

Factors influencing consumers' decision on the use of nutraceuticals: a focus group study in Malaysian population

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Abstract

Introduction: There is an increasing prevalence of nutraceuticals use globally. A systematic review identifying factors influencing consumers' decisions in taking nutraceuticals found no qualitative study in Asian countries for the general consumer population. This study aimed to explore the factors influencing consumers in taking nutraceuticals utilizing the focus group method. **Methods:** English-speaking Malaysian adults were recruited using purposive sampling. Thematic analysis was used to extract relevant themes. **Results:** The major factors to take nutraceuticals were their perception of health benefits and friends' and family members' recommendations. On the other hand, the major barriers in taking nutraceuticals were the perception of nutraceuticals as artificial agents, the experience of side effects, and the high cost of nutraceuticals. **Conclusion:** The study found that the attitude towards the perceived health benefits and safety of nutraceuticals were the two main components which were important in determining the intention to use nutraceuticals, the use of nutraceuticals should be supported with sufficient clinical evidence.

Keywords: Nutraceuticals, Dietary Supplements, Health Products, Motivations, Barriers, Factors

INTRODUCTION

Nutraceuticals are defined as “any substance that may be considered a food or part of a food and provides medical or health benefits, including the prevention and treatment of disease”.^[1-3] With its broad definition, it includes both dietary supplements (DS)^[4,5] and functional foods^[6] and its use was reported to be prevalent with an increasing trend in the United States, United Kingdom, Europe, and Korea.^[7,8]

Despite the high prevalence of nutraceuticals use, many nutraceuticals are often not substantiated with clinical evidence support for their health claims^[9-13] whilst some nutraceuticals may cause adverse effects.^[14, 15] However, consumers' may lack the awareness about the clinical evidence of nutraceuticals products,^[16, 17] and a lack of appropriate consultation from healthcare professionals with updated clinical evidence information.^[16]

To understand why nutraceuticals are so popular despite the lack of support from clinical evidence in terms of effectiveness and safety, it is important to find out the factors that affect the decision of consumers in using nutraceuticals. A systematic review of studies identifying the factors influencing consumers' decisions in taking nutraceuticals showed that the perceived health benefits and safety of

nutraceuticals, and the advice from healthcare professionals, family and friends were the main motivating factors for consumers to take nutraceuticals. On the other hand, the high cost of nutraceuticals and participants' lack of knowledge on nutraceuticals were the main barriers.^[18] However, the systematic review found no study which reported on the factors affecting the decision of consumers to take nutraceuticals in Asian countries for the general consumer population.^[18] Although two qualitative studies conducted the studies in only elderly population^[19] and patients with chronic kidney disease,^[20] the results may be different from

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the general consumer populations. As qualitative studies provide an insight into the phenomena from people's perspective,^[21] this study aimed to explore the factors influencing consumers in taking nutraceuticals utilizing the focus group method. This study is considered the first study conducted to improve the understanding of the general consumers' perspective in the Asian region.

METHODS

We used the Consolidated Criteria for Reporting Qualitative Research (COREQ)^[22] to inform the study's design and reporting.

Participants

Participants were recruited in-person in Monash University Malaysia. To obtain a range of perspectives, we used purposive sampling to include participants with different age-groups and income levels, including undergraduate students (aged 18 without income), postgraduate students (aged between 18-30, with minimal income), administrative staff and academic staff (aged between 25-46, with average and above-average income). Also, we ensured an almost equal number of included users and non-users of nutraceuticals. Participants were eligible if they were English-speaking Malaysian adults (i.e. 18 years and above). Participants received MYR20 as compensation for their time. This study was approved by the Monash University Human Research Ethics Committee, Australia. All participants signed the consent letter before the start of focus groups.

