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Culture and Non-Communicable Diseases: Determinants of Hypertension in Tenganan Pegringsingan Village, Karangasem, Bali

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ABSTRACT

Non-communicable diseases (NCDs) contribute to approximately 74 percent of global deaths, with cardiovascular diseases related to hypertension being the most significant, accounting for 17.9 million deaths each year. In Bali, the prevalence of hypertension has shown a steady increase, reaching 47.7 percent in Karangasem Regency. Existing epidemiological approaches remain insufficient as they focus predominantly on biological and behavioral determinants while overlooking cultural factors that influence health behaviors. This study aims to explore how shared knowledge within the Tenganan Pegringsingan community shapes and reinforces cultural practices that increase the risk of hypertension. Using a qualitative method with an ethnographic approach, data were collected through in-depth interviews and participant observation involving village officials, community elders, leaders of social drinking groups known as sekehe, and individuals participating in metuakan rituals. The findings demonstrate that the interaction between environmental, biological, and cultural factors sustains the practice of metuakan, a communal activity involving the consumption of palm wine (tuak), which is deeply embedded in local religious and social rituals. Long-term alcohol exposure through these practices influences biological processes and psychosocial conditions that affect heart rate and blood pressure. The study concludes that culturally embedded behaviors must be considered in the development of effective hypertension prevention strategies that are contextually grounded in local knowledge and practice.

Keywords: *Alcohol Consumption; Balinese Rituals; Cultural Determinants; Hypertension; Medical Anthropology*

1. Introduction

The global trend of non-communicable diseases (NCDs) shows a steadily increasing prevalence. Currently, NCDs are the leading cause of death worldwide, accounting for 41 million deaths or approximately 74 percent of total mortality (WHO, 2022). Among these, cardiovascular diseases remain the primary contributor, with an estimated 17.9 million deaths annually. Hypertension, a major risk factor for cardiovascular disease, affects a significant proportion of the global population (Fuchs & Whelton, 2020). According to the World Health Organization, the global prevalence of hypertension is around 22 percent, with the highest rates found in Africa (27 percent) and Southeast Asia, ranking third at 25 percent (Kementerian Kesehatan Republik Indonesia, 2019). The prevalence has increased by 31.1 percent since 2010 and continues to rise annually, reaching 1.28 billion people in 2019 (WHO, 2022). In Indonesia, the rate also continues to grow, from 25.5 percent in 2013 to 34.1 percent in 2018 (Kementerian Kesehatan Republik Indonesia, 2018).

Efforts to manage hypertension in Indonesia remain limited due to a narrow focus on conventional epidemiological models, which primarily emphasize biological and behavioral factors. This approach has been critiqued for its excessive reliance on the biomedical paradigm, which fails to account for the broader social and cultural dimensions of disease (McKinlay & Marceau, 2000). Diseases, including hypertension, are not merely discovered but socially constructed (Rosenberg, 1989); they do not arise from a single determinant but are shaped through social processes (White, 2011), which are, in essence, cultural practices embedded in society (Geertz, 1973). Although genetic predispositions may contribute to hypertension, environmental interactions and culturally conditioned behaviors are more influential (Winkelman, 2009). Biological mechanisms are often regarded as proximal causes of disease, yet these mechanisms are in turn shaped by antecedent social, behavioral, environmental, psychosocial, and cultural determinants.

McKinlay's concerns highlight the insufficiency of existing social epidemiology theories in comprehensively explaining the etiology of chronic diseases like hypertension (McKinlay & Marceau, 2000). Three prominent theories in social epidemiology, the psychosocial approach, the social production of disease theory, and ecosocial theory, have attempted to bridge this gap. The psychosocial model emphasizes the role of social stressors in generating physiological disruptions. The social production of disease theory focuses on how economic and policy structures contribute to unequal health outcomes. Krieger's ecosocial theory, proposed in 1994, integrates multilevel analyses to explain the complex interplay between biological, ecological, and social systems (Krieger, 1994, 2001). However, these frameworks largely overlook cultural determinants as core factors in shaping health risks such as hypertension. Therefore, incorporating a cultural approach is essential to provide a more holistic understanding of the disease.

Medical anthropology offers a promising avenue for integrating cultural perspectives into the analysis of NCDs, including hypertension. However, existing research in medical anthropology remains predominantly focused on infectious diseases such as tuberculosis, HIV/AIDS, malaria, and rabies (Farid, 2022; Yetti R. et al., 2023). Studies addressing the intersection of culture and NCDs, particularly hypertension, are still limited and tend to adopt

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behavioral or social science perspectives without anchoring them in cultural analysis (Herawati & Sofiatin, 2021; Musdalifah et al., 2020; Nurbaya, 2020; Setiadi & Martha, 2023).

In Bali Province, the prevalence of hypertension reached 29.97 percent in 2018, approaching the national average of 34.11 percent (Kementerian Kesehatan Republik Indonesia, 2018). Karangasem Regency stands out with the highest local prevalence at 47.7 percent, or 12,871 individuals out of 26,966 residents (Dinas Kesehatan Provinsi Bali, 2019). Karangasem includes 190 traditional villages, known locally as *desa pakraman*, which are tightly bound to Balinese cultural systems. Customary norms and values profoundly shape the behavior of residents in these communities. Consequently, efforts to address hypertension in such settings must consider the cultural roots of health behavior and adopt an approach that encompasses cultural etiology.

Alcohol consumption is a well-established risk factor for hypertension. Ethanol can increase blood acidity and elevate cortisol levels, which thickens the blood and forces the heart to work harder (Algharably et al., 2024). According to WHO, hypertension is diagnosed when systolic pressure is ≥140 mmHg and diastolic pressure is ≥90 mmHg (Williams et al., 2018).

