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TULAK BALA IN THE PERSPECTIVE OF LOCAL WISDOM AND SCIENCE IN ACEH: A LITERATURE REVIEW

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ABSTRACT

Aceh is among the most disaster-prone regions in the world, exposed to subduction-zone earthquakes, tsunamis, active faults, and increasingly severe floods and landslides. Alongside scientific mitigation, Acehnese communities inherit Tulak Bala, a set of prayers, communal meals, and village rituals, including Rabu Abeh in the month of Safar, intended to ward off misfortune. This article aims to examine Tulak Bala from the perspectives of local wisdom and science and to propose how the two can be combined for disaster mitigation. Using a narrative literature review, the study analyzed 22 sources, mostly peer-reviewed articles published between 2005 and 2026, selected through screening of titles, abstracts, and full texts and synthesized thematically. The review shows that Tulak Bala works mainly as spiritual coping, social capital, and a recurring communal gathering, while it offers no physical protection against hazards, and communities interpret it in varied ways. Smong, the oral warning tradition of Simeulue, shows that local knowledge saves lives when it encodes accurate, memorable instructions for action. The article proposes an ethnoscience and co-creation approach in which ritual gatherings become venues for risk communication, evacuation rehearsal, and the co-design of cultural media, without reducing their spiritual meaning. Field testing of this proposal is recommended.

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INTRODUCTION

Aceh lies at the edge of the Sunda subduction zone. The earthquake of 26 December 2004, with a moment magnitude of about 9.1 to 9.3, ruptured roughly 1,600 kilometers of the plate boundary, and its tsunami caused more than 283,000 deaths across the Indian Ocean region (Lay et al., 2005). On land, the Aceh segment of the Great Sumatran Fault is active and has been divided into seven sub-segments (Hady & Marliyani, 2021). Hydrometeorological hazards are now just as pressing. On 26 November 2025, flash floods and landslides struck Aceh, and the provincial village-government office reported that

about 22 villages and hamlets in seven districts were lost; residents and environmental groups linked the disaster to long-term forest loss and river degradation (Mongabay Indonesia, 2026). In October 2026, the national disaster management agency again warned of follow-up floods and landslides in Nagan Raya and Aceh Barat Daya (NU Online, 2026).

Against this background, Acehnese communities maintain Tulak Bala (literally, repelling calamity), a tradition passed across generations to ward off misfortune and disease (Manan et al., 2021; Saputra & Zuriah, 2020). One of its best-known forms is Rabu Abeh, held on the last Wednesday of the month of Safar, which usually involves communal prayer, a shared meal, torch processions, and, in some places, bathing in rivers or the sea (Husda et al., 2026; Ismawan & Misbah, 2025). The ritual has been examined as a living Qur'an practice through the recitation of Surah Yasin (Makmunzir et al., 2023), and comparable tolak bala rituals exist elsewhere in Sumatra, from Riau to West Sumatra (Aprila & Hendri, 2026; Nizom et al., 2020).

Existing studies mostly describe the procedures, theology, and social meaning of the ritual. Few place it in conversation with disaster science, that is, ask what it can and cannot do for risk reduction. Research on Acehnese local wisdom for disasters has concentrated on smong, the oral warning tradition of Simeulue (Kaksim et al., 2023; Kurniasih et al., 2020; Syahputra, 2019), and on religion as a source of social capital and resilience (Kasim et al., 2021; Khairunnisa et al., 2025). Internationally, scholars argue that indigenous and scientific knowledge should be combined through participatory frameworks rather than treated as rivals (Gaillard & Mercer, 2013; Mercer et al., 2010).

This article therefore has three objectives: (1) to synthesize how Tulak Bala and Rabu Abeh are described in the literature; (2) to compare their reported functions with scientific understanding of Aceh's hazards and of community resilience; and (3) to propose an ethnoscience and co-creation approach for revitalizing the tradition as a resource for disaster mitigation. The paper is conceptual. It is based on published literature and reports no new field data, so its propositions need empirical testing.

RESEARCH METHODOLOGY

This study uses a narrative literature review, a qualitative design suited to integrating findings from ethnographic, theological, geophysical, and psychological studies that cannot be pooled statistically. The review followed the four stages shown in Figure 1: identification, screening, feasibility assessment, and inclusion.

