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Socio-demographic determinants and prevalence of traditional medicine product use in Bali: implications for healthcare integration

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ABSTRACT: Traditional medicine products (TMPs) are integral to Balinese cultural practices. This study examined the socio-demographic determinants of TMP use through a cross-sectional survey of 440 households across all districts and cities in Bali province. A multistage cluster sampling method was applied, and data were collected using a structured questionnaire validated by expert review and tested for reliability (Cronbach's alpha = 0.82). The results showed that 76.1% of the respondents used TMPs. The key predictors included age, gender, income, and residence. Middle-aged adults (46–55 years) had the highest odds of TMP use (OR = 5.667), followed by urban residents (OR = 4.999), individuals with no income (OR = 4.681), those earning below the provincial minimum wage (OR = 2.496), and women (OR = 1.838). These trends may be linked to cultural familiarity, financial barriers, caregiving roles, and increased product availability in urban areas. These findings underscore the need to integrate TMPs into Bali's healthcare system through policy regulation, clinical guidelines, community education, and interprofessional training. Integration efforts must also address challenges such as regulatory oversight, product standardization, and patient safety. This study provides a foundation for developing culturally informed public health strategies to ensure the safe and effective use of TMP.

KEYWORDS: Bali; healthcare integration; public health; raditional medicine; socio-demographic factors.

INTRODUCTION

Traditional medicine products (TMPs) remain an important component of healthcare in Bali and are deeply embedded in cultural, spiritual, and traditional beliefs. Knowledge of medicinal plant use has long been passed down through generations and documented in ancient Balinese lontar manuscripts, such as *Usadha Rare* and *Usada Bali*, which list dozens of species used for treating ailments ranging from fever and cough to stroke and tumors [1]-[3]. These manuscripts provide a cultural foundation for traditional healing in Bali but do not fully reflect the current form in which TMPs are accessed and consumed.

In recent decades, traditional medicine in Indonesia has undergone a significant transformation. Advancements in processing and packaging technologies have led to the production of ready-to-use TMPs, including capsules, tablets, powders, and bottled herbal drinks. These products are now widely available in pharmacies, drugstores, and traditional markets [4]. To ensure public safety and product efficacy, the Indonesian Food and Drug Authority (BPOM) regulates TMPs under classifications such as Jamu, Imported Traditional Medicines, and Licensed Traditional Medicines, including *Obat Herbal Terstandar* (OHT) and *Fitofarmaka.* [5]

Nationally, approximately 48% of Indonesians report using traditional medicine, with 31.8% preparing herbal remedies at home [6]. The COVID-19 pandemic further accelerated this trend, with TMP usage increasing by as much as 600%, largely driven by self-medication efforts to enhance immunity [7]. However, the growing demand has been accompanied by rising concerns, particularly regarding the adulteration of

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TMPs with pharmaceutical ingredients, misleading efficacy claims, and potentially harmful herb-drug interactions [8]-[10]. In Bali, despite the widespread availability of commercial TMPs, community-level pharmacovigilance and consumer education remain limited [7], [8]. Conservation efforts, including medicinal plant parks and revitalization of local medicinal lexicons, continue to preserve this traditional knowledge [11].

While many previous studies have explored traditional medicine use in relation to general sociodemographic patterns, most have not differentiated between homemade remedies and ready-made TMPs. For example, studies conducted in Indonesia have shown associations between traditional medicine use and factors such as education and income levels [12], [13], but without specifying the form of medicine consumed. This limits their applicability in informing regulatory and health policies aimed at modern TMP use.

Therefore, this study focuses specifically on TMPs and aims to examine how sociodemographic factors, including age, gender, education, occupation, and income, influence their use among the Balinese population. The insights from this study are expected to support culturally appropriate public health strategies and inform the safe integration of TMPs into Bali's broader healthcare system.

▪ MATERIALS AND METHODS

Study design

This study utilized a quantitative approach, adopting a cross-sectional survey design to analyze the influence of socio-demographic determinants on the use of traditional medicine products in Bali, Indonesia. By collecting data at a single point in time, this study aimed to identify relationships between socio-demographic factors, such as age, gender, education level, occupation, and income, and the use of traditional medicine products. This design facilitated the evaluation of common usage patterns and the correlations between these factors.