Karangasem is one of the largest producers of traditional alcoholic beverages in Bali, particularly *tuak*, a palm wine derived from fermented sap. Nearly every village in the region is engaged in its production and distribution, and its significance has been formally recognized by the Bali Governor Regulation No. 1 of 2020. While *tuak* is consumed in ceremonial and artistic contexts, it is also a staple of everyday social life. In Tenganan Pegringsingan village, tuak consumption has evolved into a culturally embedded practice rooted in communal knowledge and social reproduction. This shared knowledge shapes local behavior and acts as a determinant of both health and disease (Farid, 2022).

This study seeks to examine how cultural knowledge and everyday practices in Tenganan Pegringsingan generate patterns of behavior that increase vulnerability to hypertension. By identifying the cultural logic behind these practices, the study aims to contribute to the development of more context-sensitive health interventions and inform public health strategies tailored to the lived realities of culturally distinct communities.

2. Literature Review

Culture plays a significant role in shaping behaviors that increase the risk of disease, including hypertension. The totality of human life, particularly patterns of adaptation to the environment, influences a society's susceptibility to specific illnesses. An individual's health status and the overall quality of public health are not determined solely by behavior, but also by beliefs, which constitute a core element of culture and often serve as stronger drivers of action (Trostle, 2005). Human interactions with others and with the physical environment are social realities that shape and influence the development and progression of disease (Link & Phelan, 1995). Social conditions are key factors affecting health and illness, as they create psychosocial environments that influence biological responses in the human body (Blair, 2006).

To fully understand the social determinants of health, it is essential to explore the relationship between the social, cultural, and biological dimensions of human life, since humans are simultaneously social and biological beings. Biological factors serve as direct determinants of disease, while social and cultural factors shape psychosocial conditions that influence biological responses (Brunner, 2000). Culture itself is shaped by the physical environment, developing as a human adaptation to nature, and conversely, human actions rooted in culture also alter the environment. Social conditions, such as economic, political, educational, and health-related dynamics, interact with the environment to form psychosocial influences, which

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then affect biological processes. In this interplay, culture emerges as a fundamental force influencing both the physical and social environment and, through them, the psychosocial and biological dimensions of health.

Cultural behavior is closely linked to the quality of life of individuals with hypertension (Nurbaya, 2020), particularly in relation to dietary patterns shaped by family traditions (Setiadi & Martha, 2023). For instance, in the coastal communities of Konawe Regency, Southeast Sulawesi, the regular consumption of *meti-meti*, a traditional food made from marine ingredients such as shellfish, sea urchins, and dried salted seafood, poses a risk for hypertension due to its high cholesterol and sodium content (Musdalifah et al., 2020). This dietary pattern reflects how tangible cultural behaviors are influenced by underlying cultural values that act as determinants of disease risk (Husna, 2021).

In many developing countries, culturally based approaches have proven effective in addressing hypertension. As such, local cultural contexts must be considered in designing effective public health interventions (Sima, 2024). Hypertension is often driven by habitual consumption of foods and beverages that raise blood pressure, including traditional alcoholic drinks such as *tuak*. These behaviors are shaped by environmental, demographic, psychological, and cultural belief systems (Pradani, 2024). Community values, including belief systems, knowledge, economic structures, technologies, social organizations, and artistic expressions, significantly influence the occurrence of disease, including hypertension. For instance, in the working area of Puskesmas Pakong in Madura, the prevalence of hypertension has been found to correlate strongly with local cultural values (Husna, 2021).

Studying cultural determinants of disease requires a holistic approach that encompasses the full spectrum of human experience (Ember et al., 2007). Although the term is still emerging in mainstream discourse, the conceptual foundation for "cultural epidemiology" has existed since Sydney Kark's pioneering work in 1948. Norman Scotch further developed the idea, defining epidemiology as a discipline that investigates how biological, environmental, cultural, and social factors interact to influence disease and health (Trostle, 2005). One of the key frameworks for applying this concept is the medical ecology model developed by McElroy (McElroy & Townsend, 2018). This model views disease as a multi-causal phenomenon arising from the continuous, reciprocal interaction among abiotic (physical), biotic (biological), and cultural components. The environment, from this perspective, includes not only physical spaces such as land, air, and water but also socially and culturally constructed spaces like homes, workplaces, and sacred sites.

The cultural epidemiology model, when combined with medical ecology theory and psychosocial approaches (Cassel, 2017), provides a more comprehensive analysis of disease causation. In this integrated framework, cultural adaptation to the environment is examined through the mutual relationship between organisms and their surroundings over time (McElroy & Townsend, 2018). Researchers have applied this theory to examine how urbanization correlates with rising disease incidence (Diferdinando, 1999; Fenner, 1980). The core idea of medical ecology is to treat human populations as both biological and cultural entities. Initially advanced by Alexander Alland Jr. in 1970, the theory incorporates insights from scholars such as Livingstone (1958), Wiesenfeld (1967), Dunn (1968), and Damon (1976), and was later formalized by McElroy and Townsend into three interacting domains: the physical (abiotic), biological (biotic), and cultural environments.

Although medical ecology theory offers valuable insights, it does not explicitly account for psychosocial factors. To address this limitation, this study integrates medical ecology with psychosocial theory, which posits that health outcomes are influenced by how individuals

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perceive their social existence. Psychosocial factors such as stress, anxiety, depression, and perceived control are strongly linked to physical health, particularly hypertension and cardiovascular disease (Macleod, 2003). These conditions arise from social and psychological experiences that are shaped by cultural norms, shared values, and collective knowledge.

