

Influencing Factors in Dietary Supplement Consumption among University Students

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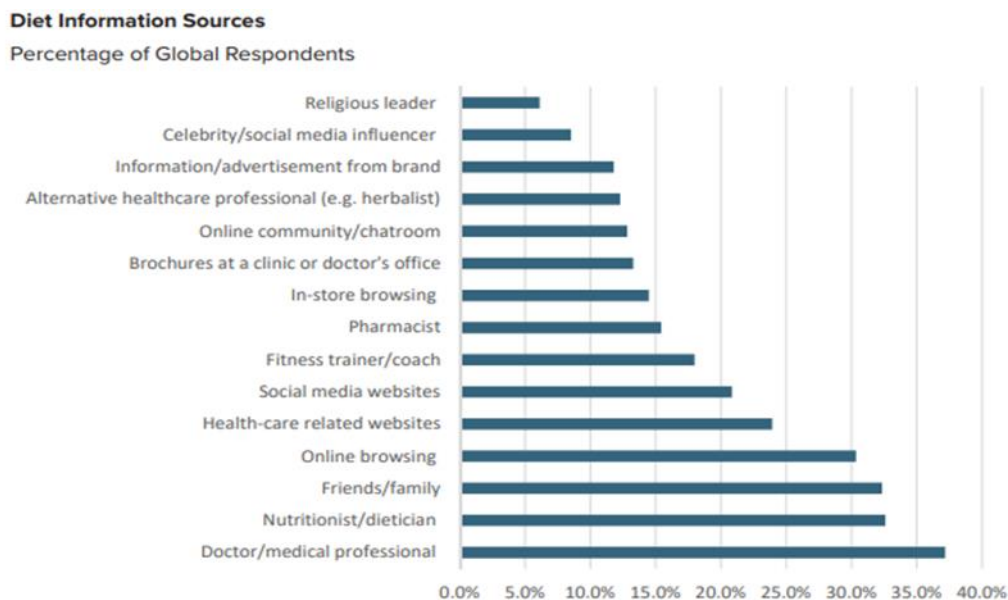
Abstract

In recent years, there has been an increasing interest in consuming dietary supplements which believed to promote a healthy lifestyle among generations. However, lack of knowledge and peer pressure can be the problems despite its long success. Thus, the aim of this study is twofold; i) to assess the sociodemographic information among the students on taking dietary supplements and ii) to examine the influencing factors that lead to dietary supplements consumption among undergraduate students in Selangor, Malaysia. Findings explained through equal distribution of survey between faculties, a majority of female students (72.5%) participated in this study compared to male students (27.5%) with both genders are in a good health condition (60.6%) and having normal BMI reading (65.3%). All the factors such as the perception of knowledge ($r = 0.387$), lifestyle behaviour ($r = 0.541$) and efficacy of the supplements ($r = 0.548$) indicate a moderate positive relationship towards dietary consumption in their daily life, respectively. More health educational talks need to be conducted in future to increase knowledge among university students. Future recommendations are drawn through the suggestion of reassessing other factors that lead to the DS consumption through qualitative method analysis.

Keywords: Knowledge, Behaviour, Efficacy, Supplements.

1. Introduction

Dietary supplements (DS) provide concentrated nutrients to prevent, alleviate, enhance, or influence physiological processes within the body (Barnes, Ball, Desbrow, Alsharairi, & Ahmed, 2016). DS comprises of one or more dietary ingredients, for instance, a vitamin, a mineral, an herb/botanical, an amino acid, concentrated, metabolite or combination of any ingredients (Owens & Toone, 2014a). The usage of dietary supplements is comprehensive, with a report indicating 75% of individuals in developed countries take one or more dietary supplements (Barnes et al., 2016). The business potential for health-related offerings such as over-the-counter (OTC) drugs, vitamins and dietary supplements has increased to a sizeable market with strong growth (Yap, Noor, Marshall, & Liew, 2014). Sidhar (2019) added; the trend of adding supplements as part of their balanced diet is seemingly encouraging where the distribution of dietary supplement products need to reach both type of consumers, vegan and non-vegan. Figure 1 illustrated a variety of information sources on health advice for nutritional intake. The doctor was rated as the most trusted source by consumers to look for health information; while the least source was religious leaders.