Data Collection

We developed a question guide based on the results of the systematic review which investigated the influencing factors for consumers in taking nutraceuticals^[18] and referring to the technique using well-established guidelines on designing a focus group^[23, 24] and, and discussion among the research team. One investigator (SLT) conducted the 1-hour focus groups in meeting rooms in Monash University Malaysia. To ensure homogeneity in the composition of the focus group, i) current users of nutraceuticals and ii) non-users of nutraceuticals were grouped in separate focus group sessions. The focus groups were conducted in October 2017 until data saturation was achieved. Data saturation was determined to be achieved when no new motivating factors or barriers for taking nutraceuticals were obtained. All focus groups were audio-recorded and transcribed.

Analysis

All transcripts were entered into Nvivo version 11 (QSR International, 2016), which is a software for qualitative data management. Thematic analysis was conducted were meaningful and relevant sections of text related to the factors influencing consumers' decisions on the use of nutraceuticals were coded into the relevant theme.^[25] The software generated a report of all of the themes with their corresponding coded text. The preliminary themes were discussed with SN, who read the transcripts independently;

any discrepancy was discussed with NC and resolved by consensus. This form of researcher triangulation was done to ensure that the preliminary themes captured the complete range of participant perspectives. Conceptual links or similarities across themes were identified and mapped into a thematic schema.

RESULTS

Of the 28 participants who confirmed to attend, 21 participated in the 4 focus groups. Of the 4 focus group sessions, 2 sessions each consisted of participants who were current users of nutraceuticals (n=11) and non-users (n=10) respectively. The number of participants in each focus group session was 5-6. Participant characteristics were shown in **Table 1**. The age of participants ranged from 19-46 (mean 29 years (SD 7)).

Table 1. Participant characteristics (n=21)

Characteristic	n
Sex	
Men	5
Women	16
Age (year)	
18-25	9
26-35	8
36-46	4
Occupation	
Undergraduate student	5
Postgraduate student	6
Administrative staff	8
Academic staff	2
Nutraceuticals users	
Users	11
Non-users	10
Taking Medicine for Medical condition	
Yes	2
No	19

The two main themes identified were perceptions of nutraceuticals product attributes and the source of recommendation to use nutraceuticals. The themes were described in the following section. Selected quotations to support each theme were provided in **Table 2 (motivating factors)** and **Table 3 (barriers)**. Also, the word cloud of the 25 most frequently mentioned words were included as supplemented information (**Figure 1**).

Table 2. Illustrative quotations to support identified themes for motivating factors to take nutraceuticals.

Theme	Illustrative quotations
Health benefits	
To be healthy	Improve and maintain your health. And then to prevent. To boost immunity. General stuff. (woman, FG1, user, 31)

