

**Original Article**

**Prevalence of herbal products use and perceptions on drug-herb interactions among university students in Klang Valley Malaysia- a cross sectional study**

*Pan Yan<sup>1</sup>, Tye Kean Hong<sup>2</sup>, Mustafa Alshagga<sup>3</sup>*

**Abstract**

**Objectives:** This study aimed to identify the prevalence and preference of herbal products usage and to determine the perceptions of herbal products together with the awareness towards the drug-herb interactions among university students in Klang Valley Malaysia. **Methods:** A cross-sectional study was carried out by using a self-administered survey questionnaire distributed to students of four universities in Klang Valley Malaysia. A total number of 231 responses were collected between December 2018 and March 2019. Statistical analysis was performed to evaluate the demographic factors associated with the use and perceptions of herbal products and awareness of drug-herb interactions. **Results:** Ethnicity and religions were two factors associated with the use/perceptions of herbal products in the current study. The general awareness and knowledge about drug-herb interactions were low and inadequate among the participants. Furthermore, with regard to awareness on drug-herb interactions, the course/program that students enrolled was found to be the sole factor linked. **Conclusion:** The cultural beliefs and family traditional cultures played critical roles among Malaysia university students on the use of herbal products. The healthcare stakeholders are suggested to design and to deliver professionally structured education to increase the consumers' knowledge and even customer service leading to an efficient and safe use of herbal products.

**Keywords:** herbal products; university students; Malaysia; knowledge; drug-herb interactions

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**Introduction**

Herbal products have long-since been utilized as therapeutic materials in indigenous medical systems such as Chinese, Malay, and Indian<sup>1,2</sup>. Herbal products are also often used as supplements to complement the patients' prescribed medicine. Approximate 50-80% people globally consume herbal products for a wide range of illness<sup>3</sup>. The previous study showed that 69.4% of the Malaysian population had ever used traditional and complementary medicine (TCM) in their lifetime<sup>4</sup>. Among all the categories of TCM, biologically based therapies (88.9%) including herbs/herbs based were the major resource used for

the health issues (40.7%) and health maintenance (35.9%). The global utilization of herbal products continues to expand and a big number of new products are being marketed. As a result, the safety issues related to herbal products are increasingly recognized rapidly. Despite several herbal products have demonstrated promising potential for drug discovery, more remain untested and lacking proper monitoring system. Moreover, majority of the herbal products are self-prescribed by the patients and public for disease treatment and health maintenance without awareness of potential adverse effects<sup>5</sup>. Since there are at least 30,000 over-the-counter drugs, 1000 chemical active constituents, as well as

1. Pan Yan
2. Tye Kean Hong
3. Mustafa Alshagga

Division of Biomedical Sciences, School of Pharmacy, Faculty of Science and Engineering, University of Nottingham Malaysia.

**Correspondence to:** Pan Yan, Division of Biomedical Sciences, School of Pharmacy, Faculty of Science and Engineering, University of Nottingham Malaysia. **E-mail:** [panyan1980@hotmail.com](mailto:panyan1980@hotmail.com)

over hundreds of herbal products, the risk of drug-herb interactions is expected to be higher than drug-drug interactions. The drug-herb interactions most probably result from interfering drug's absorption, distribution, metabolism, and excretion by herbal products<sup>6,7</sup>.

Several factors including ethnicity, gender, chronic disease conditions, educational level, age, and living environment were factors associated with the use of TCM<sup>8-10</sup>. The major findings in the literature were obtained from studies involving professionals such as doctors and pharmacists, or patients. Only few studies investigated the use of herbal products and perceptions of drug-herb interactions among university students. Medicinal plant use has been investigated among university students at two Midwest Universities in the USA and ethnic variations were identified<sup>11</sup>. Herbal drugs utilization was popular among health care students at AIMST University, Kedah, Malaysia<sup>12</sup>. One study involving Bachelor of Pharmacy students from International Islamic University Malaysia indicated that pharmacy students were lacking adequate knowledge of complementary and alternative medicines<sup>13</sup>. University students are young adults with high risk of engaging behaviors such as use of alcohol and tobacco. Young adults also commonly use weight loss products which are herbal origins<sup>14</sup>. A positive link between use of sport supplements (including herbal products) and high physical activity was suggested among young adults including university students<sup>15,16</sup>. This study aimed to identify the prevalence and preference of herbal products usage among university students in Klang Valley Malaysia by survey questionnaires. Additionally, it was to determine the perceptions of herbal products and the awareness towards the drug-herb interactions among the same group of subjects.