Source: Euromonitor International's Health and Nutrition Survey, 2019

Fig. 1 Diet Information Sources from Consumers (Sidhar, 2019)

There are differences in DS consumption trends globally. In the United States, 50% of the adult population consumed DS as stated by National Health and Nutrition Examination Survey (NHANES) in the year between 2003 until 2006 (Bailey et al., 2011) whereas in Europe countries; DS consumption seemed to be higher at the Northern region compared to Southern (Skeie et al., 2009). In Asian, South Korea showed high demands in consuming DS with an average of 60% people consume ginseng, multivitamins, glucosamine, probiotics and vitamin C (Ock, Hwang, Lee, Song, & Ock, 2010). While in Malaysia; through its first National Nutrition Survey by the Ministry of Health in 2008, only 25% of the adult population consumes DS (Mohd Zaki et al., 2018). However, according to Malaysian Dietary Supplement Association (MDSA); the Malaysian market for DS continues to grow progressively despite the weak business activity and low acceptance among consumers (Birruntha, 2019).

2. Literature Review

DS gained popularity in certain countries like in the United States, United Kingdom and many other countries, and is expected to increase in future (Lieberman et al., 2015). There are numerous reasons on why consumers are attracted to the products such as; 1) to gain back the nutrients in their diet, 2) relatively low cost, 3) obtainable, 4) believe to be prevention against diseases and disorders, 5) natural, safe supplements without adverse effects, 6) massive advertising campaigns, 7) considered as alternative medicines without side effects, 8) promised to be the elixir of youth, health and vitality (Smichowski & Londonio, 2018). Furthermore, the past study highlighted quite a numbers of users consume multivitamins which they believed are the products that consist of ten or more vitamins and minerals in it. Usually, they will hunt for well-known supplements branding to fulfil their overall health and wellness need (Dickinson, Blatman, El-Dash, & Franco, 2014). Adolescents and young adults, mostly influenced by their parents consumed the supplements to improve their health, increase nutritional levels, lose weight and to have a better appearance (Al-naggar & Chen, 2011). A past study has revealed that 54.1% and 40.2% of students in Malaysia are consuming Vitamin/ Mineral Supplement (VMS) and food supplements. The growing awareness of evidence linking nutrition with health has led many consumers to embrace self-treatment with dietary supplements;

aimed at strengthening their immune system and disease (Sien, Sahril, Mutalip, Zaki, & Ghaffar, 2014). The same scenario happened in India where a previous study investigated the Health Sciences University students on taking a dietary supplement. The result showed the medical students scored the highest point with 44.84% on having good knowledge towards the consumption as compared to nursing (43.17%) and dental students (37.8%) (Sharma, Adiga, & Ashok, 2014).

Although previous findings indicated positive results especially in western countries; there is scarce information on Asian countries. Little is known on the use of dietary supplements among students (Sien et al., 2014) and in Malaysia as well (Mohd Zaki et al., 2018). There is an assumption which indicates the intake of DS is mainly done by people who lack in nutrients such as older people, pregnant women and individual with health problems. Other than that, the vast majority of the population have poor eating behaviour where they consumed a large portion of unhealthy food like fast food, oily and processed food, not adhering to the healthy food intake according to the food pyramid and often spending time eating out with their family and friends. Malaysian university students have consumed a lot of unhealthy food; lead to lacks of nutritional food intake (Noor, Yap, Liew, & Rajah, 2014). This is supported through a statistic by World Population Review in 2019; disclosed that Malaysia has the highest prevalence of obesity (15.6%) followed by Brunei (14.1%) and Thailand (10.0%) (The ASEAN Post Team, 2019). Even though many of the students scored high for consuming dietary supplements as to maintain good health, level of knowledge among non-medical students is relatively low as to compared to students with medical background (Al-naggar & Chen, 2011). Food and Drug Administration (FDA) also issued some concerns about the supplement consumptions such as misleading information and containing dangerous ingredients that lead to liver damage or other multiple health risks (Or, Kim, Simms, & Austin, 2019).

2.1 Perceptions of Knowledge

Complementary and alternative medicine (CAM) is a group of diverse medical and health care systems, practices, and products that are not presently considered to be a part of conventional medicine and DS is a subset of CAM. In recent years, self-medication with DS has become very popular where it has been an argument that pharmacists can be a device in helping patients make a safe and informed choice about DS. Pharmacists are in a good position to provide patients with some evidence-based information about DS, especially in regarding potential interactions with conventional medications. Pharmacists also have the knowledge and experience in determining when self-medication is appropriate; as well as the expertise of another healthcare provider is needed (Kwan, Hirschhorn, & Boon, 2006).