This study is grounded in a conceptual framework that considers the incidence of hypertension in Tenganan Pegringsingan Village, Karangasem Regency, Bali, as the result of interaction between abiotic factors (physical environment), biotic factors (biological environment), and cultural practices rooted in shared environmental knowledge. Hypertension is understood here as a biological response mediated through psychosocial pathways, or as a direct consequence of culturally embedded behaviors. In this community, the regular consumption of *tuak*, a traditional alcoholic beverage, is a cultural practice that influences both psychosocial well-being and physiological health, contributing to increased vulnerability to hypertension.

3. Research Methodology

This research was conducted in Tenganan Pegringsingan Village, located in Manggis District, Karangasem Regency, Bali Province, an area identified as having the highest prevalence of hypertension in the province. A qualitative method with an ethnographic approach was employed to explore the sociocultural processes underlying hypertension in the local community (Crozier et al., 1994). Secondary data on hypertension prevalence at both the national and regional levels were obtained from the 2018 Basic Health Research and the Karangasem Regency Health Profile. Primary data were collected through purposive sampling involving village officials and community leaders. Additional informants included leaders of several *sekehe*, selected based on their frequent involvement in *tuak* stalls with high levels of community activity. Snowball sampling was then applied to identify further members within these *sekehe* groups.

Data collection was carried out using in-depth interviews and participant observation. Observations focused on interactions within four selected *tuak* stalls, while interviews were conducted with informants outside of *metuakan* sessions to gain deeper insights into individual and collective perspectives. To ensure the validity of the findings, data triangulation was applied through cross-checking between sources and methods, comparing interview data with observational evidence.

The data analysis followed anthropological research procedures, beginning with field notes and thematic coding to produce analytic memos serving as ethnographic material. These were subsequently analyzed through content analysis, guided by the study's theoretical framework, to understand how cultural practices in Tenganan Pegringsingan contribute to behavioral patterns that increase the risk of hypertension.

4. Results

4.1. Physical Environment (Abiotic)

Tenganan Pegringsingan is a traditional village located administratively in Manggis District, Karangasem Regency, Bali Province. The village lies in a valley flanked by two hills, Kangin Hill and Kauh Hill, with a mountain range extending to the north. The valley slopes from north to south at an elevation of approximately 70 meters above sea level and covers an area of 1,034 hectares, consisting of settlements, rice fields, and plantations. The two surrounding hills and the mountainous northern region are predominantly covered by tropical forest, spanning approximately 583 hectares.

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This topography creates a humid tropical climate, with annual rainfall ranging from 1,500 to 2,000 millimeters, especially during the rainy season. The average temperature in the village is around 20°C, rising to a maximum of 28°C during the dry season. Nighttime temperatures tend to be lower, particularly in elevated areas, due to winds blowing from the mainland. Overall, the village enjoys a relatively cool climate, particularly at night.

4.2. Biological Environment (Biotic)

The physical characteristics of the environment strongly influence the biological environment, particularly the types of vegetation that grow in the forests, plantations, rice fields, and areas surrounding human settlements. The most common plants found in the region include *jake* (palm or *Arenga pinnata*), *nyuh* (coconut), and *ental* (lontar palm), which thrive in both cultivated and natural forested areas around Tenganan Pegringsingan. These three species, members of the Arecaceae (palm) family, are typical tropical plants capable of growing in various soil types, including clay, chalk, and sand, at elevations of up to 2,000 meters above sea level, with optimal rainfall above 1,200 millimeters annually.

Among these, *jake* (palm) trees are the most widely cultivated in the village, particularly along the slopes of Kangin and Kauh Hills. Originally growing wild, the proliferation of these trees was aided by forest-dwelling animals such as monkeys and civets, which consumed the fruit and dispersed the seeds throughout the area. *Jake* trees begin producing sap from flower stalks that emerge after 8 to 9 years of growth. Each tree can yield between 3 and 12 stalks and produce approximately 900 to 1,600 liters of sap per year. The sap production ceases once the tree no longer produces flower stalks.

In addition to *jake*, both *nyuh* (coconut) and *ental* (lontar palm) trees also produce sap, although the quality of sap from *jake* is generally considered superior. This sap is fermented to produce various types of *tuak*, including *tuak jake*, *tuak nyuh*, and *tuak ental*. Among the three, *tuak jake* is preferred by villagers due to its lighter alcohol content and slower intoxicating effect. In contrast, *tuak ental*, derived from *ental* sap, has a higher alcohol content and causes quicker intoxication.

Tenganan Pegringsingan produces more *tuak jake* than other types of *tuak*. A single *jake* tree can yield an average of 7 liters of sap per day during its productive season, which lasts up to three months. These trees are widely distributed in forest areas and private gardens throughout the village. The sap is fermented over several days to produce an alcoholic beverage consumed both individually and communally. During fermentation, the sugar content gradually converts to ethanol, altering the taste from sweet to sour, then bitter. The sour and bitter flavors indicate a reduction in sugar and an increase in alcohol content. Research shows that the highest ethanol concentration in *tuak jake* occurs on the third day of fermentation, reaching 5.23 percent, and declines to 2.09 percent by the seventh day (Aryasa et al., 2020).

4.3. Cultural Values

The abiotic and biotic environments in Tenganan Pegringsingan shape how the community meets its subsistence needs. Traditionally, residents manage environmental resources based on locally inherited knowledge that has developed adaptively over time. This relationship between the community and its surroundings is not merely utilitarian, but is embedded within a cultural context. The village's topography and climate (abiotic factors), along with the presence of specific plant species such as *jake* (sugar palm), *nyuh* (coconut), and *ental* (lontar palm) (biotic factors), have generated a body of local ecological knowledge that supports communal adaptation and survival. This knowledge is not static, but is reproduced and passed down,

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serving as a shared reference that guides interactions between people and between people and their environment. The continual production and reproduction of this knowledge is central to the formation and evolution of culture in the village.