Study area and period

The research was conducted across multiple regencies and cities within Bali Province, Indonesia, between April and June 2023. The selection of study areas included both urban and rural regions to ensure a diverse and representative sample of the population, capturing various demographic and socio-economic profiles.

Population and sample size

The target population comprised households in Bali Province, totaling 1,180,100, based on the 2020 Bali Province Central Statistics Agency's data. The sample size was determined using the Slovin formula with a 5% margin of error, which yielded 400 households. To accommodate potential non-responses, a 10% buffer was added, bringing the final sample size to 440.

Sampling technique

A cluster sampling method was employed to ensure a balanced representation of households from different regencies and cities across Bali. Probability sampling was used to randomly select households within each cluster. One respondent from each household who met the inclusion criteria (e.g., age > 18 years, literate, and willing to participate) was selected to complete the survey. This sampling approach ensured equitable participation across different sociodemographic groups.

Data collection

Data were collected using a structured questionnaire distributed to the selected households. The questionnaire was designed to capture detailed sociodemographic information (age, gender, education level, occupation, income, and residence) and assess the respondents' use of traditional medicine products. Key sections included the following: Indications for Using Traditional Medicine Products, Types of Products Used, Methods of Use, Reasons for Choosing Traditional Medicine, Ways of Obtaining Traditional Medicine, Perceived Side Effects, and Recommendations for Safe Use.

Prior to distribution, the questionnaire underwent content and construct validity assessment by a panel of experts in public health, pharmacology and ethnomedicine. The expert review confirmed item-level content validity (I-CVI = 1.0), indicating excellent agreement on the relevance and clarity of the items. Reliability testing was conducted through a pilot study involving 30 respondents with characteristics similar to the study population. The results demonstrated good internal consistency, with a Cronbach's alpha coefficient of 0.82.

Data collection was carried out through face-to-face interviews conducted in Bahasa Indonesia by trained enumerators under field supervision to ensure data quality and respondent understanding.

Ethical considerations

Ethical clearance was obtained from the Udayana University Research Ethics Commission (Ethical Clearance Number: 1495/UN14.2.2.VII.14/TL/2023, dated June 9, 2023). Participants were required to provide informed consent before participating in the survey. The confidentiality and anonymity of all respondents were preserved throughout the study, in accordance with ethical standards for research involving human subjects.

Data analysis

The collected data was coded and entered into statistical software for analysis. Descriptive statistics were used to summarize the sociodemographic characteristics and traditional medicine use patterns. Additionally, inferential statistics, including chi-square tests and logistic regression, were employed to assess the relationships between sociodemographic factors and the use of traditional medicine products. The results are displayed in tables and figures for a clear and comprehensive presentation of the findings.

▪ RESULTS AND DISCUSSION

Prevalences and socio-demographic characteristics of respondents

Of the 440 respondents, 335 (76.1%) reported using Traditional Medicine Products (TMPs), while 105 (23.9%) did not. This high prevalence underscores TMPs as a central health practice in Bali, consistent with findings from other culturally embedded regions [14]. Table 1 outlines the sociodemographic characteristics, including age, gender, education, occupation, income, and residence.

Table 1. Prevalences and distribution of socio-demographic characteristics of respondents.

Characteristic	Category	Using traditional medicine product	Not using traditional medicine product	Total	Chi-square value	df	p-value
Age (years)	17-25	37 (53.6%)	32 (46.4%)	69 (100%)	39.467	4	0.000
	26-35	53 (63.9%)	30 (36.1%)	83 (100%)			
	36-45	95 (82.6%)	20 (17.4%)	115 (100%)			
	46-55	107 (86.3%)	17 (13.7%)	124 (100%)			
	56-65	43 (87.8%)	6 (12.2%)	49 (100%)			
Gender	Female	300 (77.7%)	86 (22.3%)	386 (100%)	4.343	1	0.037
	Male	35 (64.8%)	19 (35.2%)	54 (100%)			
Education	SD/SMP	90 (74.4%)	31 (25.6%)	121 (100%)	1.347	2	0.354
	SMA	163 (75.1%)	54 (24.9%)	217 (100%)			
	University	82 (80.4%)	20 (19.6%)	102 (100%)			
Occupation	Civil Servant (PNS)	19 (67.9%)	9 (32.1%)	28 (100%)	2.150	5	0.575
	Private Employee	56 (77.8%)	16 (22.2%)	72 (100%)			
	Entrepreneur	116 (76.8%)	35 (23.2%)	151 (100%)			