In Malaysia, a study has been conducted to investigate knowledge in taking DS among active sports students. From the results, it showed that these sports students interested in consuming DS even though they have less information on the importance of DS. In-class lectures and during participation in the sports are their sources of information towards DS (Mustafa, Awang, & Nadzalan, 2018). Nonetheless, previous studies reported that health care students lacked the knowledge regarding the use of DS when compared to working professionals. A past study in Poland explored DS consumption among the general public. The gender-based result showed that male respondents (45%) scored high marks as compared to women (29.2%) about knowledge on the DS. They also rated as having a little level of information (40.73%) compared to vast information (21.95%) on DS consumption (Kołodziej, Cyran-Grzebyk, Majewska, & Kołodziej, 2019). This also occurred in Croatia when researchers investigated the knowledge in DS among the medical and non-medical students. It has reported significant awareness (93.4%) among medical students as they use leaflet as their source of information. As for the non-medical students, they scored 59.3% of knowledge in DS; using relatives and friends as their source of information. It has concluded that students were unable to transfer the acquired knowledge needed to make clinical decisions (Bukic et al., 2018).

This is where knowledge plays a vital role in identifying all the ingredients and processes needed in the production of the supplements. Although dietary supplements originally formulated containing minerals and vitamins, supplements and food fortified with antioxidant molecules and other nutrients later appear in the market (Rocco, Donati, Touloupakis, & Aturki, 2018).

2.2 Lifestyle Behaviours

Many studies have extensively investigated the use of DS concerning the demographic and lifestyle factors including the promotion via health programmes, awareness of the dietary supplements, particularly by individuals with different health conditions, increased media publicity, a change in the public attitude and training because of the increased availability of the courses (Akilen, Tsiami, & Robinson, 2014). Nowadays, everyone has consumed at least one type of DS in their daily life. Data from the National Health and Nutrition Examination Survey (NHANES) that were collected from 2003 until 2006 reported small percentage of American adults to use at least one DS and the most common types of supplements used is multivitamin or multi-mineral products. This is actually due to their goal to promote general health (Lieberman et al., 2015) and treat any of the medical problems (Owens & Toone, 2014b). The resolution of an individual is the reason why people become the consumers of dietary supplements as they perceived more cues, have positive attitudes and has a higher level of self-efficacy (Pajor, Eggers, Curfs, Oenema, & de Vries, 2017).

According to the previous research in the United States, the researchers explored the determinants of DS intake among the public towards diet behaviours. Majority of the respondents from smokers (with lower BMIs) and people who are practising active lifestyle responded that lifestyle is part of the factor that determining on DS intake other than demographics. Food stamp recipient resulted in less interest in taking DS since the assistance not meant to buy DS (Anders & Schroeter, 2017). Another study carried out in Manchester, United Kingdom also revealed that the respondents; especially white female, active and non-smokers consumed DS due to healthy lifestyle and not because of any existence of morbidity (Harrison, Holt, Pattison, & Elton, 2004). Australian respondents also reported that women, older people, highly educated were more interested in consuming DS for a healthy lifestyle and have better health outcome (Burnett, Livingstone, Woods, & McNaughton, 2017). The results were consistent with the same characteristics (women, old age and educated) from previous studies (Guo, Willows, Kuhle, Jhangri, & Veugelers, 2009; Kofoed, Christensen, Dragsted, Tjønneland, & Roswall, 2015; Radimer et al., 2004). Another significant result in consuming DS was a study in Malaysia among people who attended selected gymnasiums. 66.3% of the respondents were taking DS; the highest was protein shake (73.7%) followed by vitamin C (72.4%) and whey protein (68.3%). The health-conscious lifestyle leads to a higher intake of DS among them (Sedek, Li, Kambli, & Kasim, 2018).