Over time, this ecological knowledge has expanded its reach beyond subsistence practices to include economic systems, social organization, and religious rituals. The three aforementioned plant species form the economic backbone of the village, particularly through the production of *tuak* (palm wine), which is distributed throughout Bali. *Tuak* production supports livelihoods, with many villagers working as sap collectors and *tuak* producers. The economic value of the *jake* tree has led to its cultivation becoming a hereditary occupation. However, *tuak* is not only produced for commercial purposes; it also plays a vital role in everyday social life and communal gatherings known as *metuakan*, as well as in individual consumption. In the religious sphere, *tuak* is an essential component of ceremonial offerings, including the *ngasuba sambah*, a month-long annual ritual. Through these practices, values such as togetherness, gratitude, and reverence for ancestral heritage are reinforced.

Religious norms and ancestral respect form the spiritual foundation of life in Tenganan Pegringsingan. The community adheres to the Bhatara Indra tradition of Hinduism, which differs from the more widespread Hindu Dharma followed by most Balinese. One of the most notable distinctions is the absence of *ngaben* (cremation rites) and the non-recognition of caste distinctions. The people of Tenganan believe in the active presence of ancestral spirits who guide, protect, and bless the living, but who can also sanction those who deviate from communal norms.

From this worldview, values rooted in inherited knowledge and belief systems develop into a broader cultural ethic of service, gratitude, and reverence toward ancestral spirits in exchange for spiritual protection and well-being. The ideal of communal togetherness is further deepened by the community's rejection of caste and the emphasis on egalitarianism. These religious beliefs interact with the biotic environment, especially with the use of *jake*, *nyuh*, and *ental* as sources of *tuak*. In ritual contexts, *tuak* operates as a symbolic medium in offerings, representing gratitude and the collective memory of ancestral heritage (Sahar, 2019; Turner & Abrahams, 2017). Similarly, the act of drinking *tuak* communally in *sekehe metuakan*, a small drinking group, embodies the symbolic expression of solidarity and mutual respect. Thus, *tuak* is more than an alcoholic beverage; it is imbued with symbolic meaning, rooted in belief systems that permeate both ritual life and everyday social interactions.

4.4. Social Behavior

In the afternoons, both in Tenganan Pegringsingan Village and across much of Karangasem, it is common to observe groups of people sitting on woven mats arranged in a circle at *tuak* stalls. While sharing *tuak* and enjoying pork satay or other local snacks placed at the center, they engage in lively conversation, ranging from light-hearted stories about their daily work in the rice fields to more serious discussions about politics and upcoming elections. For the people of Tenganan Pegringsingan, these gatherings are not merely about consuming *tuak*. They also serve as important social interactions that fulfill their need for camaraderie and help relieve the fatigue of daily labor. These drinking groups are known as *sekehe metuakan*.

The practice of *metuakan* involves a *sekehe*, a social group formed on the basis of friendship, typically consisting of around five members. These groups are usually composed of close friends who are familiar with each other's personalities and drinking behavior. Members tend to exclude individuals known for causing disturbances when intoxicated. Each *sekehe* adheres to its own unwritten rules, which are informally agreed upon and can vary between groups. A

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common feature, however, is the presence of one member acting as the *dealer*, responsible for pouring the *tuak* into a single shared glass and distributing it in turn. The glass circulates among the members, and each person is expected to drink it all in one go. Sipping slowly is frowned upon and often ridiculed by the others. The shared use of a single glass symbolizes unity and reinforces values of togetherness and solidarity among the group. In addition to managing the distribution of *tuak*, the *dealer* often assumes the role of moderator, facilitating and guiding the flow of conversation.

Cultural values and social norms function as internalized guidelines that shape patterns of thought and behavior within a community, grounded in shared beliefs and traditions (Tomaszewski, 2018). Though rarely articulated explicitly, these norms establish what is considered acceptable or inappropriate behavior in social contexts. Within the Tenganan Pegringsingan community, *metuakan* has become a culturally embedded form of alcohol consumption. The behavior is not regarded as deviant; instead, intoxication during *metuakan* is normalized and accepted as part of communal life. The practice reflects deeply rooted cultural values and social cohesion.

Religious belief is another key dimension of the cultural system that shapes social behavior, often manifesting in ritualized practices that reinforce community identity and norms (Henrich, 2015). In Tenganan Pegringsingan, the community adheres to the belief system of Hindu Bhatara Indra, which differs from the mainstream Hindu Dharma practiced in most parts of Bali. A central tenet of this belief is the veneration of ancestral spirits, who are thought to provide guidance, protection, and blessings to the living. Expressions of respect and gratitude are enacted through ritual offerings to Ida Hyang Widhi Wasa, often accompanied by *tuak* as a symbol of agricultural abundance and ancestral connection.

4.5. Psychosocial

For the people of Tenganan Pegringsingan, participating in *metuakan* within a *sekehe*, as well as engaging in religious and customary rituals, is not a trivial or casual activity. These practices serve as meaningful opportunities to establish, maintain, and strengthen social relationships, both among fellow community members and with the divine. A sense of personal and communal well-being is closely tied to the quality of these relationships. When harmony is maintained with others and with God, life is perceived as balanced and fulfilling. This outlook aligns with the doctrine of *Tri Hita Karana*, a core principle in Balinese Hinduism that emphasizes the harmonious relationship between humans and God, humans and fellow humans, and humans and the natural environment.