## **Materials and methods**

### ***Study setting and participants***

A cross-sectional study was performed among university students (age $\geq$ 18 years old) at two public universities (University of Kebangsaan Malaysia and University of Malaya) and two private universities (University of Nottingham Malaysia and Tunku Abdul Rahman University College) in Klang Valley Malaysia between December 2018 and March 2019. The survey questionnaire was designed based on a published study with modifications<sup>17</sup>. The

questionnaire was modified by a pilot study with 10 university students from University of Nottingham Malaysia to fit university students' backgrounds.

### ***Data collection***

The self-administrated questionnaire was distributed via circulation of online survey developed by Google Forms (Google Inc., United States). The survey was initiated after providing the informational consent by individual participant.

The questionnaire was structured with closed-ended questions, which contained four sections (A, B, C and D). Socio-demographic characteristics (section A) collected information including age, gender, ethnicity, religion, course of study, residence environment, and health condition. Prevalence and characteristics on herbal products usage (section B) collected information on herbal products based on the frequency usage of herbal products, method of herbal product usage, purposes of using herbal products, type of herbal products. Section C collected the opinion of participants on the functionality of herbal product after their therapy experiences for several common chronic disease conditions (eg. diabetes, high cholesterol, and hypertension). Perceptions and awareness on drug-herb interactions were assessed by section D. The responses from sections C and D were recorded using five point Likert scale (1 for strongly disagree, 2 for disagree, 3 for neutral, 4 for agree, and 5 for strongly agree). The scores of these questions were subsequently summed up to produce an opinion score representing section C and D, respectively. The internal consistency for each statement in the section C and D was measured by Cronbach's alpha coefficient. The alpha values of 0.886 (section C) and 0.889 (section D) were within the range of 0.70-0.95, indicating an acceptable level of internal reliability for the statements in the sections<sup>18</sup>.

### ***Statistical analysis***

The collected data were coded and analyzed by Statistical Package for the Social Sciences (SPSS), version 25.0 (SPSS Inc., Chicago IL, USA). The socio-demographic variables were used to represent the independent variables while section C and D were used to present the dependent variables by using perception score and awareness score. Descriptive statistics was applied to present the data such as frequencies and percentages for each valid

answer about the preference of herbal products usage. The association between socio-demographic characteristics with perceptions and awareness scores were determined by using independent sample of t-test and one-way analysis of variance (ANOVA). Normality test was conducted on the continuous variables to make sure the data were normally distributed as a bell-shaped curve. Tukey test was further used for post-hoc comparison of percentages in between each sub-group in the sociodemographic characteristics. Mean, standard deviation and p-value were presented as t-test tables and a conventional  $p < 0.05$  was employed to define the statistical significance.

#### **Ethical clearance:**

Ethical approval (ID: TKH091118) was obtained from the Science and Engineering Research Ethics

Table 1. Association between socio-demographic variables and score of perceptions on herbal medicines.

Variables		Number of respondents (total n=231)	Mean score	Standard Deviation	p-value
Gender	Male	119	27.8	4.9	0.576
	Female	112	28.2	5.2	
Ethnicity	Chinese	165	28.4	4.5	0.024 <sup>a</sup>
	Indian	12	30.4	6.9	
Religion	Malay	46	26.0	5.9	0.010*
	Others	8	26.4	5.8	
Courses/Programs	Buddhism	121	28.9	4.4	0.004 <sup>a</sup>
	Christianity	34	27.7	4.5	
Residence area	Islam	50	25.9	5.9	0.005*
	Hinduism	9	30.3	6.7	
Diagnosed diseases	Others	17	27.2	4.7	0.786
	Science	119	27.3	5.1	
Consuming herbal products	Engineering	66	28.3	4.9	0.004 <sup>a</sup>
	Arts/Business	46	30.2	3.6	
Residence area	Village	22	27.9	5.4	0.795
	Semi-Urban	86	28.3	5.6	
Diagnosed diseases	Urban	123	27.8	4.6	0.194
	Yes	9	27.5	4.1	
Consuming herbal products	No	222	27.9	5.1	0.194
	Yes	168	28.3	4.5	
	No	63	27.1	6.3	

t-test and ANOVA statistical analysis (n=231).

