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HERBAL PRODUCTS AND DIETARY SUPPLEMENTS: A STUDY OF KNOWLEDGE AND USE AMONG FILIPINO ADULTS IN BARANGAY SAN ROQUE, ROSARIO, BATANGAS DURING THE COVID-19 PANDEMIC

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ABSTRACT
The absence of treatment to the current global health crisis, coronavirus disease 2019 (COVID-19) pandemic, has led some individuals to seek alternative remedies to prevent them from contracting the disease. This study had investigated the knowledge and use of dietary and herbal supplements of Filipino adults during the COVID-19 pandemic. A survey questionnaire was administered to Filipino adults (n = 343) in San Roque, Batangas. The study demonstrated that the participants' knowledge regarding herbal and dietary supplements was at a low level (40%). About 63.56% (n = 218) of the participants stated that they had changed their supplement routine by taking the supplements more frequently to boost their immune system. The logistic analysis revealed that educational attainment did not affect the knowledge on herbal and dietary supplements. Conversely, belonging in age groups 51–60 years old (p = 0.0034), >60 years old (p = 0.0465), and being male (p = 0.0122), affects knowledge, manifesting a lower likelihood of having good knowledge on herbal and dietary supplements. Majority of the population showed notable misconceptions about the safety and use of herbal and dietary supplements; hence the government and healthcare professionals are recommended to conduct a campaign to educate and raise awareness.

KEYWORDS: Herbal and dietary supplements, COVID-19, San Roque, Batangas, Government, Healthcare professionals.

1. INTRODUCTION
The novel coronavirus that first emerged in Wuhan City, Hubei Province, China, led to the rapid spread of COVID-19 into a pandemic, responsible for the current global health crisis. The incidence of COVID-19 new cases throughout the world continues to accelerate up to this day. To date, no specific drug is discovered for the prevention or treatment of COVID-19. Given the current absence of a powerful drug to combat COVID-19, various populations worldwide seek for alternative remedies to prevent one from contracting the disease or slow down the progression of the infection. It includes the use of dietary and herbal supplements in the hope of immunity and decreases the chance of getting infected. Since the dawn of humanity, medicinal plants and related medicinal preparations were already utilized for various purposes (Pan et al., 2014).[1] People had been treating diseases and relieving symptoms by employing different plant extracts and formulations for many centuries. Zarsuelo et al. (2018).[1] reported that around four billion people, about 80% of the world's population had depended on herbal medicinal products and supplements for primary health care. Furthermore, in the Philippines, the use of herbs or medicinal plants had been gaining recognition in recent years (Baleta et al., 2016).[2] A sudden rise in the consumption of herbal and dietary supplements had been reported among individuals who were frightened of contracting COVID-19, without considering the potential adverse effects linked with the said products (Ekor, 2014).[3] Therefore, the main objective of the study was to determine the knowledge and usage of dietary and herbal supplements among Filipino adults during the time of pandemic and their beliefs about the benefits of dietary and herbal supplements as protection for diseases like COVID-19.

2. MATERIALS AND METHODS
2.1. Study design and Study population
The study adopted a descriptive correlational study design using online survey questionnaires to collect quantitative data. The researchers investigated the respondents' knowledge and use of dietary and herbal

supplements during the COVID-19 pandemic. Specifically, the frequency of intake, side effects, and participants' perceived benefits in taking dietary and herbal supplements during the pandemic. The methodology was achieved through an online survey questionnaire, to be accomplished by respondents residing in Barangay San Roque, Rosario, Batangas, as provided by Google Forms. The respondents of the study are Filipino adults who took herbal products and dietary supplements. The respondents belong to the voting-age population (ages 18 to over 65 years old). After a comprehensive literature review, the research instrument (survey questionnaire) was designed. Closed-ended type of response format was utilized in the questionnaire. Dichotomous questions (with two possible answers, e.g. 'Yes' and 'No') and multichotomous questions were utilized to ensure that all possible answers were provided to the respondents. The questionnaire tool was reviewed and validated by experts to evaluate the appropriateness, clarity, and adequacy of the questions. Pilot study was also conducted which resulted to an alpha of 0.84, this means that there was a good internal consistency within the questions. The survey questionnaire was divided into three sections. The first section had four questions on the participant's demographic profile. The second section included ten questions about their general knowledge on herbal and dietary supplements (a five-point Likert scale type). The third section contained six questions on participant's usage and purpose of using herbal and dietary supplements.

2.2. Sampling strategy

Convenience sampling technique was used to collect data in this study in consideration of time and cost constraints and the large resident population count. It allowed the quick, cost-effective completion of the survey questionnaires. In addition, respondents were nearby and readily available to take part in the study. It was ideal for the researchers to gather pertinent data in a relatively fast and convenient way in this technique.

