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# Philippine traditional herbal remedies for hypertension

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**ABSTRACT**

Certain areas of the Philippines continue to rely on traditional non-pharmacological approaches, such as herbal medicine, for hypertension treatment, a significant public health problem globally. Therefore, a systematic review of plants used in the Philippines to treat hypertension, based on the PRISMA flow diagram, was carried out. Relevant ethnobotanical studies were retrieved from databases such as Google Scholar, ScienceDirect, and PubMed. Following the eligibility screening, 36 ethnobotanical studies were included. The majority of the studies included in this review came from Region XIII (CARAGA), Region VI (Western Visayas), and Region X (Northern Mindanao). The most prevalent plant family and species were Poaceae (12 species) and *Cymbopogon citratus* (DC.) Stapf. (16 citations), respectively. Leaves were the most common plant parts utilized while decoction was the most frequently mentioned mode of preparation. Oral administration was the most widely used form of administration. This review highlights medicinal plants with potential antihypertensive properties. It underscores the need to conduct a systematic review of their pharmacological properties to determine which have been scientifically validated and are most effective against hypertension.



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## 1. INTRODUCTION

Ischemic heart disease continues to be the leading cause of death in the Philippines in the first half of 2023 [1]. One of the major risk factors for this disease is hypertension (HTN), commonly known as high blood pressure. The 2020 Philippine Society for Hypertension clinical practice guideline defines hypertension as an office blood pressure (BP) of 140/90 mmHg or higher, recorded at least twice on two separate days [2]. In 2005, Kearney *et al.* [3] forecasted that the number of adults with hypertension worldwide would increase to approximately 1.56 billion in the year 2025. Although the exact causes of hypertension are unknown, several contributing factors have been identified that may increase susceptibility to developing hypertension. These include smoking, obesity, high sodium intake, or a sedentary lifestyle [4].

The treatment for hypertension involves both non- and pharmacological methods. Non-pharmacological methods include a change in lifestyle that addresses the risk factors [5] and is considered the first step in managing hypertension. On the other hand, pharmacological approaches involve the use of various drugs, belonging to different classes, to control blood pressure. These include diuretics, sympathomimetic agents, renin, and angiotensin-converting enzyme (ACE) inhibitors, angiotensin II receptor blockers (ARBs), calcium channel, α-adrenergic, and β-adrenergic blockers, and vasodilators [6]. However, a significant portion

of the population in the Philippines lacks the privilege of consulting a professional healthcare provider [7], forcing them to continually rely on traditional non-pharmacological approaches such as herbal medicines.

Plants have a long history of use for the treatment of various diseases [8], including hypertension [9]. Several clinical trials have been conducted worldwide to evaluate the antihypertensive properties of medicinal plants. For example, powdered leaves of *Hibiscus sabdariffa* and *Olea europaea* were found to have comparable antihypertensive efficacy and safety to captopril, a common antihypertensive drug [10]. Another clinical trial reported significant reductions in systolic, diastolic, and mean arterial pressures of subjects treated with *Mentha longifolia*, *Viola odorata*, and *Urtica dioica*, which were dependent on the dose and duration of the treatment [11]. The results of these studies highlight the promising potential of plants as a source of pharmaceutical drugs for hypertension.

Currently, ten medicinal plants are endorsed by the Department of Health (DOH) and have been thoroughly tested and clinically proven by the Philippine Institute of Traditional and Alternative Health Care (PITAHC) as alternative medicines for certain conditions [12]. However, none of these plants has been approved for the treatment of hypertension. Additionally, there are no published articles on the compilation of plant species specifically used for the treatment of hypertension. Previous publications have focused on other health issues such as cancer or tumors [13], gynecologic diseases [14], anemia [12], and obstetric care [15]. Hence, this study aims to address this gap by determining the medicinal plants used for treating hypertension in the Philippines and providing a list of potential plants to be validated that could be used to develop future hypertension treatments. In this systematic review, we also identified the most common plant parts, modes of preparation, and administration used to treat hypertension in the Philippines.

## 2. METHOD

This study is a systematic review of medicinal plants used to treat hypertension in the Philippines. This is conducted based on Preferred Reporting Items For Systematic Reviews And Meta-Analyses (PRISMA) flow diagram [16], as shown in Figure 1. This diagram provides a visual representation of the study selection process, which records the number of studies identified, screened, and included, and the reasons for exclusion at each stage of the review.

