widely distributed, and often ambiguous nature of information (Zhang et al., 2002). Additionally, few organisations consistently track and document information over time, particularly during crises or in networks with high staff turnover and limited institutional memory (Lu et al., 2013; Gray and Colling, 2021). Furthermore, discrepancies in knowledge sharing between

international and domestic operations exacerbate these challenges (Dorasamy & Raman, 2011; Gray and Colling, 2021). The International Federation of Red Cross highlights several factors that hinder greater interoperability and data sharing. These include a lack of specialised expertise to coordinate efforts on interoperability, balancing a long-term agenda with the immediate focus on humanitarian crises, questions about whether consent can serve as a legal basis for data sharing, determining when and how to collaborate with social protection programs, and exploring the potential of decentralised approaches (IFRC, 2023).

Given that people all over the world are dealing with man-made crises and natural hazards (Behr & Huber, 2014), it is important for those involved to communicate with each other and with governmental and non-governmental organisations to ensure a coordinated response to emergencies (Barrantes et al., 2009; Behr & Huber 2012). Therefore, improving interoperability across humanitarian organisations is essential to being able to deliver life-saving aid while adhering to fundamental humanitarian norms.

**Findings**

The findings from the fieldwork have shown that various religious beliefs based on entities with supernatural powers and elements of mysticism are present in the study community. The entities possessing supernatural power may intentionally harm individuals' health, while at times inflicting injuries for reasons beyond their control. Many of the entities also have the power to prevent calamities and treat bodily and mental health disorders, the study community believes. In addition, these beliefs give rise to specific rituals that often incorporate syncretic elements, leading community members to practice rituals drawn from various religious traditions. The *tsebel* practice, for example, is rooted in the belief that saints, angels, the Trinity, and other supernatural entities within the Ethiopian Orthodox Church possess the power to heal health problems.

These beliefs serve as both preventive and therapeutic measures, but primarily they provide rationalisations for the value of religious beliefs in the etiology of illness. The community asserts that the mistreatment of supernatural beings or individuals endowed with

supernatural abilities, disobedience, or any actions that incite hostility may lead to misfortunes and health disorders.

Health practices based on religious beliefs rituals and other cultural elements are present in the study context. These practices have been integral to the study community's culture; yet a significant observation during the fieldwork is the emergence of a new *tsebel* (holy spring water) during the Tigray war. The new *tsebel* emerged in Raya-Alamat'a, specifically in a small village called Akabake, in September 2023. The holy water, attributed to Angel Michael, originates from a spring located adjacent to the newly established church dedicated to Saint Michael, which was founded during the same period.

The ensuing section presents the collected ethnographic data and the developed ontology graph. Based on the ethnographic data, an ontology graph[1] is developed using the Protégé open-source ontology editor, a widely used tool for creating, managing, and visualising ontologies. The tsebel ontology graph visually represents the linguistic, material, and health dimensions of the tsebel traditional practice. It captures script and pronunciation variations in Amharic and Tigrinya languages and in the Raya dialect, including Ge'ez script representations, while also structuring key concepts such as their definition and substance forms.

Additionally, the graph details the function of *tsebel* as holy spring water, names in Amharic, Tigrinya, and the Raya dialect, its specific value in maternal healthcare, various methods of application, and the individuals involved in its utilisation. Moreover, the graph identifies the newly emerged *tsebel*, mapping its location and time of establishment.

### Defining tsebel

The word *tsebel* (Amharic and Tigrinya: ጸበል) in the study area, linguistically, has multiple meanings according to the context in which it is used. The word is used in both Tigrinya and Amharic languages. The following table presents the linguistic, cultural, and material

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[1]The developed *tsebel* ontology graph is available here: Tsebel-Ontology-/Tsebel Ontology.svg at df7f658b36ce2f7822d24e8a48f0e1f1d2d28bff · Beki-21/Tsebel-Ontology-

aspects of *tsebel* and related religious terms, highlighting their definitions, substance forms, languages, scripts, and pronunciations across Amharic, Tigrinya, and the Raya dialects. It illustrates how *tsebel* is understood and categorised in the different languages, showing variations in its meaning, usage, and representation.

