

Conference Paper

Traditional Indonesian Medication Combats COVID-19

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Abstract.

In Indonesia, the number of cases infected with Covid-19 peaked between mid-June and August 2021, resulting in the denial of hospital treatment to some people due to insufficient capacity. Therefore, people treat themselves by using natural ingredients. This study aims to identify plants that can treat Covid-19 with self-medication. This study took a description approach to investigate people using traditional herbs in self-medication for COVID-19 recovery. Snowball sampling is the approach used. Interviews and an online system (gform) were used to collect data. The number of samples collected allows for a more thorough analysis of the 104 respondents. The results showed that women (51.0%), people aged between 56 and 65 (52.9%), Banten residents (32.7%), secondary education (57.7%), and people with comorbidities (86.5%) were all interested in using traditional herbal medicine. Reduction of symptoms and results of laboratory tests were used to measure recovery. The most common comorbidities were hypertension (7-14 days to recovery), diabetes mellitus (15-21 days to recovery), and cardiovascular disease (7-14 days and 15-21 days to recovery). The Zingiberaceae family dominates traditional herbs. The most widely used traditional ingredients are Empon-Empon, which consists of red ginger, turmeric, nutmeg, aromatic ginger, bay leaves, lemongrass, galangal, cinnamon, and cloves. The average healing time is 7-14 days (32.7%). In conclusion people who utilized herbal medicines reported a speedy recovery and reduction in the severity of their symptoms.

Keywords: Covid-19, Empon-Empon, herbal medicine, self-medication, traditional ingredients

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1. Introduction

The SARS-CoV-2 infection-related illness has persisted since it was proclaimed a global pandemic on March 11, 2020, till now. 225,024,781 cases and 4,636,153 fatalities worldwide were reported on September 14, 2021, according to data from the World Health Organization (WHO). The economy and one's health are seriously harmed by this, among other aspects of life. On March 2, 2020, the first Covid-19 case in Indonesia was reported. Due to a peak in Covid-19 cases from June to July 2021, some infected patients could not receive hospital care because there were not enough available inpatient beds. COVID-19 causes severe illness and mortality, especially in the elderly and patients with comorbidities, and no effective treatment was available then to prevent worsening to a severe stage. This promotes the community's use of conventional ingredients for self-care and healing (self-medication). In some countries like Chinese [1, 2], India [3], and Japan [4], traditional ingredients their respective countries are also used to treat Covid-19 and be beneficial in treating clinical symptoms caused by Covid-19, reducing the number of viruses, and accelerating the healing process.

In Indonesia, the use of plants as medicine dates back to the time of its ancestors, each tribe has evolved its own traditional medicine based on using readily available plants for disease prevention and treatment [5, 6, 7, 8, 9, 10, 11,12]. The capability to combine plants as a medication is an inherited trait with ancient cultural origins. Zingiberaceae (ginger-ginger) is indeed a commonly used plant family that consists of Temulawak (*C. xanthorrhizae*), Temu Ireng (*C. aeruginosa*), Turmeric (*Curcuma domestica* / *C. longa*), Temu Giring (*C. heyneana*), Temu Putih (*C. zedoaria*), Galangal (*Alpinia galangal*) Lempuyang (*Zingiber aromaticum* [13].

The utilization of plants as medicine by using a combination of several plants for health purposes is called Jamu [14]. Jamu has long been believed to be a health drink that can increase immunity, maintain health, and treat fever, sore throat, cough, headache, lack of appetite, nausea, and aches. At the height of the Covid-19 pandemic, some people have taken advantage of using herbal medicine to treat Covid-19 independently. Jamu is believed to have healing properties and reduce pain. This self-medication is administered without the help of a medical professional, but Jamu is thought to have the effect of minimizing the clinical consequences produced by SarsCov-2 infection.

Several ethnomedical studies have documented the antimicrobial activity of Indonesian herbal medicine [15], and some herbs have been used during the Covid-19 pandemic and may be efficacious [16]. Still, their efficacy in mild and moderate COVID-19 patients remains debated. Therefore, it is important to investigate the efficacy of Covid-19 treatment using Jamu. So It is necessary to conduct a retrospective observational study to investigate the contribution of self-medication using Jamu in treating COVID-19 with mild to moderate symptoms or suspected COVID-19. This study will examine herbs and herbal components used in the treatment of COVID-19 independently, measure the recovery period based on the type of herbal medicine, and the types of co-morbidities of Covid-19. So that the results obtained need to be evaluated using clinical studies so that in the future herbal medicine can contribute to the treatment of viral infections. The purpose of this study is to identify plants that can treat Covid-19 with self-medication.

