

# Use of nutritional health supplements and associated factors among parents with children at kindergartens in Hong Kong

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- Objectives** To estimate the prevalence of so-called nutritional health supplement consumption among kindergarten children; secondarily to explore potential factors associated with such consumption.
- Design** Cross-sectional, self-administered questionnaire survey.
- Setting** One kindergarten each in Hong Kong island, Kowloon, and the New Territories region.
- Subjects** Parents who had a child studying at the three sampled kindergartens in April 2010.
- Results** Of 951 sets of parents, 730 (77%) responded. Approximately 52% (95% confidence interval, 47-58%) of the respondents gave regular health supplements to their child. The commonest type of supplement given was cod fish oil (69%). Approximately 36% of the respondents did not know the upper limit dosage of their supplement. Parents of only 66% of regular health supplements consumers, compared to 75% of non-regular users, knew that there was an inherent risk from over-consumption ( $P=0.018$ ). Parental beliefs that "It is useful/important for normal child development" (adjusted odds ratio=1.93; 95% confidence interval, 1.18-3.16;  $P=0.009$ ), "It is useful/important for immune function" (1.79; 1.05-3.05;  $P=0.032$ ) were associated with consumption of health such supplements.
- Conclusion** There is high rate of health supplement consumption among healthy kindergarten children in Hong Kong. There are wrong beliefs from parents that health supplements are important for normal-growing children for their normal growth and body immunity. About one-third of parents has limited knowledge on potential side-effects of overdose and do not know the limit of consumption. Education on "Less (health supplement) is more (health)" is recommended.

## New knowledge added by this study

- About 52% of parents regularly give so-called nutritional health supplements to their children of kindergarten age.
- About one-third of parents do not know there may have inherent side-effects from over-consumption of such health supplements.
- Consumption of such health supplement is associated with wrong beliefs that they are "useful/important for normal child development and immune function" (respective adjusted odds ratio: 1.9 and 1.8).

## Implications for clinical practice or policy

- There is a need to: (1) promote public awareness on the possibility of adverse effects from over-consumption of such health supplements; and (2) educate the public that "Less (health supplement) is more (health)".

**Key words**  
Child, preschool; Dietary supplements;  
Health food; Minerals/administration &  
dosage; Vitamins/administration & dosage

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## Introduction

Nutritional health supplements comprise a huge market locally. In Hong Kong, about \$2.3 billion was spent on vitamins and dietary supplements in 2008. An early survey among secondary school teens revealed that more than a quarter of them took vitamin

## 香港幼稚園學生的父母讓子女進食營養補充劑的情況以及有關因素

- 目的** 估計幼稚園學生進食營養補充劑的情況，並探討他們進食模式的潛在因素。
- 設計** 橫斷面自我填寫問卷調查。
- 安排** 從香港島、九龍及新界各選擇一所幼稚園為問卷調查的對象。
- 參與者** 於2010年4月有子女就讀於參與研究的三所幼稚園的父母。
- 結果** 951名父母中收回問卷730份（77%）。被訪者中約有52%定時讓子女進食營養補充劑（95%置信區間：47-58%）；最普遍的營養補充劑為鱈魚肝油（69%）。約有36%父母並不知道進食營養補充劑劑量的安全上限。定時讓子女進食營養補充劑的父母中，只有66%知道過量服食有潛在危險，而未有定時讓子女進食營養補充劑的父母中，則有75%知悉此潛在風險（ $P=0.018$ ）。以下兩項因素均與父母讓子女進食營養補充劑有關：父母相信營養補充劑對於有效促進子女正常發育很重要（調整比數比=1.93；95%置信區間：1.18-3.16； $P=0.009$ ）；父母相信營養補充劑對於有助維持子女的免疫功能很重要（調整比數比=1.79；95%置信區間：1.05-3.05； $P=0.032$ ）。
- 結論** 香港幼稚園學生進食營養補充劑的情況相當普遍。可惜父母誤以為讓本身發育正常的子女進食營養補充劑對於促進其發育及免疫功能很重要。至於過量進食營養補充劑所帶來的副作用，只有三分之一的父母有僅有的知識，甚至不清楚進食劑量的安全上限。有必要教育大眾市民「營養補充劑少一點，健康多一點」的知識。

supplements,<sup>1</sup> and a recent study<sup>2</sup> indicated that about 35% respondents took such health foods. A household survey<sup>3</sup> conducted on about 5.6 million Hong Kong inhabitants aged 15 years and over found that around 1.3 million (about 23%) reported taking nutritional health supplements in the preceding 12 months. Another study from the US reported that approximately one-third of subjects aged 0 to 18 years took health supplements.<sup>4</sup> Yet, professional societies<sup>5</sup> and local health authorities<sup>6</sup> do not suggest a need for food supplement among healthy, normally growing children. Although the American Dietetic Association considered functional food may be potentially beneficial, it also cautioned that scientific studies were required to evaluate its risk/benefit ratio.<sup>7</sup> Health problems occurred when subjects took health supplements inappropriately. It is estimated that adverse events occurred in about 15% among chronic health supplement users.<sup>8</sup> A local survey on children who were admitted to hospital for unintentional poisoning in 1997 to 2002 reported that 13 (14%) out of 96 were identified as being due to health supplements.<sup>9</sup> Vitamins, minerals, and fish oil were the commonest nutrition supplements

leading to hospital admission. There are no other systematic data in Hong Kong on adverse effects attributable to the use of health supplements. Sporadic reports appear in media only when serious adverse effects were noted.<sup>10,11</sup> There is thus a mismatch between professional advice and parental behaviour. The current study aimed to explore the beliefs and behaviour towards so-called nutritional health supplements of parents with kindergarten children. This group was selected as kindergarten children are among the most dependent on parental influence regarding such intake behaviour, and they are also the most vulnerable to side-effects from chronic inappropriate use of such health supplements. The primary objective of the current study was to estimate the prevalence of regular health supplement consumption among kindergarten children. The secondary objective was to explore potential factors associated with such consumption, and whether parents knew the intake limit of such supplements.