**Table 2. Linguistic and material attributes of *tsebel***

Source: field works, January 2024 and January 2025

| Word | Definition | Substance | Language | Script | Pronunciation |
|---|---|---|---|---|---|
| **Tsebel** | A holy substance that has been blessed through prayers by religious leaders. | Soil, ash, or powder | Amharic | እምነት | *Emnet* |
| | | | Tigrinya | እምነት | *Emnet* |
| | | Honey, oil | Tigrinya | ቅባ ቅዱስ | *Qiba-Qidus* |
| | | | Amharic | ቅባ ቅዱስ | *Qiba-Qidus* |
| | | Water | Tigrinya | ማይ ድጋም | *Mai-Dgam* |
| | A holy spring water. | Water | Amharic | ፀበል | *Tsebel* |
| | | | Tigrinya | ፀበል | *Tsebel* |
| | | | | ማይ-ፀሎት | *May-tselot* |
| | | | Raya Dialect | ፀበል | *Tsebel* |
| | | | | ሞንጭሎት | *Monch'olot* |
| | A religious association that observes a monthly tribute dedicated to an angel, the Trinity, or a saint. | N/A | Tigrinya | ዝኽሪ | *Zkri* |
| | | | Tigrinya | ማሕበር | *Mahber* |
| | | | Tigrinya | ፅዋ | *Tsiwa* |
| | | | Amharic | ዝክር | *Zkr* |
| | | | Amharic | ማሕበር | *Mahber* |
| | | | Amharic | ፅዋ | *Tsiwa* |

*Tsebel*, as a holy substance, exists in various forms, including soil, ash, or powder (often derived from roasted barley), oil, honey, or water. The concept is defined differently in Amharic and Tigrinya, as shown

in the table above (Table 1) and the figure below (Figure 1), which provide the script in Ge'ez language and transcriptions in both languages. While the words *Emnet* and *Qiba-Qidus* are commonly used in Amharic and Tigrinya, including in the Raya dialect, to refer to other substances, the phrase *Mai-Dgam* is specifically used for water in Tigrinya and the Raya dialect.
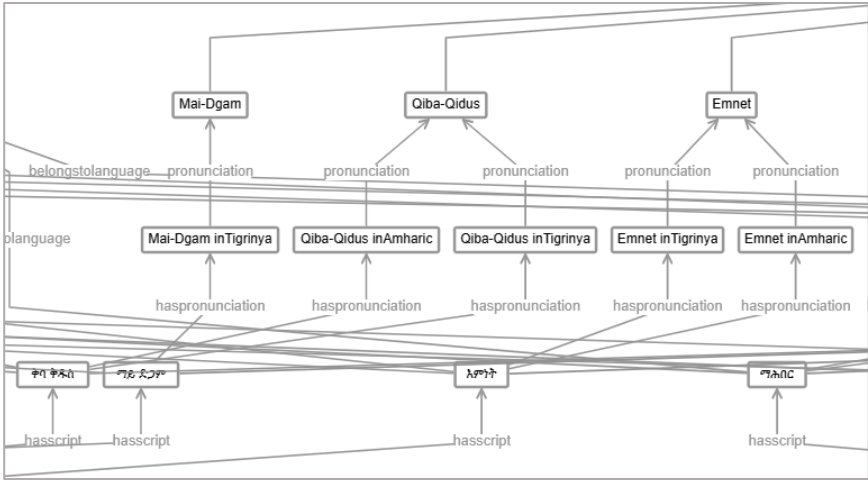