Avoiding participation in *metuakan* is perceived not only as social withdrawal but also as a disruption of this relational harmony. Similarly, failing to attend religious or customary ceremonies is viewed as neglecting one's spiritual obligations. Both forms of absence may lead to feelings of restlessness, social unease, and emotional distress. From the community's perspective, *metuakan* does not threaten psychological or biological well-being; rather, it reinforces social bonds and fulfills emotional needs. Thus, alongside cultural motivations, psychosocial factors play a central role in sustaining the practice of *tuak* consumption. When individuals refrain from these activities, they may experience discomfort and psychosocial stress, which can, in turn, impact their physical health.

These psychosocial dimensions act as compelling drivers for continued participation in both social drinking and ritual practices. However, frequent involvement in *metuakan* and religious rituals involving alcohol can contribute to the disruption of neurochemical balance in the brain. The brain relies on a delicate chemical equilibrium to regulate mood and behavior, and ethanol

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from alcohol consumption can disturb this balance. As alcohol enters the brain, it interferes with neurotransmitter function, leading to heightened susceptibility to anxiety, irritability, and aggressive behavior (Yang et al., 2022). While the community may perceive *metuakan* as emotionally stabilizing and socially necessary, the physiological effects of sustained alcohol intake include the potential for psychological strain and emotional dysregulation.

In this context, *tuak* consumption is not merely a matter of cultural expression but is deeply intertwined with psychosocial well-being. The internal tension between the social-emotional need for inclusion and the biological consequences of alcohol consumption underscores the complex role of psychosocial factors in shaping health outcomes in Tenganan Pegringsingan.

5. Discussion

Tuak is a traditional Balinese fermented drink, especially prominent in the community of Tenganan Pegringsingan Village. It is derived from palm sap and contains alcohol levels ranging from 1 to 60 percent (Wijaya et al., 2024). Based on its alcohol content and classification of alcoholic beverages, *tuak* falls into category B (5–20 percent), equivalent to wine. *Brem* is categorized as type A (0–5 percent), similar to beer, while *arak* is categorized as type C (20–55 percent), comparable to whiskey, rum, gin, vodka, or tequila. As a category B beverage, *tuak* is deeply integrated into daily life in Tenganan Pegringsingan and throughout Karangasem, appearing in both religious ceremonies and everyday social activities. There are no social or religious restrictions regarding its consumption; men, women, the elderly, and youth all partake in drinking *tuak*, especially during rituals and *metuakan* gatherings.

This widespread and culturally sanctioned exposure to alcohol begins at an early age and tends to continue across the lifespan. From a biomedical perspective, alcohol affects multiple organ systems, including the central nervous system, cardiovascular system, liver, kidneys, endocrine system, and immune function (Crews et al., 2016). In small quantities, alcohol may have a protective cardiovascular effect by lowering LDL and fibrinogen levels while raising HDL, reducing arterial plaque buildup, and inhibiting blood clot formation. However, chronic or excessive consumption negatively affects cardiovascular health by increasing heart rate irregularities, raising blood pressure, and heightening the risk of stroke (Liang et al., 2012).

Although *tuak* typically has an alcohol content ranging from 5 to 10 percent and is thus categorized as a low-alcohol beverage, the daily nature of *metuakan* in social groups (*sekehe*) leads to cumulative ethanol exposure. Over time, this shifts the impact from moderate to high due to the buildup of alcohol in the bloodstream. Prolonged consumption affects hematological health, reducing the production of red and white blood cells, disrupting blood clotting mechanisms, and forcing the heart to work harder (Komaling et al., 2013).

Alcohol influences blood pressure through multiple mechanisms, including endothelial dysfunction, activation of the renin-angiotensin-aldosterone system (RAAS), heightened sympathetic nervous system activity, and increased oxidative stress (Okojie et al., 2020). Ethanol also increases blood acidity, making it more viscous and harder for the heart to circulate, which contributes to hypertension (Komaling et al., 2013). Chronic alcohol consumption elevates cortisol levels, further stimulating the RAAS and causing blood pressure to rise (Jayanti, Wiradnyani, & Ariyasa, 2017). Ethanol is also toxic to the vascular system, causing constriction and even long-term damage to blood vessels (Iqbal & Handayani, 2022).

Environmental factors in Tenganan Pegringsingan support the availability of raw materials such as *jake* (sugar palm), *nyuh* (coconut), and *ental* (lontar palm), which are culturally and ecologically intertwined. These biotic resources, combined with deeply embedded cultural values, support the sustainability of *tuak*-based rituals and daily *metuakan* practices.

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Consequently, early and continuous alcohol exposure has become normalized, further contributing to physiological changes that affect blood pressure and cardiovascular function (Iqbal & Handayani, 2022; Jayanti et al., 2017). In addition to its biological impact, alcohol also affects psychosocial health by increasing the risk of anxiety, aggression, stress, and emotional dysregulation, all of which are linked to elevated heart rate and blood pressure.