Underlying condition	<p>To be healthy. (woman, FG1, user, 32)</p> <p>Long-time survival. Immunity. (woman, FG1, user, 31)</p> <p>To sustain and for better health. Prevention than cure. (woman, FG1, user, 46)</p> <p>Maybe generally to be healthier. (man, FG2, user, 32)</p> <p>The first one is probably health, the health thing. And also to prevent future problems. (woman, FG2, user, 22)</p> <p>And the third one is healthy. (woman, FG2, user, 19)</p> <p>Psychological reasons because at least by taking these it makes me feel I'm doing as much as I can to stay on top of things even if obviously sometimes I eat it, immediately or slightly longer-term sometimes it feels like there is no real difference but you know what, I take it because at least I tell myself you have done what you can, you've gotten your rest, you've got your relaxation, you take this to ensure that you can have enough. (man, FG2, user, 32)</p> <p>Because I'm anemic. And because I'm very active in sports and I hurt my knee. (woman, FG1, user, 26)</p> <p>Because a woman needs calcium. (woman, FG1, user, 32)</p> <p>Because I'm a person who is prone to get flu. But it depends on if you really need it. (woman, FG1, user, 31)</p> <p>Because I have back pain due to scoliosis. I'm also prone to sinus. Because I'm prone to get ulcers. So, to prevent it. (woman, FG1, user, 31)</p> <p>I also have the underlying condition. That's why I was encouraged to take that. (woman, FG1, user, 46)</p> <p>Because I have knee problems since after 30's so like ya knee pain. (woman, FG2, user, 38)</p> <p>Because I got low blood pressure. (woman, FG2, user, 29)</p> <p>Because I realized that I have some hair problem thing. (woman, FG2, user, 22)</p> <p>I used to have a lot of allergies. (man, FG3, non-user, 26)</p> <p>They said it will reduce your asthma. (man, FG3, non-user, 44)</p> <p>Because I'm coming off with the flu. (woman, FG3, non-user, 25)</p> <p>Do I need it? (man, FG3, non-user, 21)</p> <p>Health condition (woman, FG4, non-user, 25)</p>	<p>I will pay attention to that. (woman, FG1, user, 26)</p> <p>Calcium magnesium combination gives you more absorption compared to oxide. And citrate is more soluble. I wasn't aware. The cheapest was actually calcium oxide, so that's why I was taking that. (woman, FG1, user, 26)</p> <p>If I don't take it I will have knee pain. So ya it works for my family and me. (woman, FG2, user, 38)</p> <p>So it helps with when there is already a tracked record in place. So, that's why traditional medicines appeal to me more because other people have said that, not necessarily traditional, but medicines that have been around for some time, for a long time. We already know that what to do, what might cause, all sort of these, that would appeal to me. (man, FG3, non-user, 26)</p> <p>Then, and also besides that, I actually see people who improved by taking it. (man, FG3, non-user, 26)</p>
Effectiveness	<p>Because I tell myself you have done what you can, you've gotten your rest, you've got your relaxation, you take this to ensure that you can have enough. (man, FG2, user, 32)</p> <p>Because I'm anemic. And because I'm very active in sports and I hurt my knee. (woman, FG1, user, 26)</p> <p>Because a woman needs calcium. (woman, FG1, user, 32)</p> <p>Because I'm a person who is prone to get flu. But it depends on if you really need it. (woman, FG1, user, 31)</p> <p>Because I have back pain due to scoliosis. I'm also prone to sinus. Because I'm prone to get ulcers. So, to prevent it. (woman, FG1, user, 31)</p> <p>I also have the underlying condition. That's why I was encouraged to take that. (woman, FG1, user, 46)</p> <p>Because I have knee