2. Methods and Equipment

2.1. Methods

2.1.1. Study design

This study uses a descriptive method in people who self-medicate for Covid-19 healing from June to August 2021. Written and oral consent from each participant before the interview.

2.1.2. Sample

This study obtained as many as 233 respondents. All respondents were divided into two groups in the first part of the study. Group I are patients infected with Covid-19, and group II are patients not infected with Covid-19. To achieve the research objectives, group II was excluded from the study. In the second part of the study, the remaining respondents are divided into 2, namely: group IA is Jamu users for the healing of Covid-19, and group IB is Jamu users accompanied by vitamins and prescription drugs for Covid-19 healing. To avoid other influences, group IB was excluded from the study. Furthermore, as many as 104 respondents were obtained as a sample for further analysis.

2.1.3. Instrument

The sampling technique used in this research is snowball sampling. Information dissemination is spread from 1 individual to another individual or one social media group to another social media. The data collection instrument used an online system (gform). However, some respondents had problems filling out the gform due to advanced age, so data were collected by telephone interview.

2.1.4. Data collection procedure

One hundred four respondents using herbal medicine for the treatment of Covid-19 were further analyzed by classifying socio-demographic data (in age, sex, domicile, education level, and history of co-morbidities of Covid-19). They furthermore classified recovery indicators and measured healing time based on the grouping of co-morbidities of Covid-19 respondents and the types of herbs used, as well as recording the plant components used in herbal medicine for Covid-19 self-medication.

2.1.5. Data analysis

Data were collected using Excel and processed using IBM Statistics SPSS 26, variables were categorized as frequency and percentage levels.

3. Results

A total of 104 respondents who had been infected with Covid-19 and carried out self-medication using Jamu for healing Covid-19 were further analyzed in this study.

3.1. Respondent characteristics

In demographic Characteristics of self medication, the variables observed were age, sex, domicile, level of education, and brief of Covid-19 disease.

Based on Table 1, the characteristics of the subjects were dominated by those aged 56 to 65 (52.9%) and females (51.0%), with the majority residing in Banten (32.0%)

TABLE 1: Characteristics of respondents using Jamu (n = 104).

Characteristic	Category	Frequency	Percentage(%)
Age	Early adulthood(26-35 years old)	7	6.7
	Late adulthood 36-45 years old	15	14.4
	Early elderly 46-55 years old	24	23.1
	Late seniors 56-65 years old	55	52.9
	Seniors >66 years	3	2.9
Sex	Female	53	51.0
	Male	51	49.0
Domicile	Aceh	1	1.0
	Bali	4	3.9
	Bangka Belitung	1	1.0
	Banten	34	32.7
	Jakarta	9	8.7
	Jambi	2	2.0
	West Java	19	18.3
	Central Java	17	16.4
	East Java	1	1.0
	Riau Island	1	1.0
	Sourth Sulawesi	1	1.0
	West Nusa Tenggara	2	2.0
	North Sulawesi	1	1.0
	West Sumatera	3	2.9
	Sourth Sumatera	8	7.7
	Level of Education	Primary School	7
Secondary School		60	57.7
UniversitySchool		37	35.6
Brief of Covid-19	With Comorbid	90	86.5
	Without Comorbid	14	13.5

and having completed secondary education (57.7%). Furthermore, more than half of the respondents (86.5%) had comorbidities.

3.2. Duration and indicators of healing

In this study, the indicator of healing used was the disappearance of symptoms and laboratory test.

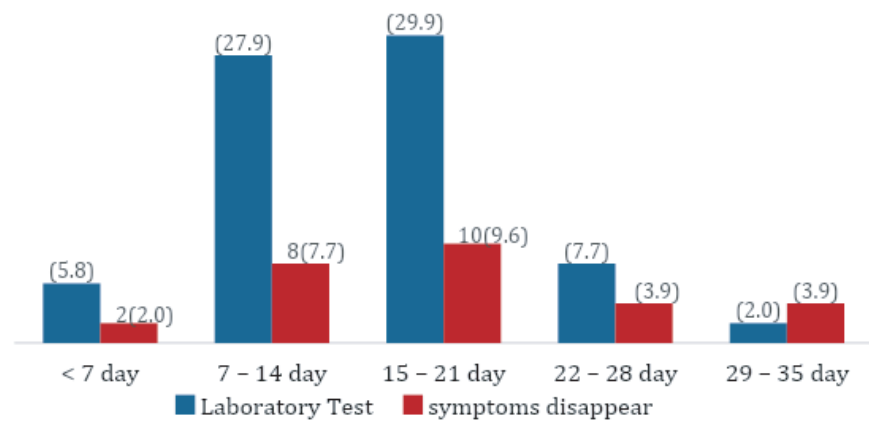


Figure 1: Duration and indicators of healing.