2.3. Sample size

The confidence interval and margin of error used in the study were 95% and 5%, respectively. Thus, the computed sample size required for the study was 343.

2.4. Statistical analysis

Data collected from the questionnaire was tallied, summarized, analyzed, and interpreted accordingly. The data were first presented in tabular form to represent the different responses provided by the respondents. A combination of descriptive and inferential statistics was used to characterize the data of the study. Response frequency and percentage were employed to summarize demographics; different types of dietary and herbal supplements used; usage and purpose dietary and herbal supplements; and Likert scale evaluation. The mode was used to identify the most likely answer in the Likert scale whereas, the ranking was done to identify which supplement is used the most; which medical condition is managed the most; which side effect is experienced the most; and which benefits are desired the most. Logistic Regression Analysis was to identify which demographic variables affect knowledge. Finally, Pearson R was used to identify the correlation between demographics and knowledge.

2.5. Ethical considerations

Ethical considerations were considered to safeguard the safety and dignity of the participants. The Centro Escolar University-Manila Institutional Ethics Review Committee (IERC) was responsible for reviewing the research protocols of the study. All participants in the study reported their acceptance concerning their participation in the research study, through a signed Consent to Participate Form. The purpose of this letter was to enlighten the participants regarding the purpose of collecting important information and that their participation in the study was voluntary. The anonymity and the confidentiality of the participants' responses was assured. The purpose of the study was explained to the participants. Additionally, they were advised that should they want to withdraw their participation in the study they could do so.

3. RESULTS

3.1. Demographic information

A total of 343 individuals residing in Barangay San Roque, Rosario, Batangas participated in this study. The main sociodemographic data obtained from our survey is presented in Table 1. There were more female participants than males (54.52% vs. 45.48%). More than half of them 53.64% (n = 184) were aged 18–30 years. Majority of the participants (86.88%, n = 298) were high school graduates and bachelor's degree holders, 7.58% (n = 26) were primary education graduates, 3.79% (n = 13) were tertiary education graduates, and 1.75% (n = 6) have no formal education. When the participants were asked what herbal and dietary supplements, they commonly use during the COVID-19 pandemic, 90.38% (n = 310) reported that they used Vitamin C, 32.94% (n = 113) used Zinc, and 26.24% (n = 90) used Mangosteen, refer to (Table 1).

Table 1: Age, gender and educational attainment of respondents.

Demographics	Respondents n=343
Age (years)	
18-30	184
31-50	89
51-60	52
>60	18
Gender	
Female	187
Male	156
Educational Attainment	
No Formal Education	6
Primary Education	26
Secondary Education	151
Tertiary Education	147
Post Graduate	13

Supplements	n (rank)
Vitamin C	310 (1)
Zinc	113 (2)
Mangosteen	90 (3)
Vitamin D	85 (4)
Virgin Coconut Oil	77 (5)
Lagundi	47 (6)
Moringa/Malunggay	45 (7)
Tawa-tawa	45 (8)
Ampalaya	29 (9)
Tsaang gubat	14 (10)
Others	8 (11)
Marijuana	2
Vitamin E	2
Fish Oil	1
Multivitamins	1
Turmeric	1
Vitamin B Complex	1

3.2. General knowledge on herbal Supplements and Dietary supplements

The results of the study showed that the responses of the respondents to survey questions related to the use and safety of herbal and dietary supplements suggested a substantial gap between perception and reality (Figure 2). Of 343 respondents, an overwhelming majority 303 [88.34%] and 293 [85.42%] believed that these supplements "pose no risk" and can be taken concomitantly with prescription medications. Moreover, most respondents (275 [80.17%]) believed that herbal and dietary supplements have no side effects and more than half of the respondents (229 [66.76%]) expressed their belief that herbal and dietary supplements are more effective than prescription medications (Figure 1). Although the majority of the respondents 218 (63.56%) accurately believe that herbal and dietary supplements must have the labelling "This product is not intended to diagnose, treat, cure, or prevent disease." a large number of respondents (293 [85.42%]) were still under the misconception that herbal and dietary supplements can treat many diseases and other health conditions. The findings further indicate that, 306 (89.21) of the respondents were confident that herbal and dietary supplements are "safe to use since they are derived from natural ingredients" while 221 (64.43) and 294 (85.71) respondents believed that these products are essential to

health and improve the immune system, respectively. The results are further indicated in Table 2.

Table 2. General Knowledge on herbal Supplements and Dietary supplements.