problems since after 30's so like ya knee pain. (woman, FG2, user, 38)</p> <p>Because I got low blood pressure. (woman, FG2, user, 29)</p> <p>Because I realized that I have some hair problem thing. (woman, FG2, user, 22)</p> <p>I used to have a lot of allergies. (man, FG3, non-user, 26)</p> <p>They said it will reduce your asthma. (man, FG3, non-user, 44)</p> <p>Because I'm coming off with the flu. (woman, FG3, non-user, 25)</p> <p>Do I need it? (man, FG3, non-user, 21)</p> <p>Health condition (woman, FG4, non-user, 25)</p> <p>It helps, like last time I used to have it very frequently maybe weekly sometimes daily but it reduced (the flu). (woman, FG1, user, 31)</p> <p>Sometimes I tried my own experience. For example, I have tried many Vitamin C before and then it's like not working like very well. And then when I tried this one brand and then suddenly it's much better for me. (woman, FG1, user, 31)</p> <p>So I still believe in my own experience. (woman, FG1, user, 31)</p> <p>Your friends said "Oh it worked for me." You think that it might work for you as well so probably you know it drives me to try. (woman, FG1, user, 32)</p> <p>When they are talking about the testimonial, I will be always looking at a testimonial from Asians because, compared to Caucasians and Asians our genetic, variation are a bit more different. So, I will look at the testimonial from Asians more than</p>	<p>I wanna try because my friend said it's quite effective. (man, FG3, non-user, 21)</p> <p>Because I have this problem that I cannot control what I eat. So that's like and I'm a picky eater so I only eat whatever that I like so I have to replace my diet. (woman, FG1, user, 32)</p> <p>Because sometimes actually in every meal that we take, you must have a slice of fruit. But now, can we get fruits for our lunch? Today yes I might. Tomorrow I might not get. (woman, FG1, user, 31)</p> <p>Only during the weekend. (woman, FG1, user, 31)</p> <p>Because over the ages, everything changes, people changed. Last time, grandmothers, they cook, home-cooked is always there. Now it is working mothers. So they not to say, they cannot provide, it's the commitment that they have, they are working, they have family, and also giving a try with a supplement, is what they think it helps. (woman, FG1, user, 31)</p> <p>Because that time people don't have to be stuck in a traffic jam for one hour (woman, FG1, user, 32)</p> <p>Because to me if I can cook by myself if I know that I can have enough nutrition, I'll stop taking supplements. Unless you know, sometimes there is a very busy period, you know that you are going to skip some meal, you don't have enough food then I feel like my immune system might drop, then I will take supplements. (woman, FG2, user, 29)</p> <p>To have enough stamina and endurance because I have a heavy schedule doing different things so I guess you can link that to health reasons. (man, FG2, user, 32)</p> <p>To replace the veggie and fruit intake that I hardly take. (woman, FG1, user, 31)</p> <p>Because sometimes you cannot count the nutrient inside of the food and things like that. (woman, FG1, user, 31)</p> <p>Moderator: "So if the mothers can provide nutrition through food, would you still make sure they get adequate nutrition more from the supplements?"</p> <p>Yes, definitely. (woman, FG1, user, 31)</p> <p>And we take vitamin C because we can't possibly eat 10 oranges (agreement from the group). So it's called supplements. (woman, FG1, user, 32)</p> <p>I said earlier that it is as if I'm dying. (woman, FG3, non-user, 25)</p> <p>For me it's like the worst-case scenario I'm lying on the hospital bed then I have to take it. Yes, no</p>