\*represents statistical significance at  $p < 0.05$  level in between each sub-element

<sup>a</sup>represents post-hoc comparison test in reference to the first sub-element

Committee (SEREC) of University of Nottingham Malaysia prior to the study.

## **Results**

### **Baseline characteristics for participants**

In total, 231 responses were collected, which included slightly more male participants (120, 51.95%) than female participants (111, 48.05%). The majority of the participants were Chinese (165, 71.43%), followed by Malay (47, 20.37%), Indians (11, 14.76%), and non-Malaysians (8, 3.46%). The median age of the participants was 22 years old. The prevalence of herbal products usage in the past 12 months was 71.89%.

### **Preference of herbal products usage**

With regard to the type of herbal medicines consumed by respondents, soup (48.9%) was most popular, followed by teabag (48.1%), liquid (45.5%), tablet (40.3%), powder (36.8%), capsule (35.9%), and ointment (31.6%). Our findings suggested that most respondents obtained the source of information on herbal products from their family, friends, or relatives (86.6%). Relatively fewer participants acquired the information from the Internet (35.1%), herbal/health supplement store (28.1%), and clinical professionals (16.0%). Most participants consumed herbal products as a dietary supplement to maintain their health conditions (84.8%). Other reasons of consuming herbal products included curing critical diseases (30.3%), being influenced by family and traditional culture (29.9%), and easy accessibility and affordability of herbal products (21.6%). 69.3% of respondents expected herbal products to improve their immunity system, while 42.0% of them expected herbal products to relieve the disease symptoms and to decrease the side effects (23.8%). Most of the respondents consumed herbal products on a monthly basis (59%), followed by daily basis (24%) and weekly basis (17%).

### **Perceptions for herbal products**

As shown in Table 1, perception score toward herbal products in terms of ethnicity, Indian demonstrated the highest mean score (30.4) followed by Chinese (28.4), and Malay (26.0). Significant difference was identified in between each ethnic group with p-value of 0.010. A post-hoc comparison test subsequently showed a significant difference between Chinese and Malay with p-value of 0.024. Significant difference

was similarly observed with regard to religion (Hinduism, 30.3; Buddhism, 28.9; Islam, 25.9) with p-value of 0.005. The post-hoc analysis test further proved that there was a significant difference between Buddhism and Islam with p-value of 0.004. With regard to the courses/programs that participants were doing, Arts/Business students scored the higher (30.2) than Engineering students (28.3) and Science students (27.3). The significant difference was noticeably presented in between each course/program with p-value of 0.006. The post-hoc comparison test also revealed that there was a significant difference between Science and Engineering students with p-value of 0.004. On the other hand, no significant difference was identified with regard to gender, residence area, whether with diagnosed diseases or consuming herbal products.

### ***Awareness on drug-herb interactions***

Table 2 summarized scores of awareness on drug-herb interactions. Among all the items (gender, ethnicity, religion, courses/programs, residence area, whether with diagnosed diseases, and consumption of herbal products) evaluated, only the courses/programs that students were taking showed significant differences in between with p-value of 0.001. Science students obtained the highest mean score (29.2) followed by Engineering students (25.2) and Arts/Business students (25.1). A post-hoc analysis test further presented that the mean score of Science students and Engineering students have

Table 2. Association between socio-demographic variables and score of awareness on drug-herb interactions.