Table 2 **Knowledge of Herbal and Dietary Supplements** **(n=343)**	
n (%)	
○ Good Knowledge	
○ Safe to use as they are from natural ingredients	306 (89.21%)
○ Different from medications/drugs that treat certain types of diseases	221 (64.43%)
○ Must have the labelling "This product is not intended to diagnose, treat, cure, or prevent diseases".	218 (63.56%)
○ Improve the immune system	294 (85.71%)
○ Poor Knowledge	
○ Herbal and dietary supplements can be taken together with other prescription medications	293 (85.42%)
○ Pose no risk	303 (88.34%)
○ More effective than prescription medications	229 (66.76%)
○ Can treat many diseases and other health conditions	293 (85.42%)
○ Provide all the nutritional benefits of real food	313 (91.25%)
○ Do not have side effects	275 (80.17%)

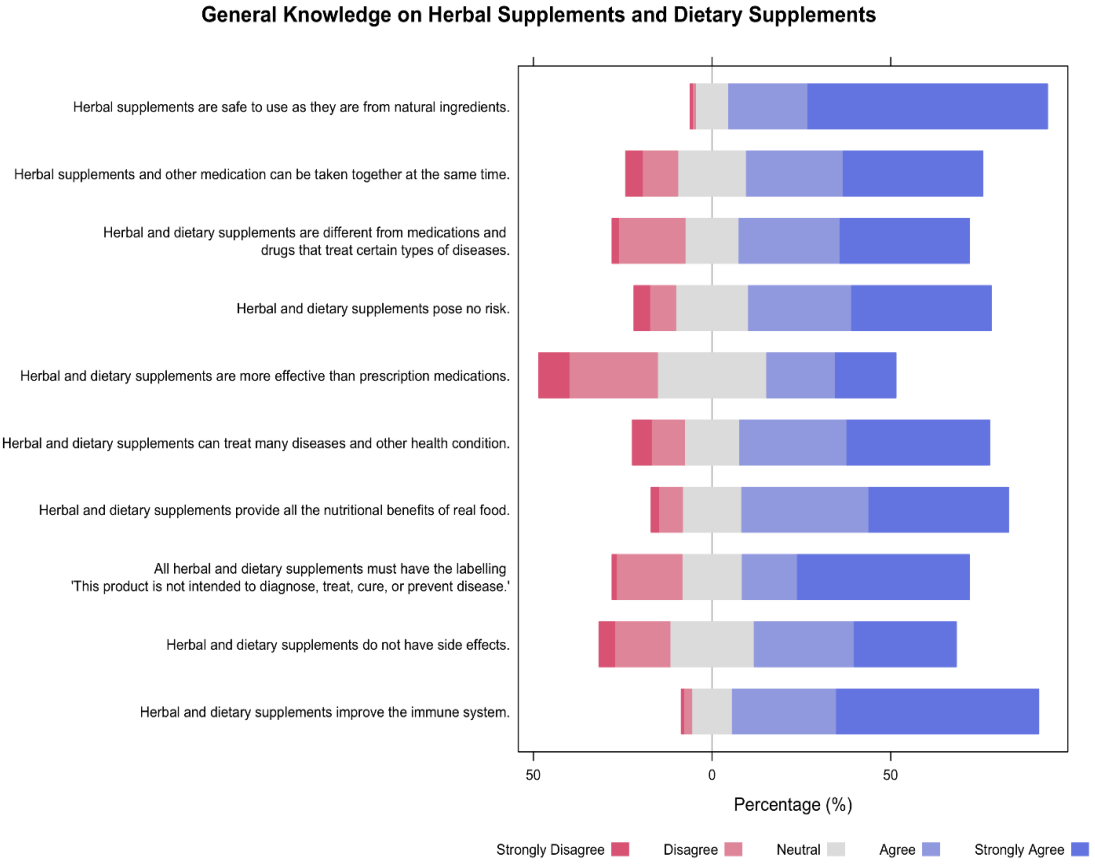

Figure 1: General Knowledge on Herbal and Dietary Supplements.