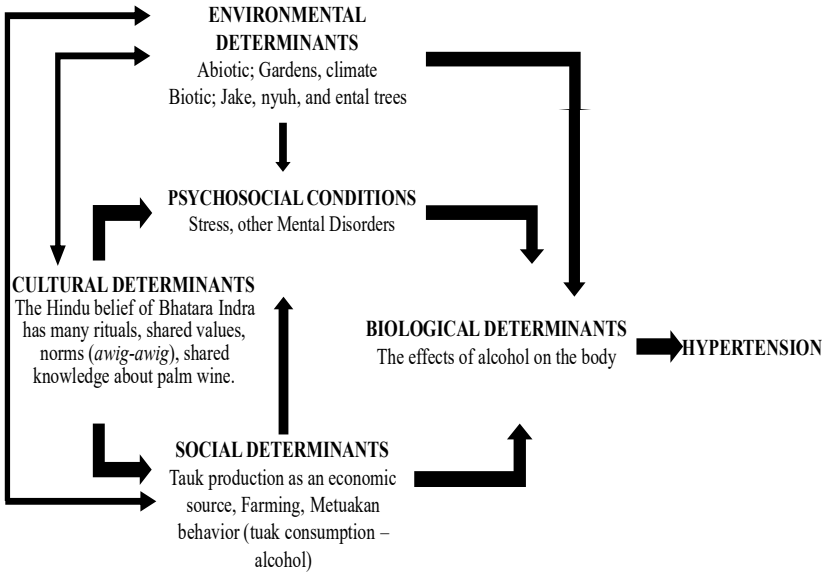

Figure 1. Interplay of Abiotic, Biotic, and Cultural Factors Contributing to Hypertension Risk

The findings of this study illustrate that the risk factors for hypertension in Tenganan Pegringsingan are interconnected and mutually reinforcing. Effective hypertension control cannot be achieved by viewing these risk factors in isolation. The biomedical approach has traditionally separated behavioral and physiological determinants and does not account for culture as a core component (Lukito, 2023). Conventional epidemiology categorizes hypertension risk factors into modifiable and non-modifiable groups. Modifiable factors include smoking, obesity, sedentary lifestyle, excessive salt intake, and alcohol consumption (Mills et al., 2020). However, this model reduces social behavior to individual choices and fails to consider how collective cultural norms shape those choices.

Public health initiatives in Indonesia, such as Community-Based Health Efforts (*Upaya Kesehatan Berbasis Masyarakat* or UKBM), focus on advocacy, empowerment, and partnerships to raise awareness and prevent hypertension (Kementerian Kesehatan Republik Indonesia, 2024). However, these strategies often overlook the significance of cultural determinants. Health education is delivered through counseling and information sessions, which may conflict with local knowledge systems that emphasize communal identity, ancestral respect, and emotional fulfillment through *metuakan* (Farid, 2022). In Tenganan Pegringsingan, the belief that *metuakan* brings psychological comfort and collective happiness outweighs biomedical warnings about alcohol's health effects.

To improve the effectiveness of hypertension prevention programs, cultural dimensions must be acknowledged and incorporated. Culturally based interventions do not require the elimination of traditions but should instead promote behavioral adjustments through social innovation. For instance, local leaders can be encouraged to regulate *tuak* production and fermentation processes. Studies show that the alcohol content of *tuak* peaks on the third day of

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fermentation at around 11.18 percent and declines to about 2.03 percent by the fifth day (Nugraha & Wiadnya, 2015). By extending fermentation time, the alcohol content can be reduced without abandoning traditional practices.

Policy advocacy targeting customary leaders and village authorities could encourage the issuance of local regulations concerning the type of *tuak* used for rituals and *metuakan*, particularly by limiting its alcohol content. Such culturally grounded strategies have proven effective in promoting health while respecting local traditions (Sima, 2024).

6. Conclusion

Based on the research findings and analysis, several conclusions can be drawn. First, physical environmental factors (abiotic), such as topography and climate, influence the biological environment (biotic), particularly the types of vegetation, *jake* (sugar palm), *nyuh* (coconut), and *ental* (lontar palm), which serve as sources of sap for *tuak* production. Second, from the interaction between the abiotic and biotic environment, shared knowledge emerges and synergizes with belief systems, giving rise to the cultural practices of the Tenganan Pegringsingan community. Third, the reciprocal relationship among environmental and cultural elements results in the formation of *metuakan* as a cultural behavior, along with customary and religious rituals that involve the communal consumption of *tuak*. Fourth, exposure to alcohol from *tuak* affects the body both biologically and psychosocially. Ethanol influences blood pressure through various mechanisms, including endothelial dysfunction, stimulation of the renin-angiotensin-aldosterone system, increased sympathetic nervous activity, and heightened psychological stress. Fifth, culture functions as a key determinant of hypertension. Consequently, efforts to manage hypertension, previously limited to biomedical approaches, will be more effective if culturally sensitive interventions complement them.

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References

Algharably, E. A., Meinert, F., Januszewicz, A., & Kreutz, R. (2024). Understanding the impact of alcohol on blood pressure and hypertension: From moderate to excessive drinking. *Kardiologia Polska*, *82*(1), 10–18. https://doi.org/10.33963/v.kp.98704

Aryasa, I. W. T., Artini, N. P. R., Vidika A., D. P. R., & Hendrayana, I. M. D. (2020). Kadar Alkohol Pada Minuman Tuak Desa Sanda Kecamatan Pupuan Kabupaten Tabanan Bali Menggunakan Metode Kromatografi Gas. *Jurnal Ilmiah Medicamento*, *5*(1), 33–38. https://doi.org/10.36733/medicamento.v5i1.837

https://doi.org/10.33019/society.v13i2.796

Blair, A. (2006). Handbook of Epidemiology. *Biometrics*, *62*(2), 627–628. https://doi.org/10.1111/j.1541-0420.2006.00589_4.x

Brunner, E. J. (2000). Toward a New Social Biology. In L. Berkman (Ed.), *Social Epidemiology* (pp. 306–331). Oxford University PressNew York, NY. https://doi.org/10.1093/oso/9780195083316.003.0013

Cassel, J. (2017). The Contribution of the Social Environment to Host Resistence: The Fourth Wade Hampton Frost Lecture. *American Journal of Epidemiology*, *185*(11), 1015–1031. https://doi.org/10.1093/aje/kwx100