Safety	<p>choice. Otherwise, It will be the same as a gym and exercise. (woman, FG4, non-user, 21)</p>	<p>allergic reactions so I had to take a lot of medication and sometimes my mother whatever supplements she gets her hands on regardless if there is any effect. (man, FG3, non-user, 26)</p>
Safer than natural sources (from food)	<p>But now, we can't also only depend on the food because sometimes like a vegetable. (woman, FG1, user, 31) Ya. (woman, FG1, user, 32) The video. (woman, FG1, user, 31) Contaminated. (woman, FG1, user, 31) Scary. (woman, FG1, user, 31) I also can't trust the food. They said the more beautiful the vegetables, scary. Must be something else. (woman, FG1, user, 31)</p>	<p>But I only did that because my mum asked me to. (woman, FG4, non-user, 21) Just like, of course when I was younger I had no choice. You just tell your parents like this is not working for me I'm like getting rashes so they changed the brand and everything. (woman, FG4, non-user, 25)</p>
Unaware of the side effect of nutraceuticals	<p>Second is probably I don't, there is no further knowledge on the side effect of these, supplements, like I don't really know about it so probably I just keep on taking. (woman, FG2, user, 22)</p>	Testimonial
Cost Reasonable price	<p>Reasonable price. (woman, FG1, user, 31) The price. (woman, FG1, user, 26) It was, they had some sales and I went crazy and bought a whole bottle. (woman, FG1, user, 31)</p>	<p>Testimonials from those who have actually consumed it. The more positive testimonial the better understanding we have. It drives us actually to try. (woman, FG1, user, 31) It can be anybody really. Because basically when we just go to buy something we go there because that is a good thing, u know, it gives us more. No for us, confidence to use that product. Rather than just go to a pharmacy. And then you just take it every. Most of us, don't really want to read we want to listen from people. Ya. (woman, FG1, user, 31)</p>
Prevent future cost of illness	<p>For mine is usually for prevention of disease. Maintaining the health that you have and then also cost-saving. In a case like you have. Of course, now you have to pay for the supplement. What if we don't take care of our body and we have some disease that cost even more and we have to suffer even more. (woman, FG2, user, 29) Yes yes. I should have written that one as well. (man, FG2, user, 32)</p>	<p>Just to go back to, the testimonial part I think you rely a lot on what other people said especially with regards to some supplements and vitamins because you don't really see the effect immediately they are not like medications. So, maybe you take like 3 months so even sometimes you don't see the effect, so no news is good news. So if you take calcium you probably don't feel anything good about it, you know that it is probably helping. (woman, FG1, user, 32) As soon as someone introduced to me and said that it helps. I went to Taiwan and they claimed it's good. (woman, FG1, user, 46)</p>
Taste	<p>Because it's not like I don't believe in natural things but I cannot swallow the jamu (traditional medicine) and I didn't take even one meal of it. Like my mum wants but I just said no. akar Kayu. No. So I rather take dietary supplements. (woman, FG1, user, 31)</p>	<p>From the good reviews, in the end, it's worth trying. So then I actually tried. (woman, FG2, user, 22)</p>
Recommendation Friends and family	<p>Recommendation from friends or family members. (woman, FG1, user, 32) And usually, we get a recommendation from family and friends. People who you know, trust. (woman, FG1, user, 31) Trust. (woman, FG1, user, 31) Know that not just saying for the tactic of marketing of the product. (woman, FG1, user, 31) So I think things like that. Asking your friends how is it. (agreement from woman, FG1, user, 31) Your friends like oh it worked for me, you think that it might work for you as well so that probably you know drives I think to me to try. (woman, FG1, user, 32) Multivitamin is used by both my dad and my father-in-law. And they are both still alive and very active, a little too active. So it's not a bad thing that. (man, FG2, user, 32) Because my parents are pretty health-conscious, so they will buy these health supplements, in the morning my mum will just give it to us as kids. (woman, FG2, user, 22) So I took that for the brain like my parents are conscious of academics as well. (woman, FG2, user, 19) Because my mother, my parents are taking it, they already bought so I might as well take it, like fish oil, they already bought it so we have like big bottles. (woman, FG2, user, 38) Basically, it was introduced to me by relatives. (man, FG3, non-user, 44) And is there a long-term effect on this thing being prescribed to me because as a kid I had very bad</p>	Healthcare professional
		<p>So maybe what you can do is you can go and see a family doctor or doctor someone who may know exactly what your body requires and then you can make a decision based on that product. (woman, FG1, user, 31) (agreement from woman, FG1, user, 46) I still believe in my own experience and then I just ask a doctor. (woman, FG1, user, 31) (Agreement from woman, FG1, user, 31) Refer back to your doctor (agreement from woman, FG1, user, 31) because he's your doctor, your confidence in, you will trust the person more than you do your own research online. (woman, FG1, user, 31) Where the doctor prescribes then I will. (woman, FG4, non-user, 25) Ya, I second that. (woman, FG4, non-user, 41) Yes, yes. (woman, FG4, non-user, 25)</p>