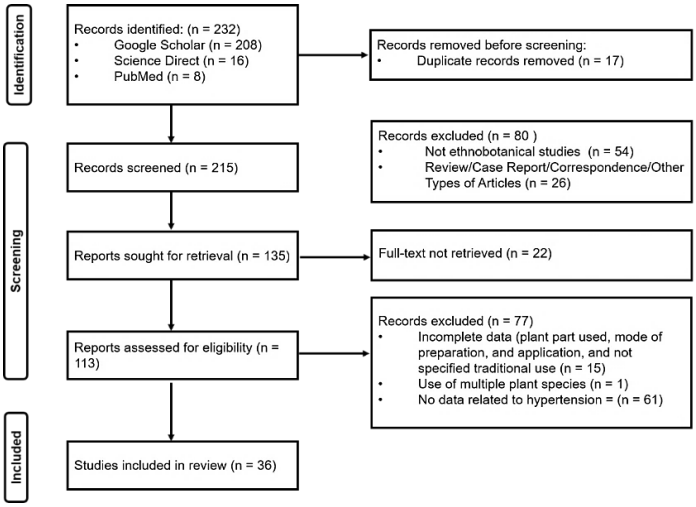



Figure 1. PRISMA flowchart of the study

### 2.1. Data sources and search strategy

The materials used in this study were obtained from three electronic databases: Science Direct (https://www.sciencedirect.com/), Google Scholar (https://scholar.google.com/), PubMed (https://pubmed.ncbi.nlm.nih.gov/). Key search terms used included: "ethnomedicine," "ethnobotany," "medicinal plants," "traditional medicine," "hypertension," "high blood," "highblood," "alternative medicine," and "Philippines".

### 2.2. Study selection criteria

Studies written in English or Filipino and published until May 2024 were considered. Observational studies were also specifically selected as they provide primary information about ethnobotanical knowledge [12],

[14], reflecting how the communities in the Philippines are using these medicinal plants for the treatment of hypertension. Other types of articles, such as systematic reviews, literature reviews, and correspondence, were excluded.

### 2.3. Data extraction

The full text of all the eligible studies was retrieved. All irrelevant articles were excluded, and reasons for their exclusion were recorded. From each eligible study, the following data were collected: first author, year of publication, plant family, plant species, plant part used, mode of preparation, administration, informants, and place of study.

### 2.4. Data analysis

The results of this study were organized and presented using tables and graphs generated in Microsoft Excel. This provides a summary of the key findings, allowing for easier interpretation. A map was also created to determine the geographical distribution of ethnobotanical studies included in the systematic review.

## 3. RESULTS AND DISCUSSION

This is the first systematic review of medicinal plants used to treat hypertension in the Philippines. As depicted in Figure 1, the initial literature search resulted in 232 ethnobotanical studies, of which 17 were duplicates. Following eligibility screening, 179 studies were excluded and 36 studies were included.

### 3.1. Geographical distribution of studies

Figure 2 shows the geographical distribution of ethnobotanical studies with data on plants used to treat hypertension in the Philippines and the informants cited per region. The numbers represent the studies conducted in each region. These studies originated from different provinces in the Philippines, covering fifteen regions. Twenty-five percent of these studies came from Region XIII (CARAGA), where most respondents belong to the Manobo and Mamanwa Tribes, respectively. Region XIII (CARAGA) was followed by Region VI (Western Visayas) and Region X (Northern Mindanao), with four (11.11%) ethnobotanical studies each, as illustrated in Figure 2 and Table 1. These regions contain diverse plant species used to treat diseases and are known for the presence of Indigenous communities with traditional knowledge of medicinal plants [17]. Additionally, these areas are usually remote and disadvantaged [14]; thus, access to medications and healthcare professionals is difficult, leading people to rely on medicinal plants to treat diseases including hypertension.