Characteristic	Category	Using traditional medicine product	Not using traditional medicine product	Total	Chi-square value	df	p-value
	Healthcare Worker	5 (62.5%)	3 (37.5%)	8 (100%)			
	Unemployed	120 (76.4%)	37 (23.6%)	157 (100%)			
	Student	19 (79.2%)	5 (20.8%)	24 (100%)			
Income	No Income	155 (89.1%)	19 (10.9%)	174 (100%)			
	<Rp 2.713.672	121 (75.6%)	39 (24.4%)	160 (100%)	40.530	2	0.000
	≥Rp 2.713.672	59 (55.7%)	47 (44.3%)	106 (100%)			
Residence	Urban	211 (89.0%)	26 (11.0%)	237 (100%)			
	Rural	124 (61.1%)	79 (38.9%)	203 (100%)	47.000	1	0.000
Total		335 (76.1%)	105 (23.9%)	440 (100%)			

TMP use was highest among individuals aged 46–55 years (86.3%) and 36–45 years (82.6%). These age groups often manage chronic health conditions and are more likely to uphold cultural health practices [15]. In contrast, younger adults aged 17–35 years showed lower usage, possibly due to greater access to modern healthcare and shifting health preferences [16].

The data also revealed significant gender disparities. Women (77.7%) were more likely to use traditional medicine than men (64.8%), with a statistically significant difference (P = 0.037). This pattern is consistent with findings in other settings, where women, often guided by family and caregiving roles, turn to traditional remedies more frequently [16]. Cultural roles and health-seeking behaviors contribute to higher usage among women, especially in areas where healthcare access is limited [17]. Women in rural settings, in particular, rely on natural treatments for common issues, such as menstrual pain and digestive ailments [14].

The educational background showed a varied pattern in TMP usage. High school graduates formed the largest user group, with 75.1% of them using traditional medicine. Interestingly, individuals with university-level education also reported high usage rates (80.4%), suggesting that higher education does not reduce reliance on traditional remedies, which may still be valued for their natural ingredients and alignment with holistic health approaches [12]. However, in other regions, such as Ethiopia, TMP use tends to be higher among those with limited formal education due to restricted access to conventional healthcare [18].

Occupational status also appeared to influence TMP use. Unemployed individuals (76.4%) and entrepreneurs (76.8%) were among the highest users, likely because of cost considerations and ease of access. This reinforces the idea that traditional remedies are often chosen as more affordable healthcare options [19]. Interestingly, high usage was also noted among private employees and healthcare workers, suggesting that cultural values around traditional practices persist regardless of professional exposure to formal medical systems. Students had the lowest usage rate (33.03%), potentially reflecting different health behaviors or better access to clinical healthcare services through educational institutions.

Income was a key determinant of TMP usage. Respondents without income reported the highest usage (89.1%), followed by those earning below the provincial minimum wage (75.6%). This supports the findings that economic limitations often lead individuals to opt for traditional remedies, which are viewed as more accessible and affordable [19]. However, even among higher-income individuals (55.7%), usage remained notable, indicating that factors such as cultural continuity and belief in efficacy influence decisions beyond economic necessity.

A notable contrast emerged between urban and rural areas. Surprisingly, TMP use was higher among urban dwellers (89.0%) than among rural residents (61.1%), with a highly significant difference (p = 0.000). While rural communities traditionally rely on medicinal plants due to limited healthcare access [20], urban populations increasingly access regulated, packaged TMPs through pharmacies and markets, contributing to increased confidence and use [21].

Traditional medicine product use patterns

The findings indicated that capsules (61.8%) were the most commonly used form of traditional medicine products (TMPs), as shown in Figure 1**.** This preference demonstrates a clear shift from traditional preparations, such as powders or decoctions, to modern pharmaceutical forms that are more practical, hygienic, and standardized in dosage. Such transformations reflect the ability of TMPs to adapt to contemporary consumer expectations while enhancing accessibility and building trust [22], [23]. This trend is consistent with the modernization of the Indonesian traditional medicine industry, which increasingly produces ready-to-use formulations, standardized herbal medicines (*Obat Herbal Terstandar*), and phytopharmaceuticals regulated by the Indonesian Food and Drug Authority [4], [5].