**Figure 1. *Tsebel* as a holy substance, scripts, and pronunciations**

The Ethiopian Orthodox-Tewahdo Church attributes the holy substance under the first definition and the holy spring water to any of the angels or saints. In the third meaning of *tsebel*, a group of people offers a tribute in the form of food and drink. Each month, all members take turns serving the feast at their respective homes. The interest of this study is in the functionality of the *tsebel* with the first and second meanings. Yet, in relation to health, *Mahber* is believed to help for stress management as it has to do with social insurance and sharing feelings including sources stress so that the members of association could help resolve the cause of the stress. The figure below (Figure 2) depicts *tsebel* as a religious association within the broader ontology graph.
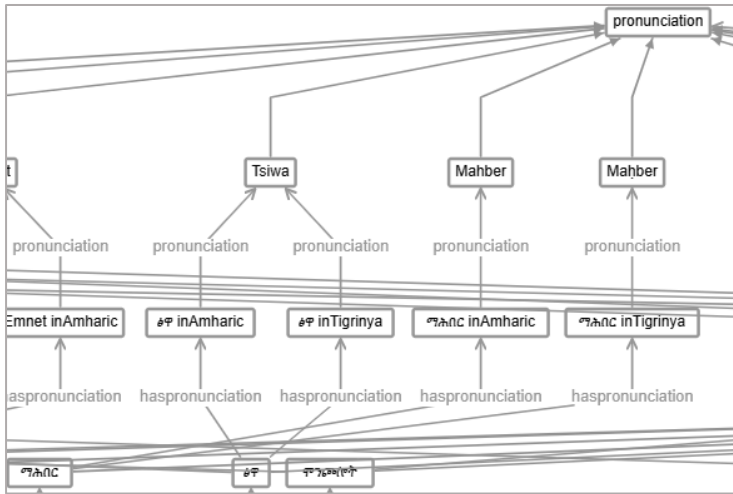
**Figure 2. *Tsebel* as a religious association, scripts, and pronunciations**

The term t*sebel* is universally used in Amharic, Tigrinya, and the Raya dialect to refer to holy spring water. However, in Tigrinya and the dialect of the study community, the words May-tselot and Monch'olot serve as alternative translations, reflecting linguistic diversity in different cultural contexts. The figure below (Figure 3) presents a section of the *tsebel* ontology graph, illustrating the definition and function of holy spring water within this conceptual framework.
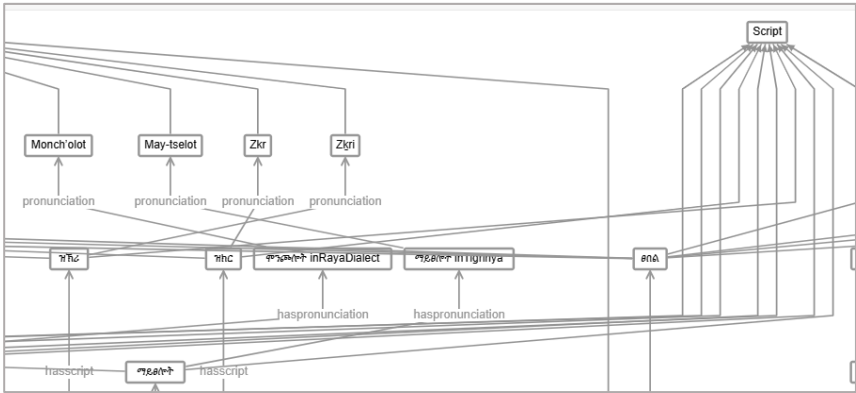


**Figure 3. *Tsebel* is holy spring water, names in Amharic and Tigrigna, and Raya dialect**

The *tsebel,* as holy spring water, is utilised by community members to address a range of physical and psychological health disorders,

including chronic, infectious, and parasitic diseases. The community members use *tsebel* to experience relief from psychological distress and the healing of bodily ailments. While it is used for several health problems, its value specifically in maternal health cases is presented below.

### Tsebel beliefs and practices in maternal health care

In the community, the Raya community, *tsebel* plays a significant value in maternal health, since it combines spiritual with physical rituals. It is believed to guard the mother and the foetus from the beginning of pregnancy. Usually, pregnant women are advised not to pass under spiritually sensitive areas or undertake special activities that might invite bad spirits. Carrying *tsebel* adds an extra layer of security in such conditions. To obtain the health and safety blessings of an angel or a saint, pregnant women may wash and/or drink *tsebel* to ensure a peaceful pregnancy. The common practice is that pregnant women tie *tsebel* (the soil) around their necks throughout their pregnancy period.

To determine which *tsebel* sources are thought to be especially beneficial for maternal health, some families also seek advice from priests or elders. Families frequently use *tsebel* as a spiritual defence against potential issues, which they occasionally attribute to curses or bad spirits. While itis common practice for women to use the *tsebel* of a saint or angel presented in the church of their village, where they receive spiritual services, the *tsebel* of Saint Mary is typically used.