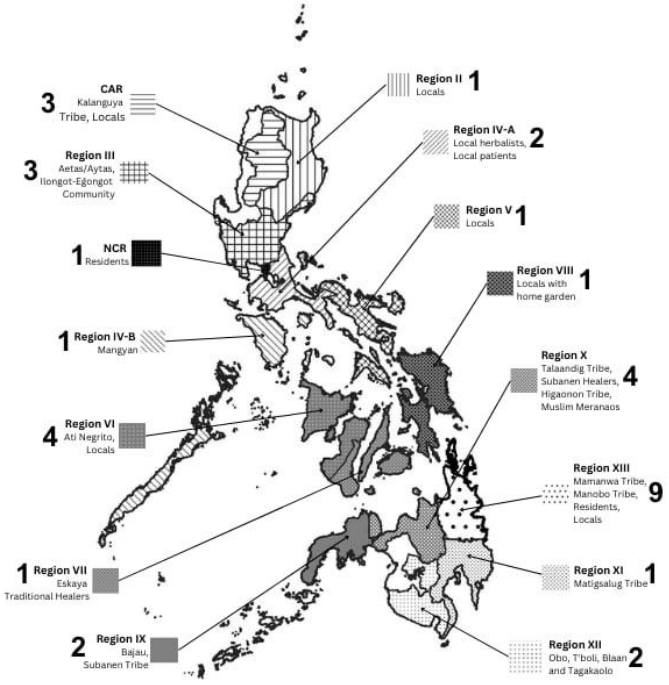



Figure 2. Geographical distribution of the ethnobotanical studies with data on plants used to treat hypertension in the Philippines, indicating the number of studies conducted and the informants cited per region

Table 1. Synthesis of the studies with data on plants used for hypertension in the Philippines

| Author | Province | Informants | Sample Size | Number of plant species used for hypertension |
|---|---|---|---|---|
| [18] | Batanes | Locals | 112 | 9 |
| [19] | Bataan | Kanawan Aytas | 61 | 2 |
| [20] | Agusan del Sur | Manobo | 39 | 1 |
| [21] | Ifugao | Kalanguya tribe | 125 | 4 |
| [22] | Benguet | Locals | 47 | 1 |
| [23] | Aurora | Ilongot-Egongot community | 65 | 6 |
| [24] | Albay | Locals | 74 | 3 |
| [25] | Leyte | Locals with home garden | 171 | 2 |
| [26] | South Cotabato | T'boli | 28 | 1 |
| [27] | Iloilo | Locals | 111 | 13 |
| [28] | Cavite | Local herbalists | 106 | 9 |
| [29] | Aklan | Ati Tribe | 106 | 2 |
| [30] | Antique | Locals | 16 | 1 |
| [31] | Agusan del Sur | Manobos | 122 | 20 |
| [32] | Laguna | Local patients | 15 | 10 |
| [33] | Metro Manila | Residents | 32 | 2 |
| [34] | Surigao del Sur | Residents | 65 | 1 |
| [35] | Surigao del Sur | Residents | 35 | 1 |
| [36] | Davao del Sur | Matigsalug Tribe | 35 | 1 |
| [37] | Zamboanga del Norte, del Sur, and Sibugay | Bajau | 36 | 2 |
| [38] | Agusan del Norte and Surigao del Norte | Mamanwa Tribe | 15 | 1 |
| [39] | Surigao del Sur | Locals | 46 | 2 |
| [40] | South Cotabato and Sarangani | Obo, T'boli, Blaan and Tagakaolo | 136 | 1 |
| [41] | Surigao and Agusan del Norte | Mamanwa Tribe | 78 | 2 |
| [42] | Bukidnon | Talaandig Tribe | 66 | 3 |
| [43] | Misamis Occidental | Subanen Healers | 60 | 1 |
| [44] | Lanao del Norte | Higaonon Tribe | 62 | 5 |
| [45] | Lanao del Norte | Muslim Meranaos | 122 | 12 |
| [46] | Guimaras | Ati Negrito | 142 | 12 |
| [47] | Bataan | Aetas | 77 | 2 |
| [48] | Agusan del Sur | Manobo Tribe | 40 | 2 |
| [49] | Surigao del Sur | Manobos | 66 | 2 |
| [50] | Zamboanga del Sur | Subanen Tribe | 89 | 7 |
| [51] | Kalinga | Locals | 80 | 4 |
| [52] | Oriental Mindoro | Mangyan | 114 | 4 |
| [53] | Bohol | Eskaya Traditional Healers | 85 | 22 |