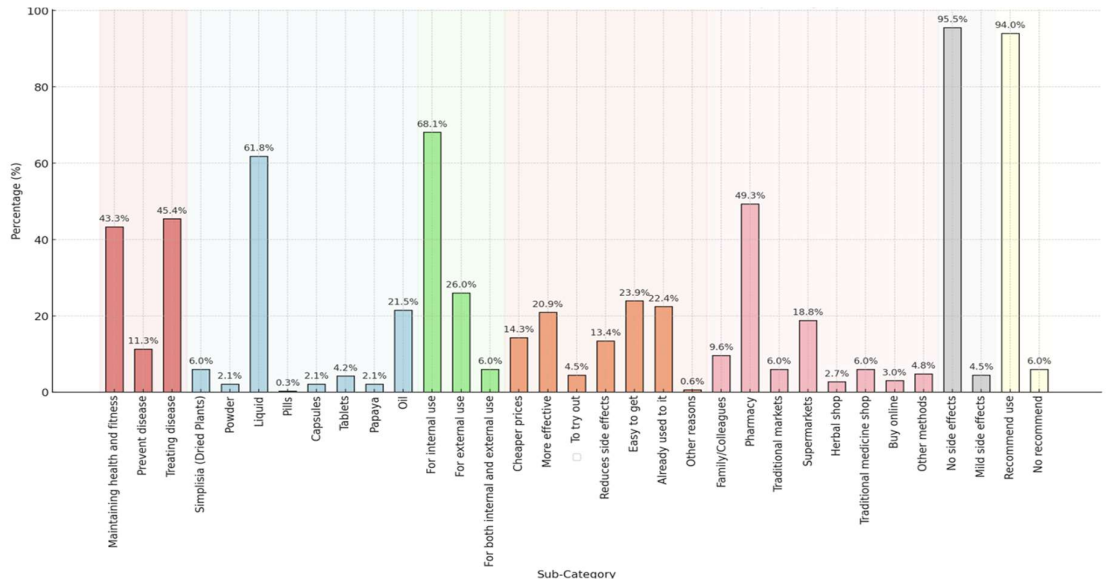
In terms of indications, TMPs were predominantly used for disease prevention (45.4%) and health maintenance (43.3%), whereas only 11.3% reported using them to treat existing diseases **(**Figure 1**).** This suggests that TMPs are widely positioned as curative agents and preventive and promotive health strategies. Furthermore, 68.1% of respondents reported using TMPs to manage chronic conditions, respiratory problems, and general wellness, which is consistent with prior studies in Indonesia showing that *jamu* and other herbal remedies are commonly consumed to maintain stamina and enhance immunity in daily life [15], [23].

The motivations for choosing TMPs were primarily based on accessibility and familiarity. Previous use was cited by 23.9% of respondents, and 22.4% emphasized ease of access **(**Figure 1**).** These findings align with evidence from Ethiopia, where accessibility is a major determinant of the preference for traditional over modern medicine [18]. In the Balinese context, cultural legitimacy and intergenerational practices further reinforce this behavior, as TMPs are often perceived as natural, safe, and tested within families over time [22].

Pharmacies were the most common source of TMPs, reported by 49.3% of respondents (Figure 1**).** This trend reflects the increasing formalization and regulation of the traditional medicine market, which contributes to consumer confidence and highlights the intersection between traditional and conventional healthcare systems [24].

With regard to safety perceptions, the vast majority of respondents (95.5%) reported no side effects, whereas only 4.5% mentioned mild adverse effects **(**Figure 1**).** However, this perception of safety should be interpreted with caution. Previous studies have emphasized the potential risks associated with long-term use and possible herb–drug interactions, which may not be immediately recognized by consumers [25], [26]. The high recommendation rate (94.0%) underscores the strong cultural trust placed in TMPs, echoing findings from African contexts where traditional medicine continues to play a central role in healthcare systems [27].

Overall, the usage patterns illustrated in Figure 1 reveal that TMPs in Bali have undergone significant transformations in form, function, and distribution channels without losing their cultural roots. Therefore, they should not be regarded as residual practices but as a dynamic component of contemporary health behavior. While cultural acceptance and accessibility ensure their continued popularity, sustained regulatory oversight and safety monitoring remain essential to maximize their benefits and minimize potential risks of their use.