The duration of herbal treatment before the disappearance of symptoms varied greatly (Figure 1). Generally, 7-14 days (total 35.6%) and 15-21 days (total 39.5%) are required for recovery. After feeling better, most responders ($n = 73.1\%$) underwent an antibody test, with negative findings. However, as many as 26.9% of respondents did not (without laboratory test); therefore, the cure rate was calculated based on eliminating symptoms.

3.3. Description of Comorbidity against healing time

The results showed that the respondent's co-morbidities with Covid-19 varied (Figure 2).

Comorbidities are dominated by Hypertension with a recovery period of 7-14 days, Diabetes mellitus with a recovery period of 15-21 days, and cardiovascular with varying recovery periods, namely: 7-14 days and 15-21 days.

3.4. Types of Jamu for healing Covid-19

People throughout Indonesia have medicinal plants that have been used for generations to treat various diseases, including fever, sore throat, inflammation, nausea, and pain, as well as to boost immunity. The community used this medicinal plant during the pandemic to recover from the Covid-19 virus (Figure 3).

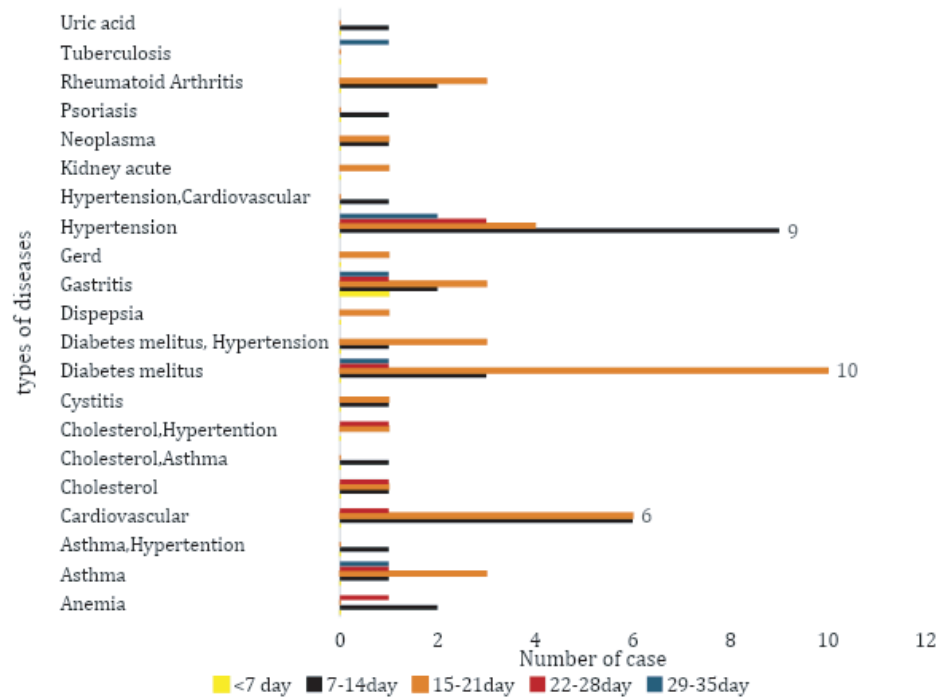


Figure 2: Description of Comorbidity against healing time.

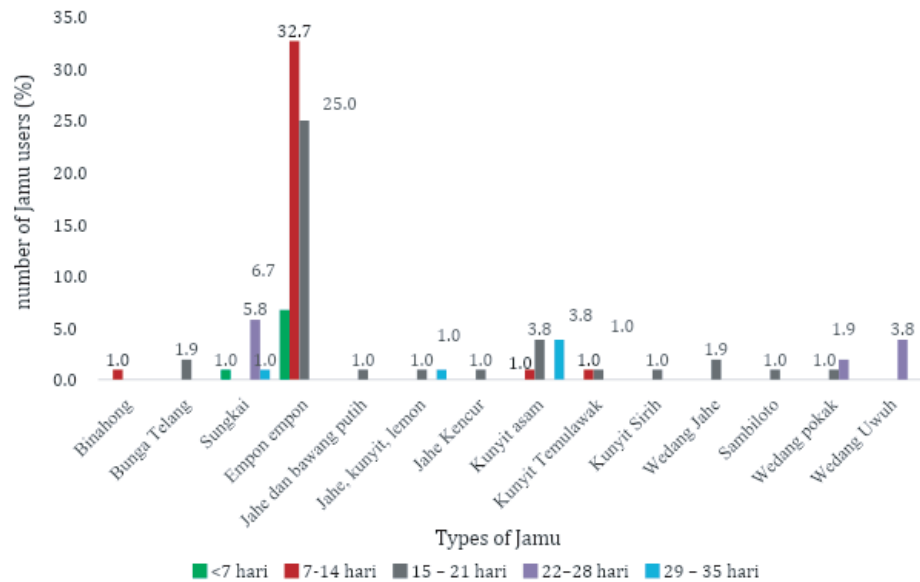


Figure 3: Types of jamu and Healing Period for Covid-19.