### 3.2. Most common plant families and species used to treat hypertension in the Philippines

A total of 44 plant families and 86 species were recorded as being used for the treatment of hypertension. Figure 3 presents the most commonly reported (a) families and (b) species of plants used in the Philippines. Among all plant families reported, the most represented was Poaceae, with 12 species mentioned for the treatment of hypertension, as depicted in Figure 3(a). The dominance of Poaceae, also known as the grass family, can be attributed to its being one of the most important flowering plant families, with a vast distribution and abundance [54]. Family Poaceae is composed of 789 genera and 11,783 species belonging to 12 subfamilies and 54 tribes [55]. Plant families with high species richness have been reported to have more useful species [56]. Additionally, Asteraceae is one of the second families with the greatest number of representative species used to treat hypertension. A review of medicinal plants for hypertension therapy in Iran [57] and South Africa [58] also listed the highest number of medicinal plants from the Asteraceae family.

Figure 3(b) shows that the most frequently mentioned plant species is *Cymbopogon citratus* (DC.) Stapf. with 16 records. This finding differs from the results of other systematic reviews, such as those conducted globally [9] and in Nigeria [59]. These differences in species utilization could be the result of diverse social and cultural backgrounds, which greatly influence medicinal practices across different countries [60]. They could also be attributed to the differences in each geographical area in terms of environmental factors, such as climate, soil fertility, and soil salinity, which affect the phytochemical composition of medicinal plants [61]. Lastly, these differences can be due to the availability of the same medicinal plants in these areas. On the other hand, *Allium sativum* L., the third most frequently cited species in the Philippines, is also reported by [4], [59] as the most mentioned plant species for treating hypertension. This commonality across different countries may indicate the potential of *Allium sativum* L. as a potent remedy for hypertension.

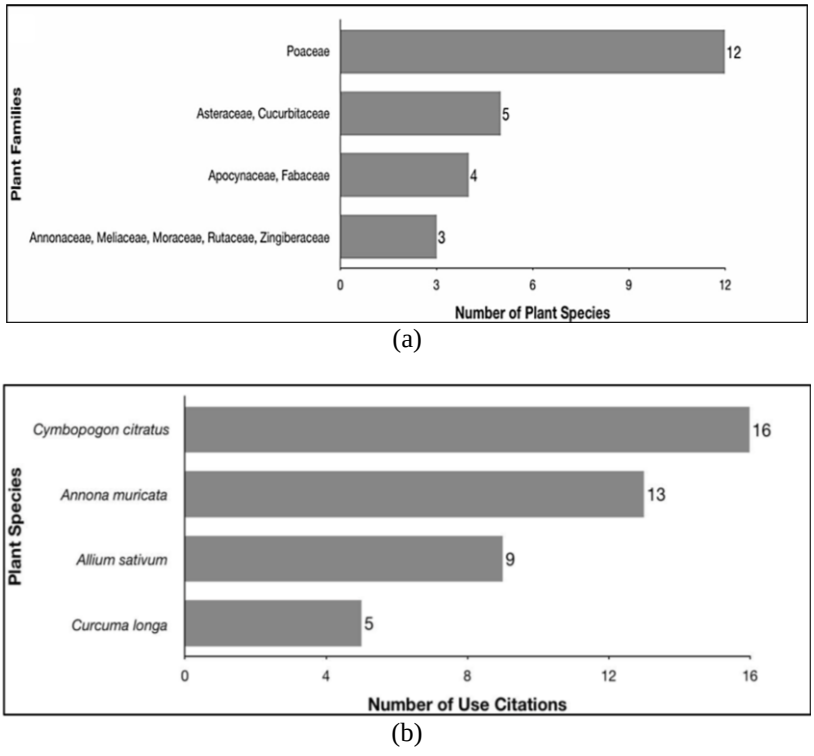



Figure 3. Most common: (a) families and (b) species of plants used to treat hypertension in the Philippines

Several studies have reported the antihypertensive properties of the bioactive compounds in medicinal plants included in this review, particularly those of the frequently mentioned species. *Cymbopogon citratus* (DC.) Stapf and citral, the major constituent of this plant, exhibit vasorelaxant effects ex vivo by facilitating the secretion of endothelial vasodilators and blocking calcium channels [62]. In addition, another essential oil constituent from *C. citratus* (DC.) Stapf is citronellol, which acts in the same manner as citral when evaluated on rats [63]. Moreover, [64] reported that aqueous extracts of *Annona muricata* L. fruit parts (pericarp, pulp, and seed) inhibit angiotensin-I converting enzyme (ACE) in vitro, which could be attributed to their phenolic contents. On the other hand, allicin is the most abundant compound in raw *A. sativum* L. [65]. Allicin has been reported to exhibit an antihypertensive effect through vasodilatory properties and hydrogen sulfide ($H_2S$) mechanisms in spontaneously hypertensive rats [66]. These findings suggest the potential of these medicinal plants as an alternative for managing hypertension.