Category label:

- Indications for Using Traditional Medicinal Products
- Types of Traditional Medicine Products
- Ways of Using Traditional Medicine Products
- Reasons for Choosing Traditional Medicinal Products
- Methods of Obtaining Traditional Medicinal Products
- Perceived Side Effects
- Recommendations for Use

Figure 1. Distribution patterns of traditional medicine product usage.

Influence of socio-demographic determinants on traditional medicine use

The logistic regression analysis presented in Table 2 and illustrated in Figure 2 reveals that sociodemographic characteristics significantly shape TMP use.

Table 2. Logistic regression analysis of sociodemographic factors affecting traditional medicine usage.

Variable	B	S.E.	Wald	df	Sig. (*p*-value)	Exp(B) (Odds Ratio)
Age (17-25)	0.480	0.384	1.564	1	0	1.617
Age (26-35)	1.176		9.379	1	0.002	3.241
Age (36-45)	1.642	0.398	17.031	1	0.000	5.164
Age (46-55)	1.735	0.537	10.445	1	0.001	5.667
Gender (Female)	0.609	0.355	2.941	1	0.086	1.838
Income (No Income)	1.544	0.344	20.090	1	0.000	4.681
Income (< Rp 2.713.672)	0.915	0.307	8.907	1	0.003	2.496
Residence (Urban)	1.609	0.275	34.261	1	0.000	4.999
Constant	-1.851	0.478	14.981	1	0.000	0.157

Age emerged as the most important determinant: individuals aged 46–55 years were the most likely to use TMPs (OR = 5.667), followed by those aged 36–45 years (OR = 5.164). This reflects the onset of chronic conditions and greater health needs during middle age, prompting individuals to adopt diverse healthcare options, including traditional medicine [28]. In contrast, younger adults (17–25 years) were less likely to use TMPs, consistent with their stronger reliance on modern healthcare services [17].

Gender differences were also observed, with women more likely than men to report TMP use (OR = 1.838), although the result was not statistically significant (p = 0.086). This trend is consistent with prior studies showing women's pivotal role as family caregivers and frequent users of traditional remedies for both personal and maternal health [19], [29].

Income significantly influenced TMP use. Respondents without income reported the highest likelihood (OR = 4.681), followed by those earning below the provincial minimum wage (OR = 2.496). These findings are consistent with prior evidence that economic barriers to formal healthcare encourage reliance on affordable traditional alternatives [30], [31]. Nevertheless, cultural acceptance and perceived efficacy remain important, as TMP use persists across income categories.

Urban residents were nearly five times more likely to use TMPs than their rural counterparts (OR = 4.999). While traditional medicine is often associated with rural practices, this urban predominance may be explained by the widespread availability of TMPs in regulated outlets, such as pharmacies, combined with the cultural continuity that sustains their role in everyday health practices [24]. For urban low-income populations, TMPs may also represent a practical response to the high costs and long waiting times for conventional care [32].

Collectively, these findings emphasize that TMP use is not confined to rural or disadvantaged groups but spans multiple socio-demographic categories. Women, middle-aged adults, low-income individuals, and urban residents are especially prominent users, confirming that TMPs occupy a unique position in Bali's pluralistic healthcare landscape.