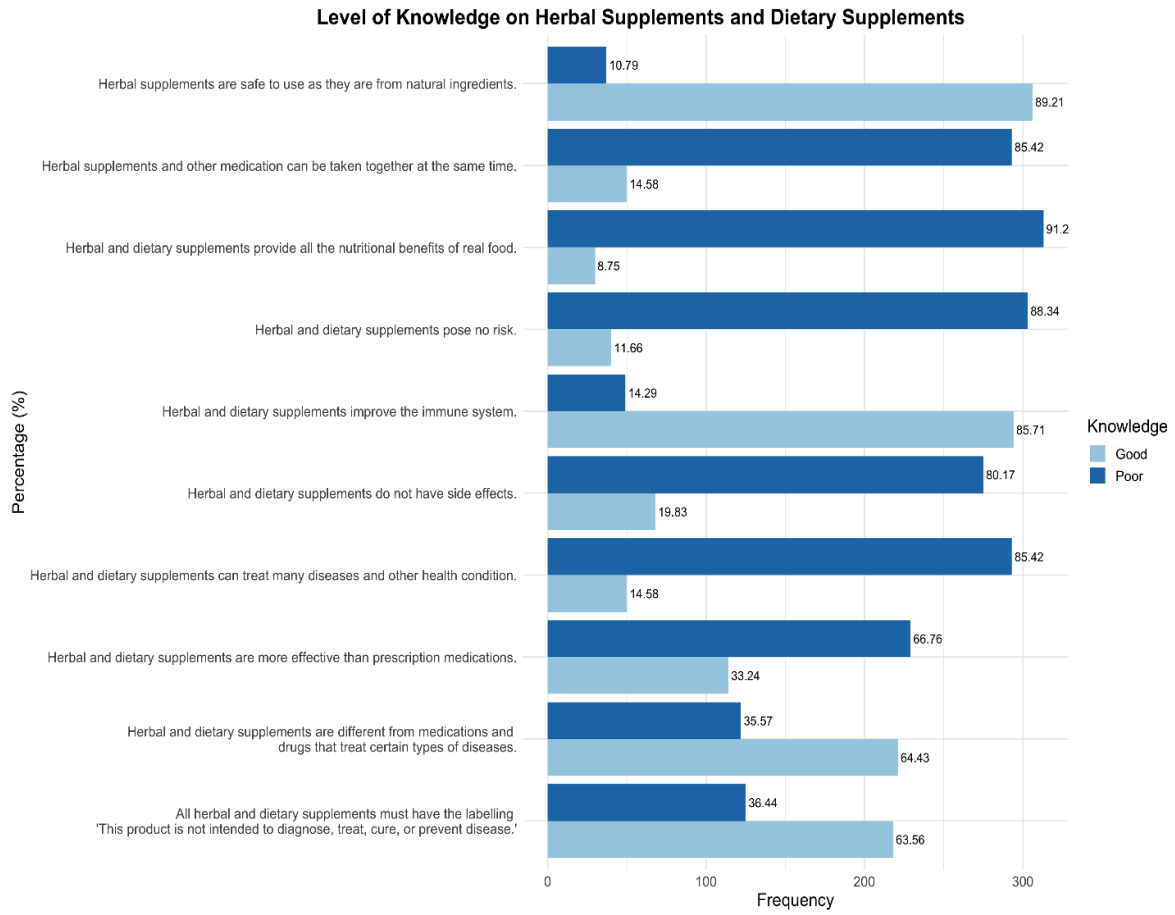

Figure 2: Level of Knowledge on Herbal and Dietary Supplements.

3.3. Usage and Purpose of Herbal and Dietary Supplements

3.3.1. Frequency of Intake

Out of 343 respondents, 13 (3.79%) take herbal and dietary supplements more than twice daily, 117 (34.11%) respondents said that they take these supplements occasionally followed closely by 116 (33.82%) respondents who take herbal and dietary supplements twice daily. The remaining 87 respondents take the herbal and/ dietary supplements once a day. The results are indicated in Table 3.

3.3.2. Changes in Supplement Routine

Majority (218 [63.56%]) of the respondents changed their supplement routine since the start of the COVID-19 pandemic. Of these respondents, nearly half (145 [42.27%]) had taken their supplements more frequently, 55 (16.03%) and 23 (6.71%) of the respondents reported that they added new supplements to the existing ones and increased the dose of the supplement, respectively. One respondent indicated reduced intake of supplement and the remaining six respondents reported taking supplements if only necessary. The results are indicated in Table 3.

3.3.3. Medication Condition(s)

A high proportion (183 [53.35%]) of the respondents do not have any current health condition to manage using herbal and dietary supplements. Further analysis revealed that 126 [36.73%]) and 60 [17.49%] respondents use herbal and dietary supplements to protect them from contracting COVID-19 and manage high blood pressure, respectively. Other health conditions such as high cholesterol (48%), diabetes mellitus (26%), heart problems (24%), rheumatoid arthritis (16%), depression (8%), and skin diseases (6%) were reported by the respondents. It is also noted that two respondents have specific conditions to manage like cough while the remaining respondents indicated anxiety and eating disorder, asthma, dengue, polycystic ovarian syndrome and one respondent reportedly takes dietary and herbal supplements to gain nutrients he is not getting from food.

Other factors that appeared to be highly predictive of herb or supplement use were (1) perceptions on how these supplements manage their health conditions, and (2) perception of benefits and unwanted effects from taking herbal and dietary supplements. The results are indicated in Table 3.

3.3.4. Side effects while taking herbal products and/or dietary supplements

A vast majority (249) experienced no side effects, a minority (49) of the respondents experienced headache, while (36) experienced diarrhea while taking herbal and dietary supplements. Few respondents experienced

dizziness (30), constipation (27), and vomiting (20). Insomnia, fatigue, and allergic reactions were reported by 13, 11, and 7 respondents, respectively. Additionally, of the respondents, two experienced acid reflux and drowsiness. The results are indicated in Table 3.