The result shows that the most used Empon-Empon for Covid-19 self-medication total 64.4%with the most healing period in the range of 7-14 days (32.7%).

3.5. Components of Plants and Areas of Origin of Herbal

For the Covid-19 healing initiatives, each region creates its own unique herbal medicine. The rhizomes, leaves, bark, flowers, and seeds of plants are all used in the preparation of this jamu medication, and it is presented as a decoction (Table 2).

The Zingiberaceae family dominates plant components used in herbal medicine. The plant parts used as herbal ingredients are the rhizomes, leaves, seeds, flowers, bark and fruit flesh. The plant parts are mixed and served by boiling. The plants used in Indonesian herbal medicine to treat Covid-19 are spread in 16 families.

3.6. Region of Jamu user

The number of people who use Jamu as a treatment for Covid-19 is distributed over different regions in Indonesia (Table 3); the results show that most Jamu consumers live on the island of Java.

4. Discussion

People in Indonesia have a longstanding heritage of using alternative therapies and a tradition passed down through the generations. Limestone crusher (lumping and pestle) fossils, inscriptions, and Sanskrit texts on temple reliefs on Java attest to this. The term "djamoe" has been in use since the 15th or 16th century A.D., and it can be found in the notes of the primbon in Kartasuro. The term was strengthened in the serati centini book, which was written by Kanjeng Gusti Adipati Anom Mangkunegoro III between the years 1810 and 1823, and in 1850 R. Atmasupana II wrote about 1734 different herbal ingredients. [17].

In Indonesia, people of all ages, from infants to the elderly, use herbal medicine for various purposes, including the treatment and prevention of disease. The habit of drinking herbal medicine is influenced by the culture that has been passed down from generation to generation, as well as the belief that herbal medicine can heal, is safe to use, has low side effects, is inexpensive, and is easy to obtain, as well as the assumption that drinking herbal medicine can alleviate some disease symptoms [18].

Based on the demographic characteristics of respondents, age has an influence on the increased risk of being infected with Covid-19 along with increasing age (Table 1).

TABLE 2: Herbal Medicine's Constituents and Origin Regions.

Jamu name	Origin Regions	Herb				Herb parts	Serving technique
		Local name	Herb name	English name	Herb Family		
Empon-Empon	Java Island	Daun Salam	<i>Syzygium polyanthum</i>	Bay leaf	Myrtaceae	Leaf	Decoction
		Kayumanis	<i>Cinnamomum Verum</i>	Cinnamon	Lauraceae	Bark	
		Lengkuas	<i>Alpinia purpurata</i>	Galangal	Zingiberaceae	Rhizome	
		Jahe Merah	<i>Zingiber officinale var.rubrum</i>	Red ginger	Zingiberaceae	Rhizome	
		Cengkeh	<i>Syzygium aromaticum</i>	Clove	Myrtaceae	Flower	
		Pala	<i>Myristica fragrans</i>	Nutmeg	Myristicaceae	Leaf	
		Kunyit	<i>Curcuma longa</i>	Turmeric	Zingiberaceae	Rhizome	
		Kencur	<i>Kaempferia galangal</i>	Aromatic ginger	Zingiberaceae	Rhizome	
Wedang Uwuh	Wonogiri, Central Java	Pala	<i>Myristica fragrans</i>	Nutmeg	Myristicaceae	Leaf	Decoction
		Serai	<i>Cymbopogon citratus</i>	Lemongrass	Poaceae	Leaf	
		Secang	<i>Caesalpinia sappan</i>	cup	Caesalpinaceae	Bark	
		Kayumanis	<i>Cinnamomum verum</i>	Cinnamon	Lauraceae	Bark	
		Jahe Merah	<i>Zingiber officinale var rubrum</i>	Red ginger	Zingiberaceae	Rhizome	
		Cengkeh	<i>Syzygium aromaticum</i>	Clove	Myrtaceae	Flower	
Wedang Pokak	Demak, Central Java	Kembang Lawang	<i>Illicium verum</i>	Star anise	Illiciaceae	Flower	Decoction
		Serai	<i>Cymbopogon citratus</i>	Lemongrass	Poaceae	Stem	
		Pandan	<i>Pandanus amaryllifolius. Roxb</i>	Pandan	Pandanaceae	Leaf	
		Kayumanis	<i>Cinnamomum verum</i>	Cinnamon	Lauraceae	Bark	
		Kapulaga	<i>Amomum cardamomum</i>	Cardamom	Zingiberaceae	Flower	
		Merica	<i>Piper nigrum</i>	Pepper	Piperaceae	Seed	
		Cengkeh	<i>Syzygium aromaticum</i>	Clove	Myrtaceae	Flower	
Kunyit Asam	Central Java	Celagi/Asam Jawa	<i>Tamarindus indica</i>	Tamarind	Fabaceae	Flesh of fruit	Decoction
		Kunyit	<i>Curcuma longa</i>	Turmeric	Zingiberaceae	Rhizome	
Sungkai	South Sumatra, Kalimantan	Sungkai	<i>Peronema canescens</i>	Sungkai	Verbenaceae	Leaf	Decoction
Wedang Jahe	Java Island	Kelapa	<i>Cocos Viridis</i>	Coconut	Arecaceae	Flesh of fruit	Decoction