The application of *tsebel* is so much more widespread in childbirth. Due to the belief that it relieves labour pains and protects mother and child from spiritual harm, many of them are customarily sprinkled on the mother or given to her to drink. Bringing along some *tsebel* as an act of faith for protection is done frequently by families when proceeding with their mothers to a birth location, be it home or clinic. Priests may also be requested to pray over the mother, adding their blessings to the potency of the *tsebel*.

The mother and her newborn keep on using *tsebel* even after delivery, which is very crucial for the cultural and spiritual practices of that community. This is a rite of purification for the mother to cleanse her spirit and soul. The community's traditional belief in the

interconnection between the spiritual and material worlds is manifested in the practice of putting *tsebel* on the infant's body as a way of warding off bad luck or evil spirits. In addition, *tsebel* is spread all over the house to bless the newborn and to create a safe and peaceful environment.

Further, *tsebel* has protective functions, especially for pregnant women. Frequently, pregnant women are found carrying a *kitab (Tigrinya: ኪታብ)*, a small book or text that is believed to be an amulet in protecting them from danger or evil spirits. These *kitab* are contained mostly in leather pouches with other ingredients, blessed by religious leaders, deemed to repel disease or bad luck, or spiritual harm. The use of *kitab* shows the reliance of the community on spiritual protection. In other words, the use of *tsebel* during pregnancy, labour, and the postpartum period points to its crucial value in maternal health as a source of comfort, support, and spiritual protection for mothers and their families.

The details of the newly emerged *tsebel (tsebel* Micheal Akabake), detailing key aspects such as time of establishment, location, disclosure permissions for each element, and its value in maternal healthcare along with parts of the ontology graph are presented below.

**Time of establishment**: there are several *tsebel* sites in the study area, with two located specifically within the study Woreda. The most recent *tsebel* emerged in September 2023, in adjacent Woreda of the study area.

**Location**: Africa, Ethiopia, Tigray reginal state, Southern Tigray Zone, Raya-Alamata Woreda, T'abya Garjale, Village Akabake. GPS Coordinates: 12°27'07''N, 39°37'55''E.
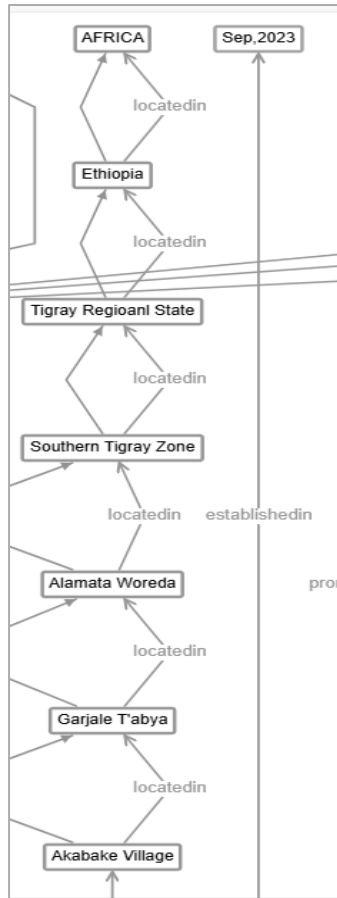
**Figure 4. Location and time of emergence of *tsebel* Micheal Akabake**

The figure above (Figure 4) illustrates the location and time of emergence of *tsebel*. In the context of this study, there are no restrictions on sharing the name, location, time of emergence, and function of the specific *tsebel* case, nor are there any limitations on sharing similar information about other similar holy spring water sites.