In the identification stage, the literature was searched between October and November 2026 through web searches of journal websites, repositories, and publisher

pages, including Indonesian journal portals and international publishers. Search terms in Indonesian and English combined "Tulak Bala", "tolak bala", "Rabu Abeh", "smong", "kearifan lokal", "etnosains", "mitigasi bencana", "Great Sumatran Fault", "indigenous knowledge", and "disaster risk reduction". In the screening stage, titles and abstracts were assessed against four criteria: the record concerns Tulak Bala or similar rituals; it concerns local knowledge for disasters in Aceh; it describes Aceh's hazards; or it offers a framework for integrating local and scientific knowledge. Peer-reviewed articles and conference proceedings were preferred. Foundational international works were retained regardless of age, and non-scholarly sources were limited to two items used only for recent event data. Records without identifiable authorship or bibliographic details were excluded.

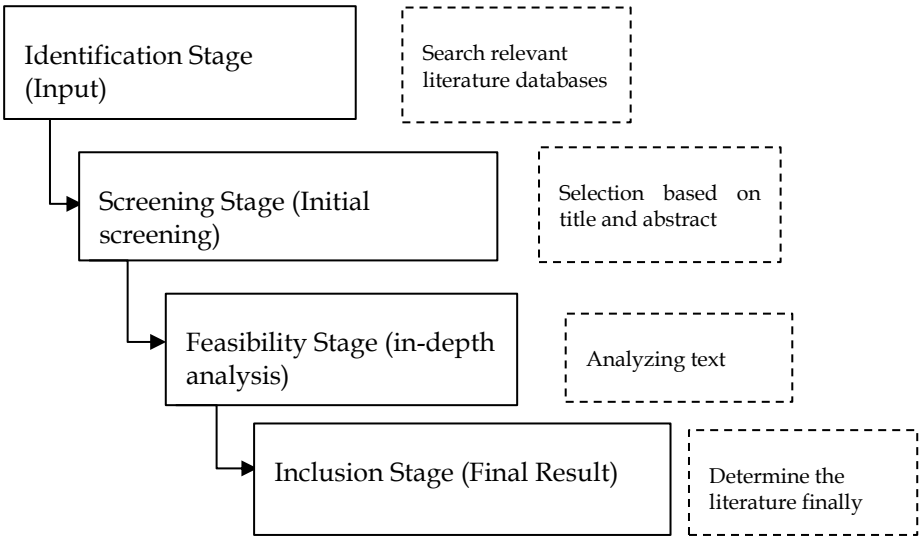


Figure 1. Literature Selection Process

In the feasibility stage, the remaining records were read in full where access allowed; where only an abstract was available, claims were restricted to what the abstract states. The inclusion stage produced a final corpus of 22 sources. Data were analyzed by thematic synthesis. Each source was coded for ritual forms, meanings, social functions, hazard-related knowledge, and mechanisms of knowledge integration, and the codes were then compared with the scientific literature on hazards and resilience. Trustworthiness was supported by drawing on primary peer-reviewed sources, citing every claim, and separating what the sources report from the authors' own interpretation. The main limitations are that the search was not exhaustive, that only Indonesian and English sources were considered, and that no formal quality scoring was applied.

RESULT AND DISCUSSION

Characteristics of the Reviewed Literature

The final corpus comprises 22 sources. Six are international: five journal articles and one proceedings paper from an international conference. Fourteen are national journal articles, and two are online news reports used for recent event data. Seventeen sources were published between 2020 and 2026, and five are older foundational or contextual works. Seven sources deal directly with Tulak Bala or comparable tolak bala rituals; they are summarized in Table 1.

Table 1. Studies of Tulak Bala and Comparable Rituals

Source	Setting	Focus	Main finding
(Manan et al., 2021)	Aceh	Tulak Bala during COVID-19	Annual and as-needed forms; mixed views, with faith combined with precaution
(Saputra & Zuriah, 2020)	Aceh	Tulak Bala and the coronavirus	Torch parades, prayers, shared porridge, and hygiene and distancing customs
(Husda et al., 2026)	Sawang, South Aceh	Jalateh in Rabu Abeh	Torch walk, riverside prayer and meal; eases anxiety, strengthens solidarity
(Ismawan & Misbah, 2025)	Aceh Barat	Scholars' views (MUDAB)	Acceptable if consistent with Islamic law; discourages reliance on objects
(Makmunzir et al., 2023)	Southwest Aceh	Yasinan in Rabu Abeh	Yasin recitation as prayer and protection; social bonding
(Aprila & Hendri, 2026)	Padang Pariaman	Bagatik tulak bala	Dhikr, torches, drums, shared meal; symbols of protection and togetherness
(Nizom et al., 2020)	Riau	Atib Ko Ambai ritual	Annual pilgrimage ritual; views on Islamic compatibility vary

The table shows that the literature is dominated by qualitative, descriptive studies from Aceh, with comparative cases from Riau and West Sumatra. None of the reviewed studies, as far as their texts and abstracts show, measured whether participation in the ritual changes disaster preparedness or outcomes. This is the main evidence gap identified by the review.