This is related to the level of immunity, elderly humans have a tendency to decrease

TABLE 2: (Continued).

Jamu name	Origin Regions	Herb				Herb parts	Serving technique
		Jahe	<i>Zingiber officinale</i> <i>Rosc</i>	Ginger	<i>Zingiberaceae</i>	Rhizome	
Kunyit Temulawak	West Java	Kunyit	<i>Curcuma longa</i>	Turmeric	<i>Zingiberaceae</i>	Rhizome	Decoction
		Temulawak	<i>Curcuma Xanthor-</i> <i>rhiza Roxb</i>	Curcuma	<i>Zingiberaceae</i>	Rhizome	
Kunyit Sirih	West Java	Kunyit	<i>Curcuma longa</i>	Turmeric	<i>Zingiberaceae</i>	Rhizome	Decoction
		Jahe	<i>Zingiber officinale</i>	Ginger	<i>Zingiberaceae</i>	Rhizome	
		Sirih Hijau	<i>Piper betle, Linn</i>	Green Betel	<i>Piperaceae</i>	Leaf	
Jahe Bawang putih	Banten	Jahe	<i>Zingiber officinale</i>	Ginger	<i>Zingiberaceae</i>	Rhizome	Decoction
		Bawang Putih	<i>Allium sativum</i>	Garlic	<i>Liliaceae</i>	Tubers	
Sambiloto	Banten	Sambiloto	<i>Androgaphis panic-</i> <i>ulata Ness</i>	Sambiloto	<i>Acanthaceae</i>	Leaf	Decoction
Kunyit Jahe,Lemon	West Java	Jahe	<i>Zingiber officinale</i> <i>Rosc</i>	Ginger	<i>Zingiberaceae</i>	Rhizome	Decoction
		Kunyit	<i>Curcuma longa</i>	Turmeric	<i>Zingiberaceae</i>	Rhizome	
		Lemon	<i>Citrus limon</i>	Lemon	<i>Rutaceae</i>	Fruit	
Binahong	West Java	Binahong	<i>Anredera cordifolia</i>	Heartleaf maderavine	<i>Basellaceae</i>	Leaf	Decoction
Bunga Telang	West Java	Bunga Telang	<i>Clitoria ternatea</i>	Butterfly pea	<i>Fabaceae</i>	Flower	Decoction
Kencur Jahe	Riau islands	Kencur	<i>Kaempferia galan-</i> <i>gal</i>	Aromatic ginger	<i>Zingiberaceae</i>	Rhizome	Decoction
		Jahe	<i>Zingiber officinale</i> <i>Rosc</i>	Ginger	<i>Zingiberaceae</i>	Rhizome	

the ability to respond to natural and adaptive immunity in response to the presence of antigens in the body so that this greatly affects the control of viral infections [19]. There is a considerable reduction in the expression and function of TLR2, TLR3, TLR4, TLR5, TLR6, TLR7, TLR8 and TLR9 in the elderly [20], a decrease in the number of macrophages leads to a lower level of proinflammatory cytokines such as interleukin (IL)-6 and tumor necrosis factor (TNF) reduced generation of CD4+ and CD8+ cells as well as antibodies can be attributed to IL-12 and IFN α [21], because of this, they are at a greater risk of becoming infected with the virus [22]. The results indicated that the elderly were more inclined to utilize herbal medicine than younger ages; this was impacted by the sickness they suffered, which led them to assume that herbal medicine could treat them because it was safer, more accessible, more practical, and had fewer adverse effects. In addition, as the age of the respondent increases, so does their practical experience

TABLE 3: Region of Jamu users for Covid-19 Medication.