3.3.5. Benefits of taking herbal and dietary supplements during COVID-19

It was observed that the majority 279 (81.34%) of the respondents take herbal and dietary supplements to boost their immune system. It is followed by 221 (90.95%) respondents who described that herbal and dietary supplements provide health and wellness benefits. Herbal and dietary supplements were believed by slightly over half 190 (55.39%) and 183 (53.35%) respondents to provide nutritional benefits in the body and treat or reduce the incidence of COVID-19, respectively. Nearly 145 (42.27%) believed the reduced risk of serious illnesses while a mere 69 (20.12%), 65 (18.95%), 56 (16.33%), and 52 (15.16%) had reported that herbal and dietary supplements help reduce cholesterol levels, blood sugar levels, provide skin care benefits, and boost mental health. It is also noted that one respondent of the study believed that taking herbal and dietary supplements can reduce stress. The results are indicated in Table 3.

Table 3: Usage and Purpose of Herbal and Dietary supplements.

Dietary and herbal supplement Intake	**Respondents n=343**
How often do you take herbal and/or dietary supplements during this pandemic?	
Occasionally	117
Once daily	87
Twice daily	116
More than twice daily	13
Did you change your supplement routine since the start of the COVID-19 pandemic?	
Yes	218

In what way did you change your supplement routine or regimen?
Increasing dose of the supplement
Adding new supplements to the existing ones
Taking the supplements more frequently
Others
Reduce intake of supplements
Supplements are used only if necessary
No

Table 3: Usage and Purpose of Herbal and Dietary Supplements (Continued).

Medical condition(s) to manage using herbal and/or dietary supplements	**n (rank)**
I do not have any current health condition	183 (1)
COVID-19	126 (2)
High Blood Pressure	60 (3)
High Cholesterol	48 (4)
Diabetes Mellitus	26 (5)
Heart Problems	24 (6)
Rheumatoid arthritis	16 (7)
Depression	8 (8)
Skin Diseases	6 (9)
Others	

Table 3: Usage and Purpose of Herbal and Dietary Supplements (Continued).

Cough	2
Anxiety & Eating Disorder	1
Asthma	1
Dengue	1
Polycystic Ovary Syndrome	1
Not enough nutrients from food	1

What are the unwanted effects that you experienced?	**n (rank)**
None	249 (1)
Headache	42 (2)
Diarrhea	36 (3)
Dizziness	30 (4)
Constipation	27 (5)
Vomiting	20 (6)
Insomnia	13 (7)
Fatigue	11 (8)
Allergic Reactions	7 (9)
Others	2 (10)

Table 3: Usage and Purpose of Herbal and Dietary Supplements (Continued).

Acid reflux	1
Drowsiness	1
What do you think are the other benefits of taking herbal and dietary supplements during this time of pandemic?	*n (rank)*
To boost immune system	279 (1)
Health/Wellness benefits	221(2)
To provide nutritional benefits in the body	190 (3)
Treat or reduce the incidence of COVID-19	183 (4)
Improved overall health	179 (5)
Reduced risk of serious illness	145 (6)
Help reduce cholesterol levels	69 (7)
Help reduce blood sugar levels	65 (8)
Skin care benefits	56 (9)

3.4. Demographics and Knowledge

3.4.1. Influence of demographics on knowledge about herbal and supplements

Logistic regression, also called a logit model, is used to model dichotomous outcome variables, i.e., good, or poor knowledge towards herbal and dietary supplement. Logit is used to identify if factors, i.e., demographics, affects the outcome, i.e., knowledge. This model can be interpreted using p-values. If p-value < 0.05, it is significant.

Otherwise, not. Also, it can be interpreted using confidence interval (CI). If 1 is not included in the interval, it is significant, otherwise, not. Odds Ratio (OR) represents the effect of a variable. In logistic regression, OR is interpreted using a reference group (ref). If OR is less than 1: The OR of age group "31–50" is 0.927 meaning that there is 7.3% [7.3% = (1– 0.927) *100] lower likelihood of having good knowledge towards herbal and dietary supplements as compared to the age group "18–30". If OR is greater than 1: The OR of "Primary Education" is 1.021 meaning that there is 2.1% [2.1% = (1.021 – 1) *100] higher likelihood of having good knowledge towards herbal and dietary supplement as compared to the age group "No Formal Education". Interestingly, the results of the logistic regression shows that educational attainment did not influence the knowledge on herbal and dietary supplements. On the other hand, belonging in age groups 51–60 and >60, as well as being male, affects knowledge. Intuitively, these groups manifest lower likelihood of having good knowledge towards herbal and dietary supplements. Results are presented in Table 4.

Table 4: Logistic regression model.