**Use in maternal health care:** there are three aspects in which *tsebel* is used in maternal health care. *Pregnancy Protection: tsebel* is thought to protect expectant mothers and their unborn children from evil spirits, curses, and spiritual harm. To ensure a safe pregnancy, women frequently carry tsebel (usually in soil) tied around their necks and drink or wash with tsebel. *Assistance Throughout Childbirth and Labor:* to

relieve labour pains and guard against spiritual threats, women are given *tsebel* to drink or sprinkle on during childbirth. Priests may pray over the mother to increase the power of *tsebel*, which families frequently bring to the birthplace (a house or even a clinic). *Spiritual cleansing and postpartum rituals: tsebel* is used for protection and purification after delivery. It is applied to the mother and infant to ward off bad spirits and spread around the house to bless the newborn for added spiritual protection.
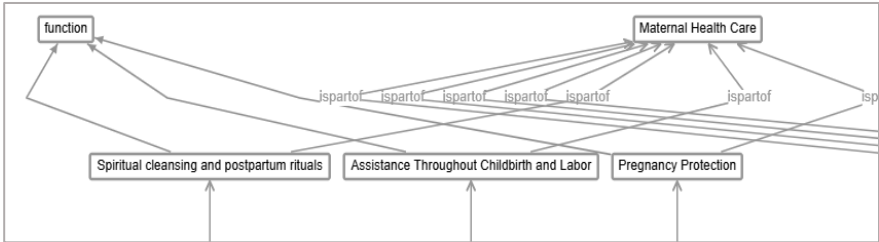


**Figure 5. Functions of the *tsebel* on maternal health**

To provide further insight, this section of the ontology graph illustrates the value of *tsebel* particularly in maternal healthcare, emphasising its significance in pregnancy protection, childbirth assistance, and postpartum rituals, in addition to its broader health-related functions.

**Activities:** *Tsebel* can be applied through drinking, bathing, spraying, or anointing, depending on the specific health condition being treated. The application may involve the intervention of religious leaders, such as priests, or it can be self-administered by individuals.
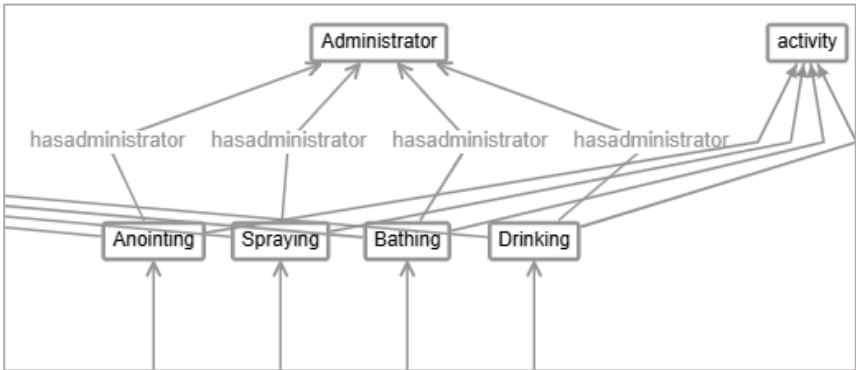


**Figure 6. Activities employed to use the *tsebel* and administrators**

The figure above (Figure 6), extracted from the ontology graph, illustrates the different ways in which *tsebel* is applied based on the specific health condition being treated. Its administration may involve religious leaders, such as priests, or it can be used independently by individuals.

### FAIR semantic ontologies

For academics, health practitioners, and humanitarian workers, understanding local vocabularies with their cultural specificity is essential for effective consultation and engagement within the area. The engagement with health practitioners, anthropology and health researchers, and humanitarian experts underscored the need to systematically inventory key vocabularies used by community members, document their meanings, and ensure accessibility for professionals across these fields. This initiative enhances the understanding of cultural nuances embedded in terminologies related to traditional and health practices, fostering cross-disciplinary communication and more culturally responsive healthcare interventions. In this case, an interviewee stated the following:

> *Even for someone fluent in the local language, understanding how community members describe their illnesses or potential treatments is nearly impossible without a deep knowledge of the cultural context. While some words may appear straightforward, a closer examination reveals their intricate connections to the community's explanations of sickness causation and their belief in specific treatments as ideal. This complexity highlights the importance of cultural insight in interpreting such terms.* Bereket interview with AH, phone, 19 January 2025

This source highlights that a thorough cultural awareness is necessary to comprehend health-related phrases in a culture, going beyond linguistic competency. Words pertaining to disease and treatment are more than simply labels; they are ingrained in the community's perspectives. Even seemingly straightforward terminology might be misunderstood if one is not aware of these cultural settings, as they represent complex local conceptions of health and illness. Because it uncovers the deeper meanings and relationships that influence health behaviours in the community, a culturally informed viewpoint is therefore crucial for correctly interpreting these terms.