2.3 Efficacy of the supplements

The expandable literature has shown that the ingredients in dietary supplements may sometimes cause unexpected side effects or intoxications, due to the presence of chemical contaminants, pesticides and mycotoxins. Besides, it has reported that an enlarge number of marketed dietary supplements have polluted with pharmaceuticals, including new stimulants, novel anabolic steroids, unapproved anti-depressants, banned weight-loss medications. At the same time, dietary supplements have become commercially available not only in pharmacies and health stores but also in supermarkets and from vendors on the Internet. However, since supplements not regulated as drugs; the requirements are not consistent across the countries (Rocco et al., 2018). Although frequently been used, the scientific consensus on the efficacy and safety of most DS does not exist, and contradictory scientific studies usually appear in the peer-reviewed literature. Information on DS from a variety of media sources including television, radio, printed-version and the internet is widely available, but the information is often contradictory and ambiguous (Lieberman et al., 2015).

Despite their popularity, the benefits of dietary supplementation in general populations are equivocal. The risks associated with dietary supplementation well documented, and they include the contamination of ingredients, inadvertent outcomes, and undesirable side effects. Furthermore, the promotion of supplements may include misleading nutrition labels and health claims (Barnes et al., 2016). Recently, in a strongly worded editorial, a leading medical journal advised the public, based on the available evidence, to “stop wasting money on vitamin and mineral supplements”. The authors of the editorial are willing to provide such forceful guidance because they found no convincing evidence that such supplements provide any benefits in well-nourished adults, and could be harmful (Lieberman et al., 2015).

Several studies have revealed the lack of people's knowledge about DS. In general; there are three (3) misguided beliefs regarding their positive effects and possible harms of drug interactions. Scientific evidence does not support most of the alleged benefits of DS and has evidence regarding the adverse effects of certain DS substances (cardiovascular, metabolic, neurological, and haematological problems) (Zdešar Kotnik, Jurak, Starc, & Golja, 2017). Another obstruct is that patients do not turn to health care professionals as a source of information about DS. A research conducted in Serbian pharmacies revealed that 88.9% of the consumers did not consider the importance of informing their physician or pharmacist about the use of herbal DS. Moreover, since DS can be bought online so many users do not discuss their choice with a pharmacist or a physician, which disables health professionals in providing consultation to patients on this matter (Bukic et al., 2018). Other than dealing with the perception of knowledge, the behaviour of DS users also plays a part in consumption. Many vitamin and mineral users believe that vitamin supplements can make them feel better, give them more energy, improve health and prevent or treat illnesses. According to several older studies, DS may be used to compensate for an unhealthy lifestyle or the presumption that one's diet is unbalanced (van der Horst & Siegrist, 2011).

There is a limited study in investigating dietary supplement consumption among university students in Selangor. Thus, this study aims to i) assess the sociodemographic information among the students on taking dietary supplements and ii) examine the influencing factors that lead to dietary supplements consumption among undergraduate students in Selangor, Malaysia.

3. Methodology

The aim of this cross-sectional study was twofold; i) to assess the sociodemographic information of the respondents and ii) to examine the relationship between influencing factors in dietary consumptions of the supplement among the university students in Selangor. The methodology used in this study was the frequency and correlational design. Frequency gave the researchers a summary of the measure for the selected categorical data in the form of a table. Data collected for this study include age, gender, faculty, health condition and BMI for each of the respondents. Bivariate Pearson correlation used to assess a possible linear association between the factors influencing the dietary consumptions among the DS users. The output data measured by using a correlation coefficient matrix table. Furthermore, this study has been carried out in one public university specifically based in Selangor, Malaysia.

3.1 Research Instruments

The survey questionnaire had five (5) sections. Section A established socio-demographic characteristics which consist of five (5) items such as gender, age, faculty, health status and Body Mass Index (BMI). Section B was about the perception of knowledge with eight questions provided. Section C, D and E had eight (8) questions focussed on lifestyle behaviour, the efficacy of dietary supplements and dietary consumptions respectively. All sections were measured based on the five-point Likert scale; 1=strongly disagree, 2= disagree, 3=moderate, 4=agree, 5=strongly agree.

Moreover, the researchers had carried out a pilot test on a convenience sample of 30 undergraduate students in the same university but with different sample size and faculty to measure the usability of the adapted questionnaire from different sources. Cronbach Alpha's reliability for the total of the 32-items was 0.904 and indicated that there is an excellent internal consistency for the questionnaires. Internal consistency is concerned with the interrelatedness of the sample of test items (Tavakol & Dennick, 2011). This test results not included in the main study.