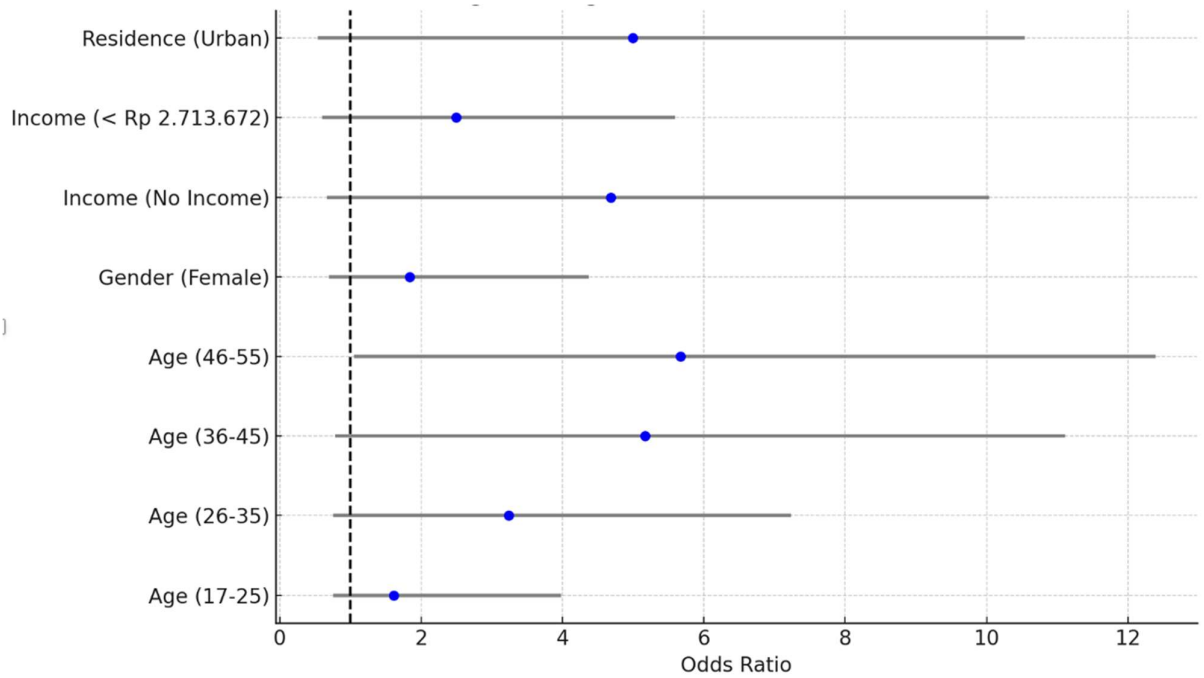


Figure 2. Forest plot of logistic regression odds ratios with confidence intervals.

These findings have important implications for public health. TMPs should be recognized as an integral part of healthcare strategies, rather than as peripheral practices. Health promotion efforts should include education on safe TMP use, especially among middle-aged adults and women, who represent the most frequent users. The regulation of distribution channels, particularly pharmacies, should be strengthened to ensure quality and safety. In addition, pharmacovigilance systems are essential for monitoring long-term effects and herb–drug interactions, given the high perception of safety among users.

This study had several limitations must be noted. The cross-sectional design prevented causal inference, and reliance on self-reported data may have introduced recall bias, particularly concerning side effects. Moreover, this study did not distinguish between different TMP categories or brands, which may vary in terms of efficacy and safety.

Despite these limitations, the findings provide insights that extend beyond the island of Bali. Although Bali's strong cultural traditions may amplify TMP reliance, the observed drivers of modernized formulations, affordability, and accessibility through regulated outlets mirror global patterns of traditional medicine use [24], [27]. Thus, while the generalizability of these results to other contexts should be made with caution, the underlying determinants identified in this study are likely to be relevant across Southeast Asia and other low- and middle-income settings.

▪ CONCLUSION

This study confirmed that age, residence, income, and gender significantly influenced the use of traditional medicine (TM) in Bali. Middle-aged adults, particularly those aged 46–55 years, showed the highest likelihood of TM use (OR = 5.667), followed by urban residents (OR = 4.999), individuals with no income (OR = 4.681), and those earning below the provincial minimum wage (OR = 2.496). Women were also more likely to use TM (OR = 1.838), reflecting their roles as caregivers and their reliance on accessible treatment options. These patterns suggest that cultural familiarity, economic accessibility, and service availability shape TM utilization, although further research is needed to better understand the role of urban access and distribution channels.

These findings highlight the need to integrate TM into Bali's healthcare system through clear policy regulations, clinical guidelines, community-based education, and interprofessional training. Public health strategies should promote safe and effective TM use while addressing the socioeconomic disparities that shape treatment decisions. Healthcare professionals, including pharmacists, physicians, and nurses, should be actively engaged in patient education and pharmacovigilance, particularly in counseling on herb-drug interactions and monitoring adverse effects.

Future research should examine long-term TM safety, explore traditional-modern medicine interactions, assess post-COVID-19 usage trends, and evaluate the implementation and impact of TM regulations at the community level to ensure culturally appropriate and evidence-based care.

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