Crews, F. T., Vetreno, R. P., Broadwater, M. A., & Robinson, D. L. (2016). Adolescent Alcohol Exposure Persistently Impacts Adult Neurobiology and Behavior. *Pharmacological Reviews*, *68*(4), 1074–1109. https://doi.org/10.1124/pr.115.012138

Crozier, G., Denzin, N., & Lincoln, Y. (1994). Handbook of Qualitative Research. *British Journal of Educational Studies*, *42*(4), 409. https://doi.org/10.2307/3121684

Diferdinando, G. (1999). Emerging infectious diseases: biology and behavior in the inner city. In L. . U. Scell S. (Ed.), *Urbanism, Health and Human Biology in Industrialised Countries* (pp. 87–110). Cambridge University Press. https://doi.org/10.1017/CBO9780511525698.005

Dinas Kesehatan Provinsi Bali. (2019). *Profil Karangasem 2018*. Dinas Kesehatan Provinsi Bali.

Ember, C. R., Ember, M., & Peregrine, P. N. (2007). *Anthropology* (12th ed.). Pearson Education.

Farid, M. (2022). Kekuasaan: Determinan Sosial dan Kebudayaan Penyakit Tuberkulosis Paru di Cinangka Serang Banten. *Jurnal Antropologi: Isu-Isu Sosial Budaya*, *24*(2), 148–156. https://doi.org/10.25077/jantro.v24.n2.p148-156.2022

Fenner, F. (1980). Sociocultural Change and Environmental Diseases. In N. . J. Stanley R. (Ed.), *Changing Disease Patterns and Human Behavior* (pp. 7–26). Academic Press.

Fuchs, F. D., & Whelton, P. K. (2020). High Blood Pressure and Cardiovascular Disease. *Hypertension*, *75*(2), 285–292. https://doi.org/10.1161/HYPERTENSIONAHA.119.14240

Geertz, C. (1973). *The Interpretation of Culture*. Basic Book.

Henrich, J. (2015). Culture and social behavior. *Current Opinion in Behavioral Sciences*, *3*, 84–89. https://doi.org/10.1016/j.cobeha.2015.02.001

Herawati, E., & Sofiatin, Y. (2021). Socio-cultural aspects of non-communicable disease prevention in three villages in the West Java. *Masyarakat, Kebudayaan Dan Politik*, *34*(3), 340. https://doi.org/10.20473/mkp.V34I32021.340-354

Husna, A. R. (2021). Hubungan Cultural Value dengan Kejadian Hipertensi Pada Lansia. *Jurnal Keperawatan Muhammadiyah*, *6*(3), 183–187. https://repository.um-surabaya.ac.id/6790/1/7. Hubungan Cultural Value dengan Kejadian Hipertensi Pada Lansia.pdf

Iqbal, M. F., & Handayani, S. (2022). Terapi Non Farmakologi pada Hipertensi. *Jurnal Untuk Masyarakat Sehat (JUKMAS)*, *6*(1), 41–51. https://doi.org/10.52643/jukmas.v6i1.2113

Jayanti, I. G. A. N., Wiradnyani, N. K., & Ariyasa, I. G. (2017). Hubungan pola konsumsi minuman beralkohol terhadap kejadian hipertensi pada tenaga kerja pariwisata di Kelurahan Legian. *Jurnal Gizi Indonesia (The Indonesian Journal of Nutrition)*, *6*(1), 65–70. https://doi.org/10.14710/jgi.6.1.65-70

Kementerian Kesehatan Republik Indonesia. (2018). *Riset Kesehatan Dasar*. Kemenkes.

Kementerian Kesehatan Republik Indonesia. (2019). *Hari Hipertensi Dunia 2019 : "Know Your Number, Kendalikan Tekanan Darahmu dengan CERDIK."* Kementerian Kesehatan Republik Indonesia.

Kementerian Kesehatan Republik Indonesia. (2024). *Pedoman Pengendalian Hipertensi di Fasilitas Kesehatan Tingkat Pertama 2024*. Kementerian Kesehatan Republik Indonesia.

https://doi.org/10.33019/society.v13i2.796

Komaling, J. K., Suba, B., & Wongkar, D. (2013). Hubungan mengonsumsi alkohol dengan kejadian hipertensi pada laki-laki di desa Tompasobaru II kecamatan Tompasobaru kabupaten Minahasa Selatan. *Jurnal Keperawatan UNSRAT*, *1*(1), 107709.

Krieger, N. (1994). Epidemiology and the web of causation: Has anyone seen the spider? *Social Science & Medicine*, *39*(7), 887–903. https://doi.org/10.1016/0277-9536(94)90202-X

Krieger, N. (2001). Theories for social epidemiology in the 21st century: an ecosocial perspective. *International Journal of Epidemiology*, *30*(4), 668–677. https://doi.org/10.1093/ije/30.4.668

Liang, Y., Mente, A., Yusuf, S., Gao, P., Sleight, P., Zhu, J., Fagard, R., Lonn, E., & Teo, K. K. (2012). Alcohol consumption and the risk of incident atrial fibrillation among people with cardiovascular disease. *Canadian Medical Association Journal*, *184*(16), E857–E866. https://doi.org/10.1503/cmaj.120412

Link, B. G., & Phelan, J. (1995). Social Conditions As Fundamental Causes of Disease. *Journal of Health and Social Behavior*, *35*(Extra Issue), 80. https://doi.org/10.2307/2626958

Lukito, A. A. (2023). *Panduan Promotif dan Preventif Hipertensi 2023* (A. A. Lukito (ed.)). Indonesian Society of Hypertension.