Demographics	Knowledge		
	Odds Ratio (OR)	**95% CI**	**P-values**
Age (years)			
18–30	(ref)	(ref)	(ref)
31–50	0.927	0.845 – 1.018	0.1134
51–60	0.839	0.747 – 0.943	**0.0034**
>60	0.830	0.691 – 0.996	**0.0465**
Gender			
Female	(ref)	(ref)	(ref)
Male	0.905	0.837 – 0.978	**0.0122**
Educational Attainment			
No Formal Education	(ref)	(ref)	(ref)
Primary Education	1.021	0.741 – 1.407	0.8974
Secondary Education	1.026	0.757 – 1.391	0.8671
Tertiary Education	0.953	0.668 – 1.361	0.7915
Bachelor Degree	1.033	0.763 – 1.398	0.8347

3.4.2. Correlation between demographics and knowledge

Pearson R correlates the demographics with knowledge. In the plot shown below, the correlation value (r) of age group vs. knowledge and sex vs. knowledge are -0.21 and -0.16, respectively.

The distribution of each variable is shown on the diagonal as histograms. On the bottom of the diagonal: the bivariate scatter plots with a fitted line are displayed. On the top of the diagonal: the value of the correlation plus the significance level as stars. Each significance level (p-values) is associated to a symbol:
0.001 = ***
0.01 = **
0.05 = *

The relationship between two variables is generally considered strong when their correlation value (r) is larger than 0.7; moderate if r is 0.5 to 0.7; weak if r is 0.3 to 0.5; and none or very weak if less than 0.3. Significant but very weak correlations were found between Age group and Knowledge, and Sex and Knowledge. These results back up the logistic regression results that Age group and Sex affects knowledge towards herbal and dietary supplements. Results are presented in the figure below (Figure 1).

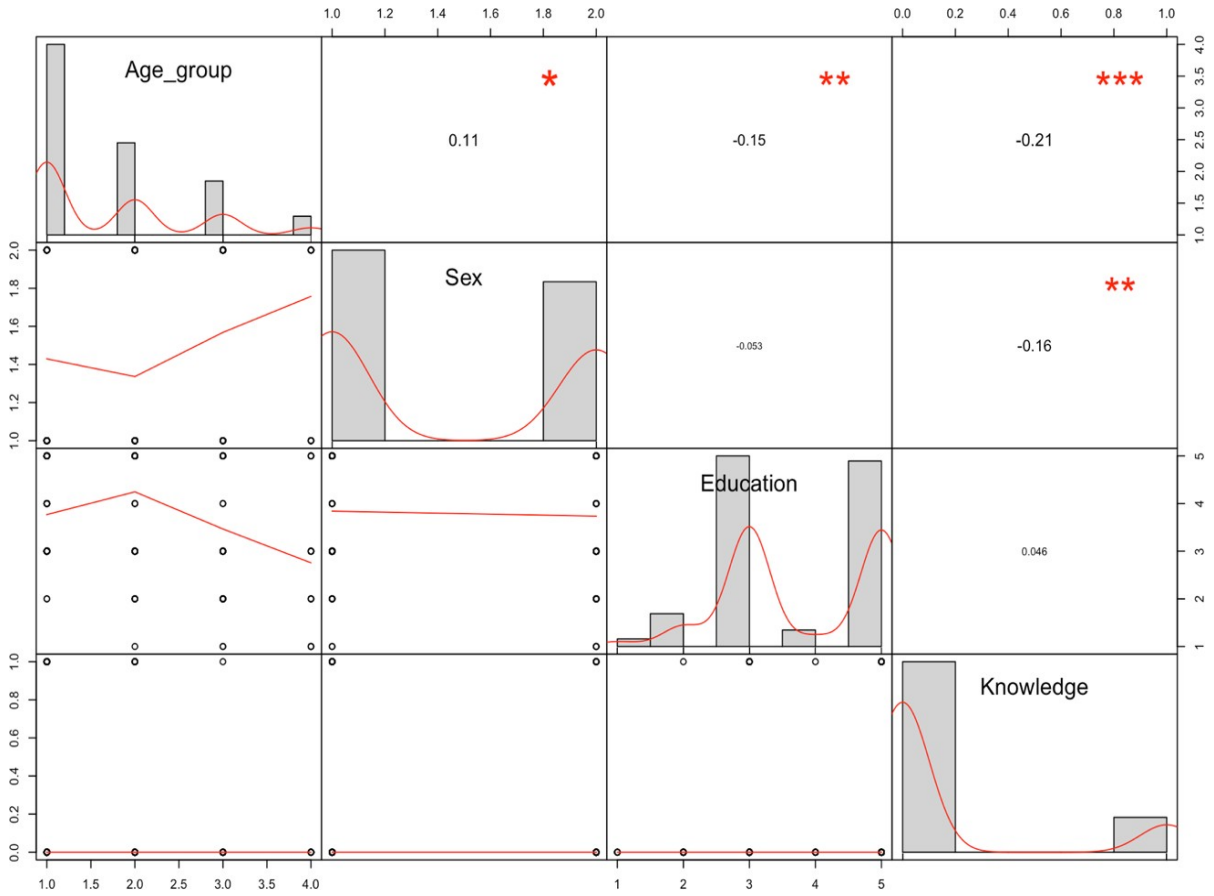

Figure 3: Pearson R correlation between demographics and knowledge.