Relevant ontologies are essential for improving the representation, categorisation, and interoperability of indigenous health practices, particularly in emergencies, according to medical professionals, anthropologists, health researchers, and humanitarian specialists who participated in the study. These ontologies facilitate improved integration into national and global health systems by methodically organising culturally specific medical knowledge into semantic frameworks. This guarantees that traditional sickness causes are recognised, and cultural healing methods are acknowledged and successfully used in emergency and humanitarian medical interventions.

An expert on FAIR semantic ontologies describes ontologies as "methods used to model and represent specific knowledge of the world" (Bereket, interview with RK, Google Meet, 31 January 2025). The interviewee further noted that before engaging in modelling, researchers must carefully consider the intended application of the ontology within the specific context of their study. To optimise the interoperability of indigenous health practices, it is essential to balance the culturally specific meanings of local concepts with their broader generalisability. This ensures that these concepts are not only meaningful within the study community but also applicable beyond it. By establishing standard definitions, the ontology modelling process can facilitate both wide usability and context-specific applicability to regions and communities.

A conversation with researchers at the Digital Health Research and Development Center at Mekelle University also confirmed that such practices have the potential to improve data representation and interoperability of indigenous health practices in a crisis context and that there are procedures to validate against a set of available parameters derived from the FAIR framework.

While the purpose of defining terminologies in the study of religious syncretism and health practices is context-specific and tailored to the study area, the exercise adds significant value to the research. The inventoried terms, along with their context-based definitions, could be published on digital platforms to ensure accessibility and facilitate the interoperability of the data. Additionally, "incorporating these ontologies into a national database would enable researchers, health

practitioners, and humanitarian workers engaged in tasks within the area to access and reuse the data effectively" (Bereket interview with SA, face-to-face, Mekelle, 17 January 2025).

As demonstrated by this case study and illustrated in the figures above, a semantic model based on meaning can be developed using detailed ethnographic data. This pilot proves that by standardising the gathering, organisation, and sharing of data in alignment with the FAIR architecture, the approach can promote more efficient collaboration, data reuse, and coordinated responses among diverse organisations. This increased interoperability could ultimately improve the effectiveness of any work aimed at improving the health-seeking behaviour of the study community. Hence, the researchers' assessment of the exercise is that the approach holds substantial promise for promoting interoperability across humanitarian organisations, health institutions, and research centres.

### Community epistemological sovereignty

The ethnographic findings of this study highlight the importance of adhering to specific protocols when accessing the study case *tsebel* or similar holy water sites. While the study community has various taboos, also particularly in religious rituals, those specific to *Tsebel* are designed to preserve the sanctity of the holy water. These include removing shoes upon entering the compound, fully undressing, including underwear, before bathing, adhering to gender-segregated bathing areas, and avoiding the use of soap or other modern sanitary items within the bathing space. Sensitivity to these and other site-specific protocols is essential when engaging with *tsebel*. This finding underscores the need for careful consideration of community knowledge sovereignty even at the data collection stage, long before any knowledge is shared or disseminated.

The practical insights from this case—utilisation of *tsebel* as a spiritual and medical choice—indicate that there are no community knowledge restrictions regarding the *tsebel* (holy spring water) that must remain undisclosed. For example, there are no limitations on sharing details about its name, location, time of emergence, or function. However, it is notable that certain rituals in the study community have restrictions on disclosing their practices. This is

because some rituals are performed at the family level, and family members prefer to keep these practices private, avoiding their disclosure to others. While these practices can be discussed in a general sense, sharing specific individual or family information remains a sensitive matter.

In discussions about the disclosure and digitisation of knowledge, an interview with an expert revealed that certain ethnographic data, such as rituals, may not be shared in their original form. 'As a researcher, one is expected to witness and demonstrate that these practices exist, but instead of presenting the raw data directly, a derivative representation should be provided' (Bereket interview with GS, Google Meet, 29 January 2025). In emic-based ethnographic studies, certain aspects of community knowledge may be difficult to fully articulate or translate. Ethnographers may gain access to this knowledge but are not necessarily entitled to share everything they observe, as some elements remain embedded within the community's own epistemic and cultural frameworks.