Macleod, J. (2003). Psychosocial factors and public health: a suitable case for treatment? *Journal of Epidemiology & Community Health*, *57*(8), 565–570. https://doi.org/10.1136/jech.57.8.565

McElroy, A., & Townsend, P. K. (2018). *Medical Anthropology in Ecological Perspective* (5th ed.). Routledge. https://doi.org/10.4324/9780429493478

McKinlay, J. B., & Marceau, L. D. (2000). Public Health Matters. *American Journal of Public Health*, *90*(1), 25–53. https://ajph.aphapublications.org/doi/pdf/10.2105/AJPH.90.1.25

Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. *Nature Reviews Nephrology*, *16*(4), 223–237. https://doi.org/10.1038/s41581-019-0244-2

Musdalifah, Indriastuti M., D., & Syahwal. (2020). Budaya Makan Masyarakat Pesisir Yang Beresiko Terjadi Hipertensi Pada Lansia Dini Kabupaten Konawe. *Jurnal Keperawatan*, *4*(2), 1–8.

Nugraha, D. F., & Wiadnya, I. B. R. (2015). Pengaruh lama penyimpanan minuman tuak (Arenga pinnata) terhadap kadar alkohol dan kadar asam cuka. *Jurnal Analis Medika Biosains (JAMBS)*, *2*(1), 37–44. https://jambs.poltekkes-mataram.ac.id/index.php/home/article/view/32/27

Nurbaya, S. . B. (2020). Hubungan Antara Perilaku Budaya Dengan Kualitas Hidup Penderita Hipertensi Pada Etnis Dayak Di Desa Pampang Samarinda. *Borneo Student Research*, *1*(3), 1463–1467. https://journals.umkt.ac.id/index.php/bsr/issue/view/32

Okojie, O. M., Javed, F., Chiwome, L., & Hamid, P. (2020). Hypertension and Alcohol: A Mechanistic Approach. *Cureus*, *12*(8), 2–7. https://doi.org/10.7759/cureus.10086

Pradani, R. P. (2024). Budaya Hipertensi dan Karakteristik Masyarakat Pesisir Pantai P ditinjau dari Dinamika. *PSIKOSTUDIA: Jurnal Psikologi*, *13*(1), 36–41. https://e-journals.unmul.ac.id/index.php/PSIKO/article/view/12461/pdf

Rosenberg, C. E. (1989). Disease in History: Frames and Framers. *The Milbank Quarterly*, *67*, 1. https://doi.org/10.2307/3350182

Sahar, S. (2019). Kebudayaan Simbolik; Etnografi Religi Victor Turner. *Sosioreligius Jurnal Ilmiah Sosiologi Agama*, *4*(2), 2–12. https://doi.org/https://doi.org/10.24252/sosioreligius.v4i2.13320

Setiadi, M. D., & Martha, E. (2023). Social Cultural Factors Affecting Quality of Life Hypertension Patients: Literature Review. *The Indonesian Journal of Health Promotion -*

https://doi.org/10.33019/society.v13i2.796

MPPKI, *6*(4), 582–587.
Sima, I. S. (2024). Cultural Influence on the Incidence of Hypertension in Developing Countries: A Systematic Review. In *The Second NANI Hasanudin International Health Conference (NHIHC)* (Vol. 2, Issue 1, pp. 86–93). STIKES Nani Hasanudin Makasar. https://jurnal.stikesnh.ac.id/index.php/nhihc/article/view/1847/1121
Tomaszewski, E. (2018). Addressing the Social and Cultural Norms That Underlie the Acceptance of Violence. In *Workshop in Brief* (pp. 50–62). National Academies Press (US).
Trostle, A. J. (2005). *Epidemiology and Culture*. Cambridge University Press.
Turner, V., & Abrahams, R. D. (2017). The Ritual Process. In *The Ritual Process: Structure and Anti-Structure*. Routledge. https://doi.org/10.4324/9781315134666
White, K. (2011). *Pengantar Sosiologi Kesehatan dan Penyakit*. Rajawali Press.
WHO. (2022). *The Global Health Observatory: Explore the World of Health Data*. WHO.
Wijaya, L., Sumerta, I. N., Napitupulu, T. P., Kanti, A., Keim, A. P., Howell, K., & Sudiana, I. M. (2024). Cultural, nutritional and microbial perspectives of tuak, a traditional Balinese beverage. *Journal of Ethnic Foods*, *11*(1), 4. https://doi.org/10.1186/s42779-024-00221-x
Williams, B., Mancia, G., Spiering, W., Agabiti Rosei, E., Azizi, M., Burnier, M., Clement, D. L., Coca, A., de Simone, G., Dominiczak, A., Kahan, T., Mahfoud, F., Redon, J., Ruilope, L., Zanchetti, A., Kerins, M., Kjeldsen, S. E., Kreutz, R., Laurent, S., … Brady, A. (2018). 2018 ESC/ESH Guidelines for the management of arterial hypertension. *European Heart Journal*, *39*(33), 3021–3104. https://doi.org/10.1093/eurheartj/ehy339
Winkelman, M. (2009). *Culture and Health Applying Medical Anthropology*. Jossey-Bass.
Yang, W., Singla, R., Maheshwari, O., Fontaine, C. J., & Gil-Mohapel, J. (2022). Alcohol Use Disorder: Neurobiology and Therapeutics. *Biomedicines*, *10*(5), 1192. https://doi.org/10.3390/biomedicines10051192
Yetti R., E., Tombeg, Z., & J. Hadi, A. (2023). Hubungan Sosial Budaya Dengan Upaya Pencegahan TBC di Puskesmas Makale Kabupaten Tana Toraja. *Jurnal Ners*, *7*(2), 1364–1373. https://doi.org/10.31004/jn.v7i2.16393

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