Table 3. Illustrative quotations to support identified themes for barriers to take nutraceuticals.

Theme	Illustrative quotations
Health benefits No reasons to take	<p>I just felt that's not really much a need because I actually eat quite healthily. I'm completely OK, normal eating healthy. Eating healthy, sleeping well. I don't feel there is a need in my diet. (woman, FG3, non-user, 25)</p>

Ineffectiveness	<p>I don't have no reason to take. You only take it whenever you have a condition. (man, FG3, non-user, 44)</p> <p>I don't feel like where I am right now border speaking my health requires me to take supplements. (man, FG3, non-user, 21)</p> <p>It's only because it's not necessary. (woman, FG3, non-user, 25)</p> <p>For some time and then I don't think I have to take it so I stopped very quickly. (woman, FG4, non-user, 25)</p> <p>That was when I was very small. After I grew up, there was no need. I don't take vitamins. (man, FG4, non-user, 21)</p> <p>As I grew up, I don't see the point of getting it. (woman, FG4, non-user, 25)</p> <p>After a while, I stopped taking them because I didn't see any effect. (man, FG3, non-user, 26)</p> <p>But after a while, I see no effect. I don't take it because people who have been taking it, it's good, it's fine that means it's good for them but it can't be good for me. Because I am still not convinced how effective it will be. (man, FG3, non-user, 44)</p> <p>Even if I took a while I did not see any improvement in my health. So I didn't see the improvement. There was no effect although it might be doing, I didn't see it. (man, FG3, non-user, 26)</p> <p>It wouldn't make a difference. (woman, FG3, non-user, 26)</p> <p>It's that there can be a placebo effect. It can happen like even if they don't do much difference, they can help you to get better like you don't cure flu with antibiotics because that is not how it works. But you gave sugar pills to the kids anyway because sugar pill can trigger placebo effect, the kid won't know any better, we won't know any better, you take a supplement. (man, FG3, non-user, 21)</p>	Unnatural	<p>It is also manufactured in a way, so it is not as natural as taking the real thing. I would probably only consider that if it is a whole food, or food that you eat, instead of supplements or vitamins, any processed-based supplements. (woman, FG3, non-user, 25)</p> <p>There is an alternative way of obtaining nutrients. Prefer the alternatives. So it's like fruits or vegetables. At least you know what you are eating. And then I don't like the feeling of swallowing pills. (woman, FG4, non-user, 25)</p> <p>I don't like taking pills. I feel like it feels nicer (to take fruits or vegetables than nutraceuticals). (woman, FG4, non-user, 21)</p> <p>For me, it's good for me to get naturally by eating fruits, a lot of vegetables as well, that's how I felt. (woman, FG4, non-user, 41)</p> <p>Cuz nowadays we stop using because the pills are artificial. (man, FG4, non-user, 21)</p>
Safety Side effect experience	<p>Because you see all the supplements are produced overseas which do not cater to Asian body conditions. So most of them are heavy and you have to take a lot of water, if not a lot of side effects. And secondly, I tried a lot and most of it is heavy. (man, FG3, non-user, 44)</p> <p>And the calcium itself I was feeling so unwell, the body aching and I couldn't even feel my feet when I started to walk so that's the reason why I stopped everything, until today not even one. (woman, FG4, non-user, 41)</p> <p>It's like artificial in a way even though they said it's natural. (woman, FG4, non-user, 21)</p> <p>Besides that, because consuming pills like processing the chemicals and all that. You have, I don't know about others but I've been hearing a lot of news that people getting various disease it's because people are taking a lot of pills and all. I'm not saying that it's not good but over-indulging it. Normally I just feel very sluggish after taking pills. Even though if I'm sick, after taking pills. (woman, FG4, non-user, 25)</p>	Price High price	<p>So once you go in, you put yourself in some cost thing where I'm like the benefit only stays if I maintain it. (man, FG3, non-user, 21)</p> <p>The dietary supplement actually for me is quite expensive. (man, FG3, non-user, 26)</p> <p>Partly cost. It links in a way whereby, it is not necessary. I wouldn't really spend so much on it. (woman, FG3, non-user, 25)</p> <p>The reason being for quitting all the vitamins is the price is so expensive. (woman, FG4, non-user, 41)</p> <p>I don't have money. (man, FG4, non-user, 21)</p> <p>(When asked the reasons for not taking nutraceuticals) Cost. (man, FG3, non-user, 44); Price. (woman, FG4, non-user, 25); The Pricing. (woman, FG4, non-user, 21)</p>
		Others Reliant on supplement	<p>Because now once you start taking you to put yourself in a position where you find it hard to get off the. So once you go in, you put yourself in some cost thing where I'm like the benefit only stays if I maintain it, once it stops the benefit goes away so that now you are putting yourself in a place you become reliant on that and it puts you in the mindset that you don't have to take care of yourself normally because you are reliant on. (man, FG3, non-user, 21)</p> <p>It is a drug. (woman, FG3, non-user, 25)</p> <p>I'm fear of depending on that. So rather not started at all. (woman, FG4, non-user, 25)</p>
		Inconvenience	<p>One thing is that I really dislike the schedule that comes with it..that you have to stick to a schedule because a lot of the supplements I need a schedule. (man, FG3, non-user, 21)</p>
		Taste	<p>(When asked the reasons for not taking nutraceuticals) The schedule thing. (woman, FG3, non-user, 25)</p> <p>Because I don't like the taste. It was quite difficult to take down. (man, FG3, non-user, 26)</p> <p>Like fish oil, there is some fish smell. (woman, FG4, non-user, 25)</p>

From **Figure 1**, “side”, “natural” and “effect” have been frequently mentioned which were related to the safety components of nutraceuticals.