Tulak Bala and Rabu Abeh as Living Practice

The literature describes Tulak Bala in two forms. The first is an annual observance in Safar, locally called Rabu Habeh or Mano Safa, which may include bathing in a river or the sea. The second is performed when a specific threat appears, as happened during the COVID-19 pandemic (Manan et al., 2021). Typical elements across Aceh are collective

prayer and recitation, torch processions through the village, food sent to the mosque or shared among neighbors, and, in some households, protective amulets (Ismawan & Misbah, 2025; Manan et al., 2021). In Sawang, South Aceh, men walk the village with bamboo torches reciting prayers under the guidance of the teungku imum, and the community gathers at the river the next day for prayer and a shared meal prepared by women (Husda et al., 2026).

Participants interpret these practices as worship and as a spiritual safeguard. In Aceh Barat Daya, the community links Surah Al-Qamar (54:19), which refers to a day of misfortune, to Rabu Abeh and responds by reciting Surah Yasin together as a prayer for protection (Makmunzir et al., 2023). At the same time, the ritual eases collective anxiety, strengthens solidarity, and expresses a blend of adat and Islamic values; the authors note that modernization has shifted some views, although many residents still see the ritual as compatible with Islam (Husda et al., 2026). Similar symbolism appears in the Minangkabau bagatik tulak bala, where torches, incense, drums, and almsgiving represent protection, purification, and togetherness (Aprila & Hendri, 2026).

Interpretations are not uniform. During the pandemic, most residents in an Acehnese study agreed to perform the ritual, but many rejected the belief that the ritual itself prevents disease, holding that illness comes from God and that prayer must be combined with precautions (Manan et al., 2021). A study of Aceh Barat's ulama council (MUDAB) found that scholars regard the tradition as acceptable as long as it does not conflict with Islamic law, and they discourage reliance on objects as protection because it borders on shirk (Ismawan & Misbah, 2025). Comparable debates exist in Riau, where views on whether a tolak bala ritual fits Islamic norms depend on the community's intentions (Nizom et al., 2020). These findings indicate that, for many participants, Tulak Bala is a complement to practical effort, in line with the Islamic principles of ikhtiar (effort) and tawakal (reliance on God), rather than a substitute for it.

Some practices reported during the pandemic also carry protective behaviors. Saputra and Zuriah describe sharing porridge with neighbors, bathing, a water jug at the doorway for cleansing, henna worn on alternating fingers as a signal of distancing, and isolating the sick, which the authors present as ways of promoting hygiene and limiting transmission (Saputra & Zuriah, 2020). These interpretations come from a qualitative study and have not been tested epidemiologically, but they show that ritual and practical precaution can coexist in the same tradition.

The Hazard Context: What Bala Means in Scientific Terms

Scientific research gives "bala" in Aceh specific physical and social-ecological meanings. For earthquakes and tsunamis, the 2004 event ruptured about 1,600 kilometers of the Indo-Australian and Eurasian plate boundary, with fault slip of around 15 meters near Banda Aceh (Lay et al., 2005). The Aceh segment of the Great Sumatran Fault has also been mapped as seven sub-segments with field evidence of right-lateral movement; the authors argue that treating it as a single segment overestimates the possible earthquake size, which would approach magnitude 8, compared with the magnitude 6 to 7 events in the historical record (Hady & Marliyani, 2021). Science cannot predict when such an event will occur, and Davies et al. add that major disasters are too rare in any one locality for statistics to predict their timing reliably at the community level (Davies et al., 2015). What science offers is hazard mapping, building standards, early warning, and rehearsed evacuation.