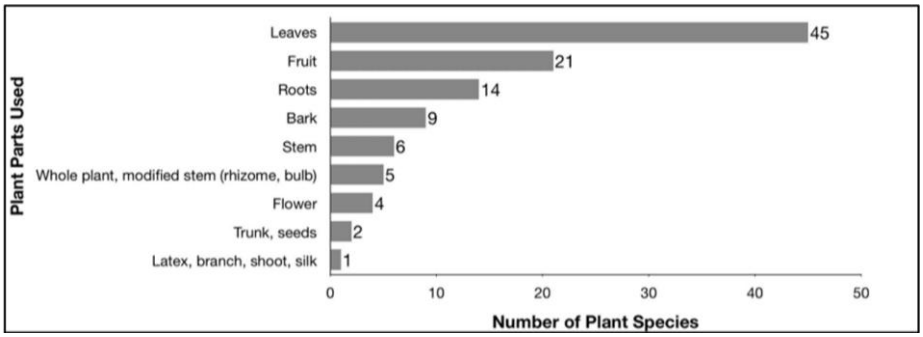
### 3.3. Most common plant parts, mode of preparation, and administration of medicinal plants used to treat hypertension in the Philippines

Figure 4 illustrates the most common 4(a) plant parts, 4(b) mode of preparation, and 4(c) administration of medicinal plants used to treat hypertension in the Philippines. As shown in Figure 4(a), the most common plant part used for herbal preparations was leaves (45 records). Similar findings with leaves as the most commonly used plant parts have been recorded by other systematic reviews [9], [67]. The high usage of leaves might be explained by the abundance of compounds found in leaves, which serve as sites for the synthesis of secondary metabolites [68]. These secondary metabolites contribute to a variety of plant bioactivities and are the active components of most herbal preparations [18], [28]. Additionally, leaves are widely available and are common plant parts, especially in tropical countries, such as the Philippines [27]. This also ensures sustainability in the use of medicinal plants compared to other plant parts, as leaves can regenerate quickly, unlike other parts such as roots and stems [69]. The excessive use of fruits and seeds also has negative impacts on plant genetic diversity and distribution owing to their role in sexual reproduction and dispersal [70].

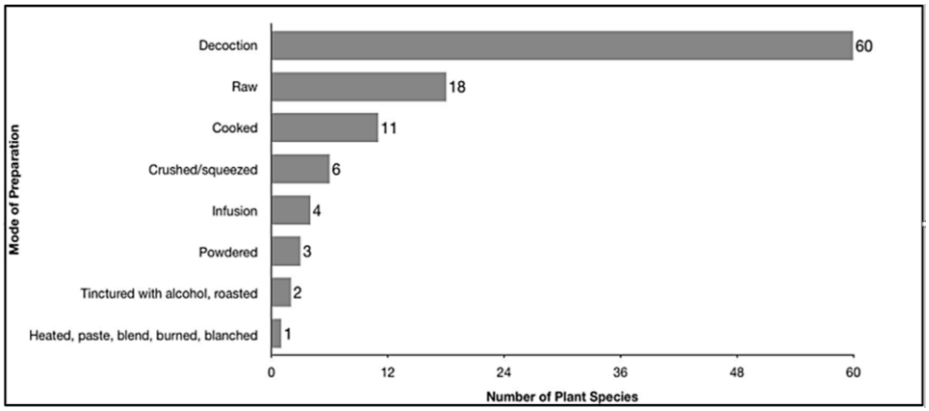
Filipinos use various methods to prepare medicinal plants for the management of hypertension. As illustrated in Figure 4(b), the most frequently used mode of medicinal preparation was decoction, with 60 plant species prepared this way. This result is in congruence with other systematic reviews [9], [67]. Both previous studies reported that the common mode of medicinal preparation was decoction. Decoction is known to be one of the simplest and oldest herbal preparations [28], which involves boiling plant materials for a certain period. According to [71], [72], using heat on aqueous extracts accelerates biological reactions and the extraction of

bioactive components. In a randomized clinical trial assessing the effectiveness of two medicinal plants in galenic forms of tablets and decoction for hypertension treatment, the decoction was more effective than tablets. This result could be due to the higher absorption of bioactive compounds when prepared in this manner [73].