Variables		Number of respondents (total n=231)	Mean score	Standard Deviation	p-value
Gender	Male	120	26.3	6.3	0.081
	Female	111	27.6	5.4	
Ethnicity	Chinese	165	27.1	5.9	0.386
	Indian	11	24.4	7.8	
Religion	Malay	47	27.2	5.4	0.389
	Others	8	25.0	4.3	
Courses/ Programs	Buddhism	121	26.8	6.2	0.001*
	Christianity	33	28.0	5.3	
	Islam	51	27.0	5.3	
	Hinduism	9	23.6	7.3	
Residence area	Others	17	26.9	5.2	<0.001 <sup>a</sup> 0.001*
	Science	119	29.2	5.9	
	Engineering	67	25.2	5.5	
Diagnosed diseases	Arts/ Business	45	25.1	4.9	0.924
	Village	22	25.7	7.5	
	Semi-Urban	87	26.7	5.6	
Consuming herbal products	Urban	122	27.2	5.8	0.566
	Yes	9	27.2	9.3	
Consuming herbal products	No	222	26.9	5.7	0.566
	Yes	166	27.1	6.2	
	No	65	25.6	5.1	

t-test and ANOVA statistical analysis (n=231).

\*represents statistical significance at p<0.05 level in between each sub-element

<sup>a</sup> represents post-hoc comparison test in reference to the first sub-element

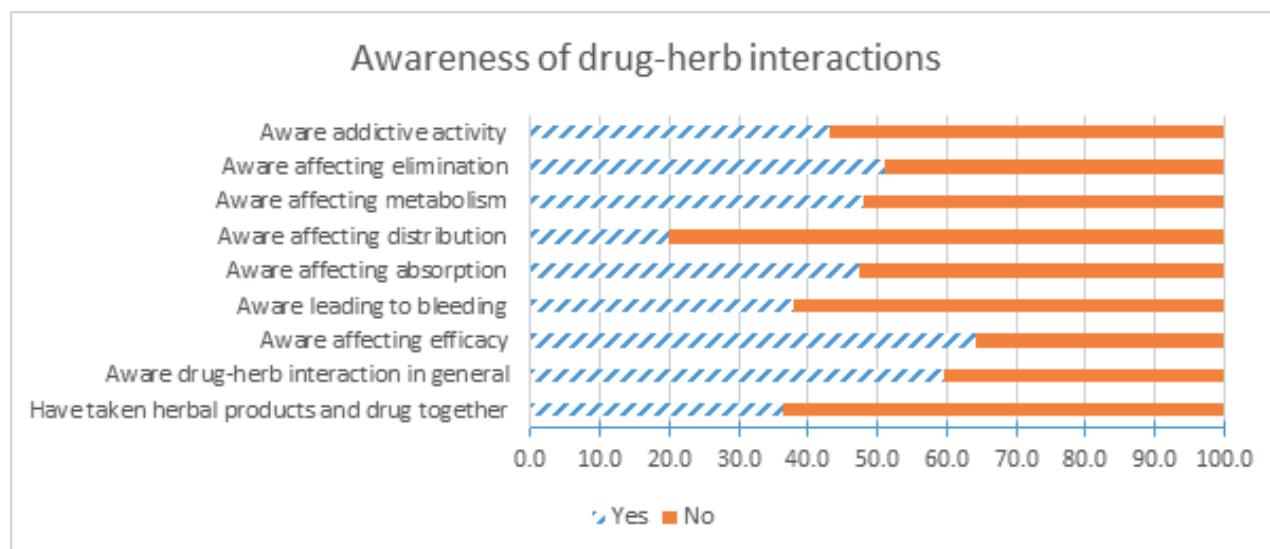


Figure 1. Awareness of drug-herb interactions among university students of west Malaysia. N=231, x axis represents percentage (%) of respondents who were aware (Yes) potential drug-herb interactions.

a significant difference with p-value <0.001. Figure 1 demonstrated that 36.3% participants had taken herbal products together with conventional drugs. It was also seen that the proportions of respondents' awareness towards various aspects of drug-herb interactions (see Figure 1): herb leads to addictive activity of drug (43.2%); herb affects drug elimination (51.1%); herb affects drug metabolism (47.9%); herb affects drug distribution (20.0%); herb affects drug absorption (47.4%); herb leads to bleeding (37.9%); herb affects drug efficacy (64.2%); general drug-herb interaction (59.5%).

### **Discussion**

The consumption of herbal products is on a rise all around the world. It was projected the market value of global herbal industry would reach USD 5 trillion by 2050<sup>19</sup>. In Malaysia, both of plantation of herbal plants and registration of herbal products for general health showed a significant increase in the past 20 years<sup>20</sup>. The current study was carried out to evaluate the prevalence and preference of herbal products usage as well as the perceptions of herbal products and the awareness of drug-herb interactions among university students in Klang Valley Malaysia by a survey questionnaire.