Jamu name	Region of Jamu users
Empon-Empon	Aceh, Bali, Bangka Belitung, Banten, Jakarta, Jambi, West Java, Central Java, Riau Islands, East Java, South Sulawesi, North Sulawesi, West Sumatra, South Sumatra
Kunyit Asam	Banten, Jakarta, Central Java, West Nusa Tenggara
Sungkai	Jambi, South Sumatra
Wedang Uwuh	Banten, West Java, Central Java
Wedang Pokak	Bali, West Java
Wedang Jahe	Banten, South Sumatra
Kunyit Temulawak	Bali, South Sumatra
Kunyit Jahe, lemon	Banten
Bunga telang	Banten, West Java
Sambiloito	West Java
Kunyit, Sirih	Banten
Kencur Jahe	West Java
Bawang Putih Jahe	Jakarta
Binahong	Central Java

and awareness of the efficacy of traditional herbs [15], so respondents prefer to use herbal medicine for Covid-19 treatment and health maintenance.

The percentage of herbal medicine users for handling Covid-19 between men and women has almost the same percentage (Table 1), this shows that the use of herbal medicine is attractive to both men and women to maintain their health independently and feel a recovery after consuming it. Men have a potential susceptibility to Covid-19 infection compared to women, this is related to the presence of the hormone testosterone which can activate androgen receptors [23]. Androgen receptors play a role in regulating the TMPRSS promoter [24]. So the presence of Androgens can increase the rate of Covid-19 infection. Adult men have more Androgen receptors than children before puberty and women, so this causes adult men to be more at risk of being infected with Covid-19. The percentage of men and women who use herbal medicine to treat Covid-19 is about identical (Table 1). This indicates that herbal therapy appeals to both men and women who wish to maintain their health independently and recover after eating it. Men may be more susceptible to Covid-19 infection than women due to the availability of testosterone, which can activate androgen receptors [23]. Androgen receptors play a function in TMPRSS promoter regulation [24]. Consequently, androgens can enhance the incidence of Covid-19 infection. Adult men have more Androgen receptors than

prepubescent children and women, making them more susceptible to infection with Covid-19.

Based on Table 1, When infected with Covid-19, respondents from Java utilized herbal treatment more frequently than respondents on other Indonesian islands. This is because the plants that make up herbal medicine have been utilized as cooking spices on the island of Java since the 15th and 16th centuries [17]. This research shows that most Jamu users have secondary schooling (57.69%), and those with a secondary education realize that a healthy lifestyle entails using goods made from natural components and have a solid understanding of avoiding and controlling Covid-19 infections. Secondary education respondents' decisions, opinions, and motives to consume herbal medicine are strongly influenced by the ease with which they can get information regarding the impact and efficacy of the selection of pharmaceuticals used to maintain health and cure.

Based on Figure 1, healing responses from Covid-19 were obtained based on laboratory tests, but some were obtained based on the disappearance of symptoms. Respondents' recovery periods varied widely but were dominated by 7-14 days and 15-21 days. In addition to the presence of comorbidities, the difference in the healing period can be caused by age and the effects of the plants contained in the ingredients on the body's immunity. The clinical symptoms of patients with comorbidities are worse than those without comorbidities [25,26]. Generally, the comorbidity of Covid-19 is controlled by diabetes, hypertension, and coronary heart disease[27, 28,29].

Figure 2 shows that the respondent's comorbidities are dominated by hypertension, diabetes mellitus, and cardiovascular disease. Covid-19 is more severe in hypertensive individuals because of the activation of the RAS by (ACE/Ang II/AT1R) and (ACE-2/Ang 1-7/Mas) [30]. Hypertension is a significant risk factor for susceptibility to SARS-CoV-2 infection, including the severity of Covid-19-associated mortality [31]. Hypertension induces a reduction in ACE-2 expression, which is believed to inhibit ACE-2 residues when bound by SarsCov-2, hence promoting the development of ARDS [32]. The covid-19 infection induces a more significant decrease in ACE-2 [33]. ACE-2 catalyzes the conversion of angiotensin II to angiotensin 1-7, a peptide that inhibits angiotensin II's pro-oxidative, vasoconstrictive, and fibrotic characteristics [34]. Decreased ACE-2 produces an imbalance in the renin-angiotensin-aldosterone system (RAAS) to angiotensin II (Ang II)/AT1R, leading to endothelial dysfunction that can lead to the development of hypertension and stimulating the high activity of pro-inflammatory components [35].