4. DISCUSSION

4.1. Demographic Information

Participants of all ages (18 to over 65) were represented, with significantly larger numbers in the lowest age bracket 18-30 and 31-50 categories accounting for 184(53.64%) and 89 (25.95%) of the participants, respectively. This can be attributed to the fact that the lowest age bracket was more engaged in barangay activities during the survey period. The number of males who took the online survey-questionnaire were slightly fewer, 156 (45.48%) as compared to females 187 (54.52%). The study findings coincide with several articles such as Sharma et al. (2014) [4] with a majority of female participants in their study as well as with Alowais et al. (2019) [5] where 85.9% female participants were included in the study. A larger proportion of the study population are at least a high school graduate which accounted for 311 (90.67 %). 151 (48.55%) of this finished secondary education, 147 (47.27%) have bachelor's degrees, and 13 (3.79%) finished tertiary education.

The findings of this study showed that most of the respondents 310 (90.38%) use Vitamin C as their supplement. This could be explained by the fact that Vitamin C is relatively cheap and is a widely available supplement which many people use already (Biancatelli, 2020).[6] Moreover, there is sufficient evidence that

Vitamin C can reduce levels of mediators in the body such as interleukin-6 and endothelin-1, which was found to be elevated for patients with severe COVID-19 (Feyaerts & Luyten, 2020). [7] The results are similar to a study done by Alyami (2020) [8], in which Vitamin C was the most used food supplement to increase immunity and minimizes the likelihood of contracting a disease. Second to the most used supplement was Zinc which accounted for 113 (32.94%) of the participants and third was Mangosteen which accounted for 90 (26.24%) of the participants. Significant use of herbal and dietary supplement was not a surprising finding as these "natural remedies" or nutraceuticals have been promoted for many decades to prevent or treat illnesses given that several vitamins are known to have antimicrobial properties and immunomodulatory activity (Brown et al., 2020). [9]

4.2. General Knowledge on Herbal Supplements and Dietary Supplement

The COVID-19 pandemic has created a global alarming situation. The expeditious spread of the recently emerged SARs-CoV2, as well as the absence of an efficacious vaccine or treatment for the said virus, has triggered fear, panic, and anxiety among the general public (Liu et al., 2020,[10] World Health Organization, 2020a).[11] Unsurprisingly, individuals exposed to the perils of such disease seek for self-care measures and run to natural remedies such as herbal and dietary supplements to minimize the risk and make the situation more manageable (Saudi Ministry of Health, 2020, Saudi Center for Disease Prevention and Control, 2020, World Health Organization, 2020b).[12] [13] [14]

It was interesting to note that most of the participants believed that herbal supplements are safe to use as they are from natural ingredients and they improve the immune system. The results are similar to a study done by Akande-Sholabi (2020)[15] in which majority (85%) of the respondents agreed that herbal medicines build up the body's own defenses and promote self-healing. Center for Food Safety and Applied Nutrition (2017)[16] shed more light on these views by stating that herbal medicine is produced from herbs which originated from natural products does not justify its safety. Despite these findings, most of the participants were still uncertain on the effectiveness of herbal and dietary supplements versus prescription medications. This supported observations by Akande-Sholabi (2020),[15] who concluded that respondents use herbal medical therapies because they feel it is cheaper, less expensive and at the same time effective when compared to conventional treatment.

A relatively surprising outcome was the fact that participants agreed that herbal and dietary supplements pose no risk, do not have side effects, and can be taken together at the same time. These findings match those of study carried out by Ceremuga (2020) [16] in which he found out that 89.7% of patients taking dietary supplements were not aware of any potential side effects, and 97.1% lacked knowledge regarding any potential medication interactions between the supplement consumed and their prescribed medications. Khalid (2018)[17] reported that the majority of the survey population considered herbal products and dietary supplements safe for consumption. Thus, continuous appropriate measures should be put in place towards educating the populace about possible side effects and drug-supplement interaction between herbal and dietary products and prescription medicines. The findings of the study further indicated a significantly larger proportion of participants believed that herbal and dietary supplements can treat many diseases as well as other health conditions and can provide all nutritional benefits of real food. This supported findings by Ceremuga (2020) [16] in which the participants believed herbs can cure all diseases.