Results of this study showed that the prevalence of herbal products usage in the past 12 months was 71.89%. The high use rate was comparable with other similar studies using Malaysia university students<sup>12,13</sup> and Nigeria students<sup>21</sup>, but higher than the studies performed in other countries such as USA<sup>22,23</sup> and Qatar<sup>14</sup>. The preference of using herbal products for health was also consistent with numerous previous findings using Malaysia subjects<sup>4,8,17,24</sup>. The consumption of herbal products by our study cohort (86.6%) was mainly influenced by their family, friends, or relatives. This finding might be correlated with the fact that the majority of participants of the current study was Chinese (71.43%), who have strong and long belief in Traditional Chinese Medicine including herbal products<sup>25</sup>. The median age of our respondents was 22 years old, and very few of them experienced critical diseases. It was not surprised to see that most of them (84.8%) consumed herbal products for the purpose of maintaining health conditions by improving their immunity system (69.3%)<sup>10,14</sup>.

As shown in Figure 1, a significant number of

participants were not aware of drug-herb interactions under all categories. These findings were in accordance with other studies which acquired the knowledge and awareness of drug-herb interactions among health professionals such as pharmacists<sup>26</sup> and nurses<sup>27</sup>, patients<sup>28</sup> as well as university students<sup>13</sup>.

Significant ethnic different perception toward herbal products was observed in this study (Table 1). This finding agreed with other studies conducted in Malaysia and other countries<sup>8,11,29,30</sup>, which could be due to different ethnic groups varies widely given with the cultural differences among the ethnic groups<sup>17</sup>. As mentioned above, the vast range of herbal remedies was a manifestation of ethnic and cultural diversity in the Malaysian population. The commanding use of herbal medicines in a variety of methods was due to the fact that Malaysia is diversified in ethnicity that still follows the generations of traditional healing practices complementary with natural resources<sup>4</sup>. This study also revealed that religion was a factor associated with the herbal use perceptions (Table 1), which was similarly reported elsewhere<sup>31</sup>. It was believed that ethnic difference at least partially accounted for this as majority of Malaysian Chinese were Buddhism and Christian, all Malays were Islam and most of Hinduism was composed of Indian<sup>32</sup>. The diversified religions and spiritual beliefs in a multicultural community leading to wider beliefs systems of herbal medicine usage in Malaysia<sup>33</sup>. Additionally, it was interesting to see that the course/program that students were enrolled was a factor responsible for their herbal use perceptions as well as awareness of drug-herb interactions (Table 1 and 2), which had not been reported previously. The majority of the past studies focused on health care professionals and students or patients with chronic conditions<sup>9,12,34,35</sup>. Apparently, science stream students in general had higher exposure to health science knowledge acquired from their pre-university and undergraduate education. However, studies have shown that no association was found between risk awareness comparing health science students and non-health science students<sup>36</sup>.

### **Conclusion**

The current study was limited by its sample size and sample diversity, since only four universities of Klang Valley Malaysia were included. Nevertheless, this study provided some insight of current understanding

on the use of herbal products and awareness on drug-herb interactions among university students in Klang Valley Malaysia. Ethnicity and religions were the two factors associated with the use of herbal products in the current study. It was believed that the cultural beliefs and family traditional cultures played critical roles among Malaysia university students on the use of herbal products. On the other hand, the general awareness and knowledge about drug-herb interactions as well as associated adverse drug reactions were low and inadequate among these students. With regard to awareness on drug-herb interactions, the course/program that students were pursuing was found to be the sole factor linked. This indicated that educational exposure to drug-herb interactions could improve the awareness. Hence,

the healthcare stakeholders are suggested to design and deliver professionally structured education to increase the consumers' knowledge and even customer service leading to an efficient and safe use of herbal products.

**Conflicts of Interest:** None declared.

**Author's contribution:**

Data gathering and idea owner of this study: Pan Y, Tye KH, Alshagga M

Study design: Pan Y, Tye KH

Data gathering: Tye KH, Alshagga M

Writing and submitting manuscript: Pan Y

Editing and approval of final draft: Pan Y, Tye KH, Alshagga M

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