For floods and landslides, reporting after the November 2025 disaster stresses human-made drivers. Citing the forest-monitoring group HAkA, Mongabay Indonesia reports that Aceh lost 90,108 hectares of forest between 2015 and 2024, and it quotes environmental groups who point to oil palm expansion, mining, and illegal gold mining in river basins. A disaster expert cited in the same report explains that loss of forest cover lets rainwater run off at the surface, erode slopes, and silt up rivers (Mongabay Indonesia, 2026). These are views of sources quoted in a news report rather than verified findings, but they match the broader scientific understanding that land use and river-basin condition shape flood impacts. The national disaster agency's guidance is equally practical: clean rivers and drainage before the peak rainy season, map vulnerable areas, prepare evacuation routes, and watch for cracks in hillsides, muddy river water, and tilting trees (NU Online, 2026).

Therefore the "bala" that Acehnese communities now face is partly geophysical and partly produced by land-use decisions. Prayer can give meaning and courage, but it cannot repair a watershed or retrofit a school. This does not make the ritual irrelevant. It means that its value should be assessed according to the functions it can actually perform.

Local Wisdom for Mitigation: Lessons from Smong and Religious Resilience

The best-documented Acehnese example of local knowledge that saved lives is smong in Simeulue. Its chants consist of a five-stanza poem that explains what a tsunami is and how to escape it, with little figurative language, and the authors link the tradition to the low death toll on Simeulue in 2004 (Kaksim et al., 2023). Smong has been described as a traditional early warning system that could be adapted elsewhere (Kurniasih et al., 2020),

and a study of Acehnese communities found that many still practice indigenous knowledge for emergency management because they see its value (Syahputra, 2019).

Smong also shows what happens when tradition meets modern media. Digital media, animated videos, and school curricula have raised awareness among young people, but modernization risks commercialization and oversimplification that can weaken the story's authenticity (Elanira et al., 2024). Because the tale is traditionally taught in the Devayan language, an animated children's version in Indonesian was created to widen its reach (Raden et al., 2024). From these cases, three conditions can be inferred under which local knowledge works as mitigation: its content is accurate about natural phenomena, its form is memorable, and its channel of transmission remains alive in everyday life. This inference is the authors' own synthesis.

A second body of research concerns religion and resilience. In Banda Aceh, religious values such as monotheism, patience, sincerity, reliance on God, and solidarity function as social capital, transmitted through families and religious leaders, and they contribute to resilience in facing disasters (Kasim et al., 2021). In a survey of 250 disaster-affected residents in Bireuen, local wisdom predicted both Islamic spirituality and social resilience, and spirituality in turn predicted resilience, explaining 58.2 percent of its variance (Khairunnisa et al., 2025). Together these studies support the claim that rituals such as Tulak Bala may contribute to resilience mainly through psychological and social pathways.

Reading Tulak Bala through Science

Table 2 maps the elements of Tulak Bala reported in the literature to their social functions and to a scientific reading. The mapping is an analytical synthesis by the authors and is offered as a set of hypotheses for field testing.

Table 2. Elements of Tulak Bala and Their Scientific Reading

Element	Function reported	Scientific reading
Collective prayer and recitation	Spiritual coping; sense of protection (Husda et al., 2026; Makmunzir et al., 2023)	Supports psychological coping; does not alter the hazard
Shared meals and almsgiving	Solidarity and sharing (Husda et al., 2026)	Builds social capital usable for mutual aid and logistics
Gathering at meunasah, mosque, or dayah	Communal space and moral authority (Kasim et al., 2021)	Ready venue for risk communication and drills
Torch processions	Collective participation (Husda et al., 2026)	Chance to rehearse evacuation routes (proposed)
Bathing in rivers or sea in Safar	Symbolic cleansing (Manan et al., 2021)	Possible exposure in extreme weather; needs safety guidance (inference)

Element	Function reported	Scientific reading
Amulets and protective objects	Symbolic protection (Manan et al., 2021)	No evidence of physical protection; discouraged by scholars (Ismawan & Misbah, 2025)
Hygiene and distancing customs	Reported during COVID-19 (Saputra & Zuriah, 2020)	Consistent with public health measures; untested

Two strengths emerge. First, the ritual works as spiritual coping, giving communities a shared way to face uncertainty (Husda et al., 2026; Makmunzir et al., 2023). Second, it renews social capital: shared meals, almsgiving, and gatherings under the guidance of trusted religious leaders keep the networks and moral authority that matter when disaster strikes (Kasim et al., 2021; Khairunnisa et al., 2025). Rabu Abeh also brings people together every year in a known place at a known time, which is exactly what risk communication and evacuation drills need.