4.3. Usage of Herbal Supplements and Dietary Supplements

The absence of new and efficient conventional drug treatments to combat drug-resistant infectious diseases (Zahn et al., 2019) [18] and infections has turned attention towards herbal and dietary products as a potential source of immunity. The COVID-19 pandemic has sparked a sharp rise in the demand of herbal and dietary supplements, alongside face masks and alcohols. The study findings contradicted this as the majority of the participants took their supplements occasionally or in irregular intervals during the pandemic. This can be attributed to the fact that the survey was conducted when the COVID-19 scare has subsided. Concurrently, a considerably high percentage of participants took their supplements twice daily. An explanation for this could be that a significant proportion of participants still take the supplements religiously while the dangers of COVID-19 are still present.

Since the start of the COVID-19 pandemic, majority of the participants 218 (63.56%) changed their supplement routine and 145 (42.27%) of these participants take their supplements more frequently. Despite these findings, a huge proportion of participants take herbal and dietary supplements not for the reason of treating a certain health condition. Patients may choose to self-medicate with these supplements because they are easily accessible and may provide a sense of security (Adams et al., 2020, p. 825).[19] This result displayed a growing concern as this practice can be dangerous most especially if combined with medicines and/or taking too much of some supplements (Center for Food Safety and Applied Nutrition, 2017).[20] Findings from the study further indicated that, COVID-19 is the second most answered health condition that herbal and dietary supplements used to manage. According to (Biancatelli, 2020b),[6] the prophylactic use of over-the-counter vitamin supplementation to combat infection is a behavior many people engage with already. A similar perception of this behavior was described by (Evans, 2020): Consumers

with minor ailments are having to self-medicate as an eagerness to do anything that might boost health and immunity. [21] One factor pushing consumers towards supplements and over-the-counter medicines has been the overload on health services caused by the pandemic.

Interestingly, findings of the study revealed that a high proportion of participants have not experienced any unwanted effects. These findings did not match those of study carried out by Alkhamaiseh and Aljofan (2020),[22] in which a high percentage (46 %) of reported side effects has been associated with the use of herbal medicines. Kennedy (2018)[23] shed more light on these views by stating that severe adverse effects to some vitamin preparations are uncommon but occur when very large doses have been consumed. A majority associated herbal and dietary supplements with immune system boosting capacity, health and wellness benefits, nutritional benefits, and protection against COVID-19. These findings are similar to those studies carried out by Alyami (2020), [8] in which participants have reported that they took herbal and dietary supplements during the pandemic period, to protect themselves from contracting the disease.

4.4. Demographics and Knowledge

4.4.1. Effect of demographics on knowledge about herbal and dietary supplements

The study further revealed that educational attainment did not affect the participants' knowledge on herbal and dietary supplements. These findings did not match those study carried out by Ceremuga (2020) [16] in which he reported that the levels of education of herbal medicine users in his study significantly influenced their perception about herbal medicine, notably the perception that herbs can cure all diseases, combination of the conventional drugs and herbs have no side effects has mostly been associated with lower level of education achievement.

On the other hand, belonging in age groups 51–60 and >60, as well as being male, affects knowledge. Intuitively, these groups manifest lower likelihood of having good knowledge towards herbal and dietary supplements. In the study conducted by Gahche et al. (2017), he reported that dietary supplement (DS) use is widespread, with over half of adults reporting use, and the highest use reported in older adults. Y. Sato et al. (2020) [18] shed more light on these views by stating that consumers' knowledge of dietary supplements is limited among older adults and patients. They further argued that a survey of the elderly in the United States revealed that 19% of current dietary supplement users were taking supplements with medicines in potentially harmful combinations.

4.4.2. Correlation between demographics and knowledge

Further findings revealed that significant but very weak correlations were found between Age group and Knowledge, and Gender and Knowledge. These results back up the logistic regression results that Age group and Gender affects knowledge towards herbal and dietary supplements. These findings match those of a study carried out by Khalid (2018) [17] in which he reported that age significantly correlated with the knowledge on supplements and education levels were not significant predictors. He further argued that gender was not a significant predictor which contradicted the findings of the study.

5. CONCLUSION

The use of herbal and dietary supplements was highly prevalent during the COVID-19 pandemic; however, a large proportion of the study population exhibited substantial misconception about the risks and benefits of these products. Furthermore, educational attainment did not affect the knowledge on herbal and dietary supplements, on the other hand, belonging in age groups 51–60 years old ($p = 0.0034$), greater than 60 years old ($p = 0.0465$), and being male ($p = 0.0122$), affects knowledge. These groups manifest a lower likelihood of having good knowledge of herbal and dietary supplements. Moreover, significant but very weak correlations were found between Age group and Knowledge, and Sex and Knowledge.

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