Price

The price of nutraceuticals products has to be reasonable for participants to continue using nutraceuticals, which can also be seen with “pricing” as frequently mentioned by participants (**Figure 1**). Taking nutraceuticals was also a way for participants to prevent illnesses which may cost even more than what they were currently paying for nutraceuticals.

Many participants perceived that the cost of nutraceuticals was too high for them hence not taking nutraceuticals. One participant perceived that taking nutraceuticals was long-term maintenance hence it incurs a continuous cost in the long-term to sustain any potential health benefit from nutraceuticals.

Taste

The taste of dietary supplement was normally neutral when compared to some natural ingredients. Therefore, for a participant, it was the reason why she took nutraceuticals as she could not accept the taste of traditional medicine. In contrast, non-users of nutraceuticals perceived that the taste of nutraceuticals was not pleasant for them and hence not taking nutraceuticals.

Source of Recommendation

Friends and family

Participants were interested to take nutraceuticals when their friends and family mentioned the products worked for them. The participants mentioned that the feedbacks of use from their family and friends were more trustable compared to those who sold the nutraceuticals products and therefore would have a better effect in motivating them to try the nutraceuticals. They also mentioned that if their family members or friends were taking nutraceuticals, they would be motivated as well. Even for non-users, they have mentioned having taken nutraceuticals in the past as it was recommended by their family members.

Testimonial

Participants wanted to try nutraceuticals products after knowing good reviews or testimonial from people who have used the products. They could be anyone who they came across with. A participant mentioned that due to the duration required to see the health effects of nutraceuticals, it was better if participants asked from those who have taken it.

Healthcare professional

Some participants including users and non-users of nutraceuticals trust healthcare professionals and would be influenced on the decision to take nutraceuticals, although they also mentioned that they would still trust their own experience at the same time.

From **Figure 1**, “people”, “information”, “doctor”, “research” were frequently mentioned words related to the source of information.

Other barriers to taking nutraceuticals

Reliant on supplement/ Inconvenience

Some participants revealed the fear that they had to sustain the habit of taking nutraceuticals which were perceived as being dependent on the nutraceuticals. Others perceived that taking nutraceuticals might make them feel good enough to not doing other necessary steps to take care of their health.

Taking nutraceuticals was seen as inconvenient for some participants where they had to stick to the schedule to taking nutraceuticals regularly.

DISCUSSIONS

To the best of our knowledge, this study is the first qualitative study reported to explore factors influencing consumer's decision in taking nutraceuticals in the Malaysian population and the first in Asian countries for the general population. The theory of planned behavior (TPB) is an established theory in human behavioral research^[26] and was used to relate to the findings of the studies. In general, TPB describes that behavior was a result of an intention attributed to the 3 domains of attitude toward the behavior, subjective norm and perceived behavioral control. According to this study, the intention of the behavior of taking nutraceuticals was heavily dependent on the attitude towards the behavior, followed by the subjective norm and only to a small extent on perceived behavioral control.

The two major attitudes of the participants in determining the intention to take nutraceuticals were the perceived health benefits and the perception that nutraceuticals may cause side effects. If participants perceived that taking nutraceuticals was beneficial to their health, they had the intention to take nutraceuticals while those who did not believe this behavior was not beneficial to their health would deem taking nutraceuticals as not necessary. Participants who did not take nutraceuticals perceived that the products were not natural and may cause side effects. This finding was consistent with the systematic review^[27] that found that the perceived health benefits and safety of nutraceuticals were the key factors that motivated consumers to take nutraceuticals. However, as most nutraceuticals were not supported with clinical evidence in terms of effectiveness and safety, it means that more work has to be done to improve on consumer education using clinically based evidence.