These include elevated levels of Ang II, chemokines, and cytokines, such as interleukin-6 (IL-6) and tumor necrosis factor- α (TNF) [36], hence aggravating Covid-19 [33].

Base on Figure 2, In respondents with a history of diabetes, the time needed for recovery is longer compared to other comorbidities due to the poor progression of COVID-19. Comorbidities associated with diabetes can affect Covid-19 patients [37]. Uncontrolled hyperglycemia can harm components of the adaptive and innate immune responses to infections in the lung [38, 39]. In individuals with hyperglycemia, the CD4+, CD3+, and CD4+/CD8+ ratios were decreased than in regular patients, although the levels of Lactate dehydrogenase (LDH), High-sensitivity C-reactive protein (hs-CRP), and IL-6 decreased [40]. This pro-inflammatory condition is thought to be responsible for the incidence of ARDS and multi-organ failure [41], increasing the severity and death in COVID-19 patients [37].

There is a substantial correlation between the mortality rate of Covid-19 patients and cardiovascular comorbidities accompanied by the following symptoms: headache, loss of consciousness (LOC), oxygen saturation below 93%, and the requirement for ventilation [42]. Myocardial damage, as measured by a rise in troponin I, and inflammatory biomarkers (IL-6 and C-reactive protein (CRP), hyperferritinemia, and leukocytosis) are associated with the severity of Covid-19 in patients with cardiovascular comorbidities [43]. Through the ACE-2 receptor, a change in the balance of the RAAS causes an increase in the inflammatory response and cardiac aggressiveness [44]. In contrast, based on the study's results, it was found that individuals who used herbal remedies reported a decrease in symptom severity and recovery.

Research results show that during the Covid-19 outbreak, individuals with and without comorbidities utilized herbal medicine to treat the virus. Empon-Empon is the most extensively used natural medicine (Figure 3). This Empon-Empon is employed to reduce fever, hoarseness, and lack of smell in people who have breathlessness; the community obtains these herbs from herbal medicine merchants, and they have a curative effect. Empon-Empon is a natural medicine composed of rhizomes and culinary spices: Turmeric, Bay Leaves, Red Ginger, Lemongrass, Aromatic Ginger, Galangal, Cloves, Cinnamon and Nutmeg. People have faith in the safety and several advantages of these components. In preclinical studies, it was found that the rhizome of turmeric exhibits antiviral activity against hepatitis B (HBV) C, cardioprotective, anti-platelet, and anticoagulant, hence restoring cardiac function by reducing oxidative stress and scavenging free O₂ radicals and is anti-inflammatory [45]. Antioxidant, antihypertensive, anticancer,

antidiabetic, antibacterial, and antidiarrheal properties are present in Bay leaves [46]. Red ginger can decrease the number of macrophage cells [47] and contains antioxidant properties ([48]. By reducing NO generation, gingerol, [6]-shogaol and proanthocyanidin exhibit anti-inflammatory properties capable of suppressing chronic inflammation and inhibiting macrophage activation [49], which suppresses ACE and has antihypertensive action [50]. The ability of lemongrass to scavenge superoxide anions and nitric oxide radicals (NO) and inhibit NO generation by LPS-stimulated macrophages (cell line RAW 264.7) is indicative of its antioxidant and anti-inflammatory properties [51]. The rhizome of Aromatic ginger is rich in essential oils and is used to treat stomach aches, cough, chest pain, nasal blockage, asthma, and high blood pressure [52]. Extract of Aromatic ginger leaf water contains analgesic and anti-inflammatory properties [53]. Cinnamon (*Cinnamomum Verum*) has antioxidant activity, is cytotoxic against cancer cells [54], and has the potential to be used as a bronchitis treatment [55]. It also cures bronchitis, asthma, cephalalgia, odontalgia, heart disease, diarrhea, uropathy, nausea, vomiting, flatulence, fever, bad breath, arthritis, cough, hoarseness, impotence, and frigidity [56]. Nutmeg seeds contain antithrombotic, anti-inflammatory, analgesic [56], and antioxidant properties [57,58, 59].

In addition to Empon-Empon, Kunyit Asam is commonly employed (Figure 3). Turmeric tamarind is created by combining turmeric with tamarind. Tamarind (*T. indica*) has traditionally been used as an analgesic and anti-inflammatory [60] via downregulation of cyclooxygenase-2 (COX-2) expression, inducible nitric oxide synthase (iNOS), 5-lipoxygenase biosynthetic and tumor necrosis factor, the analgesic activity of *T. indica* such as through activation of central and peripheral opioidergic mechanisms [61]). It has been reported that *T. indica* can be used to treat abdominal pain, inflammation, antioxidant, diarrhea and dysentery, antimalarial, wound healing, certain bacterial infections and parasitic infestations, constipation, hepatoprotective, antidiabetic, cardioprotective, antimicrobial, and antihyperlipidemic activity [62].