3.2 Sample

In this study, the researchers have decided to use stratified sampling and distributed the questionnaires among students from various faculties; Health Sciences, Business and Management, Electrical Engineering and Pharmacy. Hence, researchers used convenience sampling to select samples from every faculty involved. A total of 320 undergraduate students volunteered to participate in this survey. The respondents spent five (5) minutes to complete the questionnaire; the whole data collection process took approximately four weeks.

4. Results and Discussions

The results of the Frequency test had presented in Table 1 below. From a total of 320 respondents, age 24 was the highest number of students who participated in this survey; and most of them are the graduating students. Besides, the female group dominated this survey with the percentage of 72.5 over the male respondents which contributed only 27.5%. Undergraduate students were from four different faculties in the same university and it seems that researchers have equally distributed to all the students with a percentage of 25 per cent for each faculty. Other than that, the health condition gave a good result where most of the respondents involved were in good health during their participation in this survey. Lastly, on the body mass index (BMI) level, it is thrilled to say that these students achieve normal BMI reading (65.3%), followed by overweight with 18.8% and a small number of obese students involved with only 4.4%.

Table 1: Sociodemographic Profile

	Frequency	Percent
Age		
19	1	.3
20	42	13.1
21	57	17.8
22	57	17.8
23	76	23.8
24	78	24.4
25	7	2.2
26	1	.3
27	1	.3
Gender		
Male	88	27.5
Female	232	72.5
Faculty		
Health Sciences	80	25.0
Business & Management	80	25.0
Pharmacy	80	25.0
Electrical Engineering	80	25.0
Health Status		
Good	194	60.6
Poor	126	39.4
BMI level		
Underweight	37	11.6
Normal	209	65.3
Overweight	60	18.8
Obese	14	4.4

Table 2 illustrated the correlational matrix results in investigating the influencing factors that derive the DS consumption among undergraduate students. This quantitative method through convenience sampling technique was using survey instruments to gather all the feedbacks from different faculties' respondents. They have given an estimation of four weeks to complete the surveys. As a result, the factors seem to be significant at the level of $p = 0.01$ with a moderately strong relationship. The highest score for influencing factors to the DS consumption is the efficacy of supplement ($p=.548$) where the respondents believed to have a good trust on the supplement they consumed. This is followed by lifestyle behaviours ($p= .541$) to practically live in a healthy lifestyle and perceptions of knowledge ($p = .387$) draws a moderate positive linear relationship; even though they choose to consume DS, they rarely have the specific information regarding the supplements.

Table 2: Correlation Matrix on Sample Data

Correlations	Knowledge	Behaviour	Efficacy	Dietary Cons
Knowledge	1.000	.504**	.445**	.387**
Behaviour	.504**	1.000	.676**	.541**
Efficacy	.445**	.676**	1.000	.548**
Dietary Cons	.387**	.541**	.548**	1.000

4.1 Efficacy of the Supplements

Efficacy or effectiveness of the DS has the highest impact towards the consumptions of DS. By achieving $p=.548$, it means students agreed that most of the DS they consumed considered safe in terms of the ingredients. This might be some of the reasons where DS provide concentrated nutrients to prevent, alleviate, enhance, or influence physiological processes within the body. Other than that, previously reported reasons for overall use of DS is related to improvement or maintenance of general health and physical performance (Barnes et al., 2016). Another study on the efficacy of the DS emphasised on the safety of DS; 60% of them responded with a neutral result whereby, 17% and 23% responded agree and disagree, respectively. When asked about the effectiveness of DS; similar trends found with 51% stating they were neutral (Marx, Kiss, McKavanagh, & Isenring, 2016).

Turning from the advantages of consuming DS, other previous studies highlighted several drawbacks of consuming DS. The risks associated with DS is well documented, and include contamination of ingredients, inadvertent outcomes, and undesirable side effects. Furthermore, the promotion of supplements may include misleading nutrition labels and health claims (Barnes et al., 2016). Despite these common beliefs, there are many other supplements that have been reported as having potential health risks. In many cases, a large quantity of the supplements consumed with little regard for their interactions with other supplements or recreational drugs. Non-prescriptions DS simply taken by non- prescription supplement to use is observed mostly among adolescents, students, physically active adults, postmenopausal women, cancer patients, and people with a high risk of cancer, chronic diseases and elderly (Petroczi, Taylor, & Naughton, 2011). The possibility that the next highest factor; lifestyle behaviour influence the consumption of DS among students and the reason for the high efficacy of DS. They tend to see this as a lifestyle and assume most of the supplements are safe to consume.