Next, the subjective norm was another major factor influencing the decision of the participants in taking nutraceuticals. When the nutraceuticals were recommended, participants were motivated to take nutraceuticals. The influence of the recommendation can be from friends and family, healthcare professionals or from anyone who had a

good experience with the nutraceuticals. Compared to the systematic review,^[27] recommendation from healthcare professionals was much more influential. This could be due to only generally healthy adults who were recruited in the study while the systematic review included participants with all health conditions including those who were generally healthy as well as with diseases. Also, the difference between culture and education level could contribute to this difference which should be explored in the future.

In terms of the perceived behavioral control of TPB, the price of the nutraceuticals, as well as the equipped knowledge on the effectiveness and safety of nutraceuticals, were mentioned as the factors determining the use of nutraceuticals. Whether if the participants were willing to pay for the amount of the price of nutraceuticals determined taking nutraceuticals or not while often participants referred to the lack of knowledge about the effectiveness and safety of the nutraceuticals products which may have caused them to resort to believing in others' experience, opinion, and healthcare professional's advice. The study has shown that the public had many misperceptions about the safety of dietary supplements^[28] while another study also found that the clinical evidence which showed the lack of effectiveness of nutraceuticals did not affect the sales of nutraceuticals.^[29] This scenario reiterates that consumers may not be aware of the current clinical evidence and highlights the need to improve the knowledge of consumers regarding the use of nutraceuticals with the knowledge from clinical evidence.

Between the users and non-users of nutraceuticals, there was a shared attitude towards taking nutraceuticals. Whether or not the participants were taking nutraceuticals depends on whether if they perceived that their current health conditions can be improved by taking nutraceuticals. In general, users were taking nutraceuticals as they believed that taking nutraceuticals can be beneficial to improve their current health condition while non-users, despite not taking nutraceuticals, may take nutraceuticals when they perceived that it could help to improve their health condition (in the future). On the other hand, there was a difference between the subjective norm between users and non-users. Users were more susceptible to be influenced by the opinions and suggestions from others (including friends and family with experience in using nutraceuticals) and healthcare professionals while non-users were less susceptible as they had a strong attitude on the lack of health benefits and the potential of side effects from taking nutraceuticals. These findings revealed that the consultation with consumers/patients whether to refer to the use of nutraceuticals has to consider the factor of their attitude towards taking nutraceuticals.

The advantage of our study was both users and non-users of nutraceuticals were recruited which enabled the identification of motivating and demotivating factors from both groups of participants. Also, the purposively selected method enabled the perspective of participants with varying levels of age-

groups and income levels. Nevertheless, our study is limited to only a generally healthy population and may not apply to those who had severe health conditions. Future studies could include participants with different education levels and health conditions to investigate if the difference affects factors influencing their decision to take nutraceuticals.

Our study is limited to a broad view of the general population on factors influencing their decisions in taking general nutraceuticals as no nutraceuticals products were specified throughout the discussion. Also, the sample size in our study is relatively small. However, this is because data saturation has been achieved.

In conclusion, this study identified that the major factors motivating Malaysian adults to take nutraceuticals being the perceived health benefits and recommendations from friends and family; while the perception that nutraceuticals were artificial, the experience of side effects and cost being the major barriers in using nutraceuticals. As the study found that the attitude towards the perceived health benefits and safety of nutraceuticals were two main components that were important in determining the intention to use nutraceuticals, the use of nutraceuticals should be supported with sufficient clinical evidence. Future studies should produce high-quality clinical evidence that investigates the effectiveness of health benefits as well as the safety, to inform on whether or not to support the use of nutraceuticals. Also, studies should investigate ways to improve the channeling of clinical evidence to consumers to enable informed decision making in nutraceuticals.

Declaration of Interest

The authors report no conflicts of interest.

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