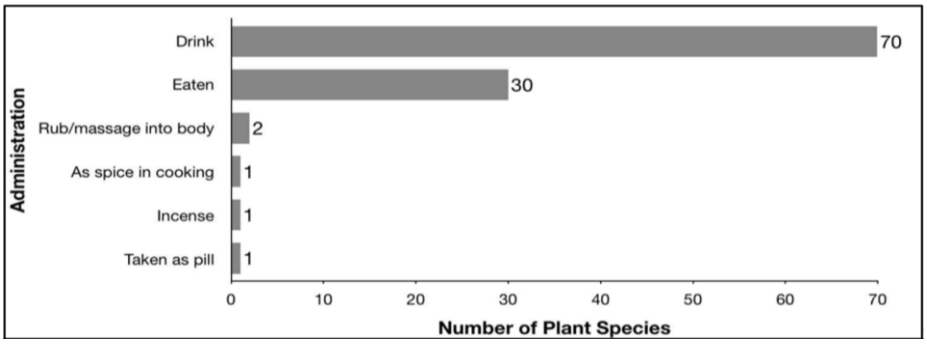
Furthermore, based on Figure 4(c), the major route of administration was oral, accounting for 102 species ingested in various ways, including drinking (70 species), eating (30 species), using as a spice in cooking, and by taking as a pill (1 species each). Oral administration is mostly preferred due to advantages like high patient compliance, convenient administration, and minimal preparation [74]. The prevalence of oral administration may also be attributed to the higher efficacy of plant-healing agents when taken internally [75].




(a)




(b)




(c)

Figure 4. Most common: (a) plant parts, (b) mode of preparation, and (c) administration of medicinal plants used to treat hypertension in the Philippines

This review identifies common plants, plant parts, modes of preparation, and administration utilized by Indigenous and local users in the Philippines for treating hypertension. This implies the essential role of plants as a vital source of medicine in the Philippines, especially for people in remote areas with limited and no access to modern health services. This review may help promote the conservation of valuable plant species and the geographical areas where these plant species thrive, as medicinal plants are increasingly threatened due to habitat destruction resulting from industrialization and climate change, as modernization progresses [17].

The findings of this study may provide a list of potential plants that can be scientifically validated for the treatment of hypertension, ultimately leading to drug development.

This study has several limitations. Observational studies with data on medicinal plants for treating hypertension have only come from fifteen regions in the Philippines. This suggests the possibility of undocumented medicinal plants in other regions that may be useful for treating hypertension. Additionally, this review mainly focused on the plant species, family, locale of the study, plant part used, mode of preparation, and administration. Another systematic review must be done on the pharmacological properties of these plant species to know which have been validated and are most effective against hypertension. Lastly, toxicological studies are needed to determine and verify the safety of these medicinal plants in treating hypertension.

## 4. CONCLUSION

This study presents data on medicinal plants used in the Philippines to treat hypertension. Eighty-six plant species belonging to forty-four families were reported, retrieved from 36 ethnobotanical studies included after the eligibility screening. The findings of this study imply that medicinal plants have been used for treating hypertension, highlighting the need to provide a scientific basis for these medicinal plants. Consequently, this review can be used as a reference list to help discover alternative therapeutic options for treating hypertension. Lastly, pharmacological and toxicological studies should be conducted to ensure the efficacy and safety of medicinal plants used for hypertension treatment in the Philippines.

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## AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

| Name of Author | C | M | So | Va | Fo | I | R | D | O | E | Vi | Su | P | Fu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meliza Parba | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | | ✓ |
| Cesar G. Demayo | ✓ | ✓ | | ✓ | | ✓ | | | | ✓ | | ✓ | ✓ | ✓ |

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

## CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

## DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [MP], upon reasonable request.

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