Regarding the digitalisation of community knowledge, particularly what information may or may not be disclosed, the interviewee emphasised that technology should adapt to the context of community knowledge, rather than assuming that all knowledge must conform to technological methods. He argued that " technology is all about thingifying thoughts and communities do not thingify - and good for them" (Bereket interview with GS, Google Meet, 29 January 2025).

The above perspective highlights the fundamental difference between the technological structuring of knowledge and the organic, lived epistemologies within communities. While technology aims to transform abstract ideas into concrete applications, communities preserve their shared values by resisting such simplification, thereby maintaining the rich diversity inherent in human social structures. In summary, digital tools should be designed to respect and align with indigenous ways of knowing, rather than imposing external frameworks or attempting to reshape knowledge generation to fit within these technological structures.

**Discussion**

This paper has provided an integrative thesis of a study examining the intersection of religion and health practices within a conflict-affected environment. The findings underscore the dual impact of war on communities, exacerbating humanitarian crises while simultaneously fostering the emergence of traditional health practices as adaptive mechanisms. The case of the community's reliance on *tsebel*, a holy spring water, highlights the critical value of religiously embedded health practices in addressing health challenges when formal systems falter. This convergence of religious rituals and traditional healing practices offers valuable insights into how war-affected communities navigate their health needs amidst systemic disruption.

The results illuminate the need for a broader understanding of how such practices function, not only as coping strategies but also as culturally ingrained systems of care. The case study has revealed that there are several vocabularies used by the study community as they practice religious beliefs and rituals that affect their health practices.

By examining these practices, the study uncovers valuable insights into the intersections of culture, particularly in contexts like the study area where syncretism prevails, health, and conflict, all of which are underexplored. Moreover, this study emphasises the transformative potential of integrating traditional health practices into formal health systems. Doing so can bridge the gap between local knowledge and global frameworks, enabling a more nuanced and effective humanitarian response and health interventions. Incorporating these practices into digital health ontologies would not only validate their value in community health but also provide actionable data to inform culturally appropriate and context-sensitive interventions.

While FAIR Semantic Ontologies enhance data accessibility and usability, Indigenous Data sovereignty can be upheld. This means ensuring community control over data collection, storage, and sharing, respecting consent, cultural protocols, and governance frameworks. Ethical data-sharing practices and context-sensitive policies help balance open data benefits with community autonomy. Integrating FAIR principles with indigenous sovereignty ensures ethical knowledge representation while preserving cultural integrity.

The research found that understanding the socio-political and other context-based factors that enable the re-emergence and adoption of these practices during crises, such as the newly emerged *tsebel*, can provide valuable insights into how communities adapt and build resilience in the face of systemic disruptions. Furthermore, examining the relationship between religious beliefs and health-seeking behaviours sheds light on the broader implications of these practices for community health and survival strategies.

Incorporating traditional health practices into formal digital health ontologies presents a significant opportunity to enhance their recognition and integration within global health systems. Developing frameworks that accurately map these practices ensures their visibility and relevance in wider health science. Such frameworks should be created in collaboration with local practitioners, religious leaders, and community members to reflect cultural nuances and practices authentically. Leveraging digital tools to collect, analyse, and share data on the prevalence and outcomes of these practices can provide critical insights for improving the design and implementation of health interventions.

Health interventions should be designed to complement traditional practices, ensuring they align with community needs and values. Humanitarian responses must also evolve to be more culturally informed and inclusive. Training humanitarian workers to understand and respect these practices could foster trust and cooperation between affected populations and aid providers. Moreover, allocating resources to assess and integrate emerging practices and producing accessible health ontologies into public health initiatives will enhance the effectiveness and cultural appropriateness of these interventions.

Advocacy and policy efforts are crucial to recognising and supporting traditional health practices in global health frameworks. Multisectoral collaborations among humanitarian agencies, health organisations, and academic institutions should focus on bridging the gap between traditional and formal health systems. By championing the inclusion of traditional practices in global health policies, stakeholders can ensure that these culturally rooted strategies are not only acknowledged but also utilised to address health challenges in conflict and crisis settings effectively.