There are also limits. Ritual does not change the physical hazard, and no source in this review demonstrates a protective effect against disease or disaster. The main risk is false security if participants treat the ritual as sufficient; the scholars and residents cited above explicitly reject that view (Ismawan & Misbah, 2025; Manan et al., 2021), but groups with less exposure to education may still hold it. Some practices may also expose participants to harm under extreme conditions, such as bathing in rivers or the sea during heavy rain or high waves. This last point is an inference by the authors rather than a finding of the reviewed studies, and it implies that guidance from religious and disaster authorities should accompany such practices.

Toward Ethnoscience and Co-creation

Ethnoscience studies knowledge held within a community and examines it with scientific concepts. In science education, for example, a local practice can be analyzed to reveal the science it embodies, so that culture becomes a bridge to scientific ideas (Nurrubi et al., 2022). In disaster research, Mercer et al. propose a participatory framework for combining indigenous and scientific knowledge to reduce community exposure to hazards (Mercer et al., 2010), and Gaillard and Mercer emphasize bridging the gap between knowledge and action (Gaillard & Mercer, 2013). Davies et al. suggest that communities, local officials, civil society organizations, and scientists form teams to co-develop local hazard scenarios that guide long-term resilience plans (Davies et al., 2015). Co-creation, in this sense, means that residents, ulama, adat leaders, researchers, and government design solutions together instead of receiving programs from outside.

Drawing on these frameworks and on the Acehnese cases reviewed above, we propose six steps. First, document Tulak Bala and Rabu Abeh participatively in several gampong, recording variations, prayers, foods, taboos, and memories of past disasters. Second, validate the knowledge embedded in them, such as signs of heavy rain, river behavior, and slope conditions, against data from the meteorological and disaster agencies and geological studies, in the spirit of ethnoscience. Third, embed short risk messages and rehearsals in ritual gatherings, for example a brief talk from a trusted religious leader and a walk along the evacuation route during the torch procession. Fourth, co-create cultural media, such as chants, hikayat, or animations, that pair religious values with action instructions, learning from smong while avoiding its commercialization (Elanira et al., 2024; Raden et al., 2024). Fifth, bring the results into school local-content materials (Nurrubi et al., 2022). Sixth, evaluate jointly, measuring changes in knowledge, attitudes, and preparedness before and after the program, and revise the design with the community.

Three ethical principles apply. The spiritual meaning of the tradition must not be reduced to a tool for outreach. Religious and adat leaders, including scholars' bodies such as MUDAB (Ismawan & Misbah, 2025), must be equal partners. And the community must decide which parts of the tradition are open to study and adaptation. These principles reflect the participatory emphasis of the integration frameworks above (Mercer et al., 2010) and the authenticity risks identified for smong (Elanira et al., 2024).

Limitations

This review has limits. The search was not exhaustive, sources are limited to Indonesian and English, and some sources could be assessed only through their abstracts. Two of the 22 sources are news reports, used only for recent events and treated as reports of what quoted actors say. Several older works, such as Lay et al. (Lay et al., 2005), Mercer et al. (Mercer et al., 2010), Gaillard and Mercer (Gaillard & Mercer, 2013), and Davies et al. (Davies et al., 2015), fall outside a ten-year window and were kept as foundational references. Finally, the mapping in Table 2 and the six-step approach are conceptual proposals, not empirical findings.

CONCLUSIONS AND SUGGESTIONS

This literature review shows that Tulak Bala and Rabu Abeh are living traditions with strong religious and social meaning. Their documented strengths lie in spiritual coping, solidarity, and a recurring communal gathering that is trusted by residents. They do not provide physical protection against earthquakes, tsunamis, floods, or landslides, and the

reviewed sources suggest that many communities and scholars themselves understand the ritual as a complement to practical effort. Experience with smong demonstrates that local knowledge saves lives when it carries accurate, memorable instructions for action and remains alive in everyday transmission.

Treating the ritual and science as partners is therefore both possible and desirable. An ethnoscience and co-creation approach can use Rabu Abeh gatherings for risk communication, evacuation rehearsal, and the co-design of cultural media, while protecting the tradition's spiritual meaning and the authority of its custodians.

Suggestions

Future research should test these propositions in the field. We recommend a mixed-methods study in several Acehnese gampong that compares preparedness among ritual participants and non-participants, combined with participatory documentation of local variants. A pilot co-creation program should be run with village governments, ulama councils, regional disaster agencies, and schools, and evaluated with before-and-after measures. Policymakers are advised to include religious and adat leaders in disaster risk reduction planning and to provide safety guidance for ritual activities in hazardous conditions.

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