4.2 Lifestyle behaviours towards DS

The second highest factor that related to the DS is lifestyle behaviour with a significant result of $p = .541$. The consumption of DS determined by a combination of social, psychological, knowledge-based, and economic factors. In the observation, the users of DS are people who want to take care of their health. In this context, it is conceivable that awareness of a metabolic disorder, such as diabetes or hypertension, makes people more receptive to supplement use (Rovira, Grau, Castañer, Covas, & Schröder, 2013).

Several kinds of research have shown that lifestyle behaviour of individual may influence someone for taking the dietary supplement in their daily life. As mentioned in this article where; individuals who usually consume dietary supplement are more likely to take 55 precautions which are, they put a high value on their health (Pajor et al., 2017). Besides, other researches have stated that people who consumed dietary supplement have health consciousness and

showed a significant result. However, acquaintance with dietary supplement advertising is insignificant (Willis & Royne Stafford, 2016). These two articles are likely to be related when an individual has health consciousness and put a high value on their health; they may consume dietary supplement as a precaution in their life. Another study also focussed on the consumers' attitudes as the foreground on the individual to consume dietary supplements (Noor et al., 2014). Furthermore, an individual that comes from a family that constantly consumed dietary supplements tend to influence their children to consume the same supplements (Sien et al., 2014).

4.3 Knowledge towards dietary consumptions

Due to the overwhelming information and also the knowledge gained in consuming DS, most people rely more on the environmental influence rather than investigating carefully on why they have to take DS. Health knowledge is defined as "the individual's storehouse of information about preventive health care behaviours". This definition reflects on the expertise that can assist the individual and their health information processing, as well as guiding them in selecting appropriate health behaviours, which may contribute to the greater odds of health-related product acquisition and/or consumption (Yap et al., 2014). Patients are usually unaware of the harmfulness of DS, and DS labels often do not contain a sufficient key safety message for consumers (Bukic et al., 2018). Previous studies have shown that health care professionals, including pharmacists and physicians, lack the knowledge and confidence to advise consumers on DS use. Besides, patients do not turn to health care professionals as a source of information about DS. Since DS can be bought online; many users do not first discuss their choice with a pharmacist or a physician, which disable the role of health professionals in providing consultation to patients on this matter. Health care professionals should be qualified to address these concerns; and in many countries, they have the opportunities to improve their knowledge through participation in workshops and online education (Bukic et al., 2018). In this study, the respondents from all the faculties resulted in a moderately significant relationship on consuming DS, means they have not equipped themselves with appropriate information about the supplements. Thus, the knowledge score is not reaching a satisfactory level for undergraduate students. Extended research emphasises on health knowledge as an important factor for explaining various health behaviours. In contrast, this research exposed no such relationship of health knowledge that appeared to have no significant effect either the attitudes or intentions.

Moreover, health knowledge will affect behaviours only when consumers are motivated to improve their health. However, the attempt to find an interaction effect between health motivation and health knowledge failed here. One possible explanation for the less salient role of health knowledge in this research is rooted in socio-economic development differences among the countries in the previous studies. As a developing nation, Malaysia's preventive health care systems are not well established as other, more developed, nations. The public policy efforts in disseminating knowledge of healthy eating, better diet, nutrients knowledge, and healthier habits are still lacking. This argument reflected in the relatively low mean score for health knowledge reported in this study. (Yap et al., 2014).

5. Future Recommendation

For future recommendations, researchers' can reassess this study by exploring other possible determinants on the reasons people consume DS. Other than that, this study can be investigated through a semi-structured interview to get detailed insight from the respondent's personal opinions on this matter.

6. Conclusion

Health literacy needs to be improved gradually since consuming healthcare products can put life in dangers. Open educational talks should be conducted to gain more knowledge. Besides, seeking professional advice before purchasing is a good step in determining the safety of the DS. In sum, these students assured that the supplements safe to be consumed in practising a healthy lifestyle. This study also can be reassessed and generalized to another program such as postgraduate and other public or private university students on opinions in taking DS.

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