Sungkai leaves were identified as a component that did not contain rhizome plants commonly used for medicinal purposes because they were contaminated with Covid-19 (Table 2). A decoction of sungkai leaves has been utilized by the inhabitants of South Sumatra and Kalimantan to treat patients with mild to moderate respiratory symptoms, as indicated by Covid-19, and a cure is reached based on clinical symptoms. The community obtains this herb by harvesting the leaves and combining them. The Dayak tribe in East Kalimantan is the source of the Sungkai plant [63]. That species is also prevalent in

Bengkulu, South Sumatra, Jambi, and Lampung [64]. This plant's leaves have been used for centuries as a treatment for colds, fever, influenza, stomach aches, and ringworms, as an anti-inflammatory, as a bath for women after childbirth and malaria, and as a mouthwash to prevent toothache. It has been observed that Sungkai leaves possess antipyretic effects and stimulate leukocyte count [64].

Some individuals also utilize Wedang Uwuh to treat Covid-19. Brazilin is the most significant phytochemical constituent of Secang wood. Brazilin contains a variety of biological properties, including antibacterial, anti-inflammatory, anti-photoaging, hypoglycemic, vasorelaxant, anti-allergic, anti-acne, and antioxidant properties [65, 66], as well as inhibiting IL-6 production [67]. In addition, a Wedang Pokak herb contains additional combinations, such as cardamom, pandan leaves, and Lawang flower. Cardamom (*Elettaria cardamomum*) possesses anti-inflammatory and antibacterial properties [68], while cloves (*Syzygium aromaticum*) contain antimicrobial, antioxidant, anti-inflammatory, analgesic, anticancer, antipyretic, and anesthetic properties [69]. Pandan leaves (*Pandanus amaryllifolius*) exhibit antioxidant, anti-inflammatory, and antiviral properties [70,71]. Kembang Lawang (*Illicium verum*) exhibits antioxidant and antiviral properties [72, 73]. The shikimic acid found in flower lawang is a precursor in the production of oseltamivir (Tamiflu®), an antiviral medication used to treat influenza A and influenza B [74]. Bunga Lawang extract inhibits TNF- and IFN—induced production of chemokines and cytokines in human keratinocytes, demonstrating anti-inflammatory action [75]. Xanthorrhizol chemicals and temulawak rhizome extract decrease the synthesis of inflammatory cytokines, such as tumor necrosis factor-alpha (TNF-), interleukin-6 (IL-6), interleukin-1 (IL-1), and protein C-reactive protein (CRP) in fat tissue [76]. Temulawak has antiviral action against hepatitis B [77, 78].

According to Table 2, the leaves, rhizomes, flowers, seeds, fruit flesh, and bark are the plant parts used to make a medicinal combination. The plant pieces are combined and boiled before being served. Some prepare it (particularly the rhizome) by grating, filtering, and boiling. However, drying and boiling is also viable way of preparation. Most of the herbs used in these ingredients have been used as cooking spices for decades. Zingiberaceae is the most prominent plant family [79] and thrives predominantly in the tropics [80]. The Zingiberaceae family is commonly used as a spice with therapeutic characteristics [80] and to treat a variety of ailments [81, 79]. The Zingiberaceae family predominates traditional Indonesian herbs used for self-medication to treat Covid-19.

Table 3 indicates that Empon-empon is used to treat Covid-19 in different regions of Indonesia (Java Island, Sumatra Island, and Sulawesi Island). Indonesians are familiar with and have easy access to the plant components present in Empon-empon.

5. Conclusion

The use of Jamu as an effort to self-medicate Covid-19 is in great demand by both men and women. Most users are between the ages of 56-65 (52.9 %), reside in Banten (32.7 %), possess a secondary education, and have comorbidities dominated by diabetes mellitus, hypertension, and cardiovascular disease. Covid-19 recovery is measured based on laboratory results and the disappearance of clinical symptoms that appear. Covid-19, accompanied by hypertension (7-14 days of healing), Diabetes mellitus (5-21 days of recovery), and cardiovascular comorbidities, have the same percentage of recovery, namely 7-14 days and 15-21 days. The most widely used herbal medicine is Empon-Empon (64.42%) which consists of a mixture of turmeric, red ginger, cinnamon, lemongrass, cloves, bay leaf, kencur, galangal, and nutmeg served by boiling. The Zingiberaceae family dominates plant components used in herbal medicine.

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Conflict of Interest

The authors have no conflict of interest to declare.

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