The study concludes that further research on traditional health practices in conflict-affected areas is essential. Ethnographic studies should delve deeper into the origins, cultural significance, and perceived effectiveness of these practices as they keep affecting the health practices of communities.

**Conclusion**

The study investigated the emergence of a new holy water source in 2023 in the Raya area in Ethiopia following the war in the region. The research explored the phenomena of newly emerging traditional health practices, which emerge in the context of war. The study was carried out with an ethnographic case study.

The study found that the word *tsebel* (ፀበል) has three different definitions depending on its context. It is written and used in both Amharic and Tigrigna languages, as well as in the local dialect of the Raya area. However, in Tigrigna, its vocabulary varies and also differs within the specific dialect of the study area. The newly emerged holy spring water following the war in the region has been used to address various health disorders, including maternal health. The case study examines the value of holy spring water specifically in maternal healthcare, revealing its three key functions: pregnancy protection, childbirth assistance, and postpartum rituals. Based on these ethnographic findings, the study piloted the development of an ontology within health semantics with cultural specificity, using the case of the newly emerged holy spring water as a case.

By organising culturally specific health information into standardised digital frameworks, relevant ontologies enhance the representation and interoperability of indigenous health practices, facilitating their integration into national and international health systems. Incorporating these ontologies into vocabulary databases further strengthens their accessibility and usability within humanitarian data frameworks. Additionally, procedures are needed to FAIRify traditional health practices, ensuring secure and ethical data handling in crisis settings. These ontologies guarantee that local health beliefs and treatment practices are acknowledged in crises, making medical and humanitarian efforts more successful and culturally sensitive.

Procedures like contextual definitions, metadata standardisation, systematic documentation of local terminologies, and ethical data-sharing frameworks are necessary to FAIRify traditional health practices. These actions provide community-driven control over data representation while improving findability, accessibility, interoperability, and reusability (FAIR).

The study also highlights that ontology development must be ethically guided, respecting cultural sensitivities, limiting the disclosure of private rituals, and ensuring that technology adapts to indigenous knowledge systems rather than imposing external frameworks. This approach preserves community knowledge sovereignty while ensuring secure data handling. To preserve the scope and context of traditional knowledge and to facilitate its responsible and moral application in humanitarian and medical interventions, digital tools should be formed to support indigenous epistemologies.

In summary, FAIRifying traditional health practices requires systematic documentation, metadata standardisation, and ethical data-sharing to ensure Findability, Accessibility, Interoperability, and Reusability (FAIR principles). The findings of the study suggest for a development of a methodical process for compiling a list of the vocabulary that the study community uses in the course of their religious rituals and beliefs. These practices significantly influence their health-seeking behaviours, providing valuable insights into the interplay between linguistic, traditional practices and health. By recording these vocabularies and publishing on certain digital platforms, the study emphasises the necessity of comprehending linguistic and cultural subtleties to address health-related issues and create healthcare solutions that are more culturally responsive.

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## Authors' Contributions

As part of his PhD study, the first author drafted the chapter based on his fieldwork and ethnographic data. He defined the problem, integrated relevant theoretical concepts and literature, presented findings, discussed insights, and formulated conclusions. He also identified data for the ontology graph and integrated figures, providing detailed descriptions of their content. The second author played a key advisory value, guiding the development of ontology-based health semantics with cultural specificity, advising on the selection of ethnographic data essential for the ontology graph, and providing feedback on the chapter structure and content revisions. The third author developed the ontology graph using Protégé, with data provided by the first author and guidance from the second author.

**Bereket Godifay Kahsay:** Methodology, Conceptualization, Writing of the first text of the chapter, Overall Analysis, Validation, Review & Editing.

**Mirjam van Reisen**: Conceptualization, Supervision, Validation, Review & Editing.

**Chengdu Lin:** Visualization- development of the ontology graph based on ethnographic date provided by the first author.

The publication of this chapter is as part of the PhD study of the first author.

**Ethical Considerations**

The first author received administrative and ethical clearance from the Department of Anthropology, Institute of Palaeoenvironment and Heritage Conservation at Mekelle University to conduct the fieldwork.

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