## Methods

### Operation definitions

For the current study, definitions from the Thematic Household Survey Report<sup>3</sup> were adopted. 'Health supplements' referred to any instant of an orally consumed health product intended to improve health, gain weight, lose weight, control weight, or improve body shape/physical appearance (irrespective of their packaging or form).

### Procedures

This was a cross-sectional study using self-administered questionnaires and was conducted in April 2010. The target population was the parents who had children studying in kindergartens in Hong Kong. One kindergarten in Hong Kong (Central district), Kowloon (Kowloon Tong), and the New Territories (Tseung Kwan O) regions were conveniently selected. All parents with children studying in these three kindergartens were approached, except those who were non-Chinese.

The principals of the three sampled kindergartens were approached and the importance and implications of the current study explained. With their consent, the self-administered questionnaire was distributed as a school circular to each set of parents. An accompanying information sheet was enclosed, which explained the purpose of the project, operational definitions of health supplements, and that the survey should be completed by one parent only, and anonymity and confidentiality of all responses would be maintained. Instructions were also given that, if they received more than one questionnaires (more than one child studying

in the same kindergarten), they had to complete both Section I (beliefs and attitude) and II (types and frequency of health supplement consumption in the preceding 3 months) for each child. However, they had to complete Section III (demographic data) on one of the questionnaires only. Parents were expected to return the questionnaire, together with other school circular, within 1 week.

### Instruments used

A standardised, structured questionnaire was designed, and piloted through interviews with five public health professionals. The latter completed the questionnaires and were asked to comment on the relevance of the issues covered, whether the questions could be readily comprehended and whether the response options were appropriate. Based on the comments of these respondents, further changes were made to the questionnaire. The questionnaire was then piloted through interviews with five parents. On the basis of their comments, the questionnaire was re-revised with respect to its items, wording, and format. The finalised version was then distributed to the study sample. The questionnaire was divided into three parts:

- Section I explored beliefs and attitudes towards health supplements. For beliefs, respondents were presented with statements on claimed functions of health supplements for their children, and asked to indicate how important they regarded the claim to be, using a 5-point Likert scale ("No use at all" to "Very important"). For attitudes, the respondents were presented with likely reasons for giving health supplements, and asked to rate to what extent they agreed with the statement, using a 4-point Likert scale (from "Not agree at all" to "Totally agree"). Questions were also asked about their perceptions on the risks of health supplements.
- Section II investigated the health supplement consumption pattern. Parents were asked to tick the most appropriate consumption pattern (type, frequency, monthly expenditure on such items in the preceding 3 months) for a set of commonly consumed health supplements. For parents who gave regular health supplement to their children, the "risk alert", self-rate knowledge about maximum dosage of health supplements, and knowledge on how to calculate the amount of health supplements were enquired into.
- Section III collected respondents' demographic information and the age of their preschool children. Parent's ages were grouped in bands of 8 years (18-25, 26-33, 34-41, and so on).

### Statistical analysis

Descriptive data on the respondent's profiles, as well as prevalence and patterns of health supplements given, were collected. Responses to beliefs and attitudes were dichotomised into "Not important"/"Important" and "Not agree"/"Agree", respectively. Subjects who responded as "Agreed completely" or "Agreed" were grouped as "Agree", while those who "Disagreed completely" or "Disagreed" were grouped as "Not agree". Similarly, those responded as "No use at all" and "Not that important" were grouped as replying "Not important". Those who replied as "Some importance", "Effective/Important" or "Very important/Cannot be missed" were classified as replying "Important". The Chi squared test was used to compare categorical variables on beliefs and attitudes between parents who gave and did not give their children nutritional health supplements. Gender, age, and factors that gave a P value of less than 0.1 in the above Chi squared tests were analysed further using a logistic regression model to adjust for confounding factors. Significance level of  $P < 0.05$  was used to determine whether the observed results were attributable to chance. All statistics were performed with the Statistical Package for the Social Sciences (Windows version 16.0; SPSS Inc, Chicago [IL], US).

### Ethical considerations

Invitation letters explaining the purpose of the study and procedures for data collection were sent to the principals of the selected kindergartens. Approval for the study from the relevant school-governing authorities was obtained before distribution of the questionnaires to the parents. The parents were informed that participation was voluntary and that they had the right to comply or refuse to participate. Completion and return of questionnaire was taken as implied consent. All data collected were kept confidential. Ethics approval for the study was obtained from the Survey and Behavioural Research Ethics Committee of the Chinese University of Hong Kong.

### Results

A total of 951 (41, 310, and 600 in each of the kindergartens) questionnaires were distributed to parents in these three kindergartens; 740 questionnaires were returned. Ten questionnaires were excluded because of incomplete data in Section II (health supplements consumption pattern). The response rate of the three kindergartens ranged from 49% (20/41) to 87% (269/310) with an average response rate of 77%. Among these respondents, 14 had more than one child in the same kindergarten, 81% (519/644) were female and 83% (537/647) were within the 34-41-year-old age-group.

Among the valid respondents, 383/730 (52%) [95% confidence interval, 47-58%] gave regular health supplements to their children. The commonest type of supplement given was cod fish oil and was given by 69% of the responding parents, of whom the majority (31%) gave it once or more than once a day.

Vitamins alone were given to 59% of the children. If one included vitamin plus minerals however, total consumption of vitamin supplements topped to 86% (Table 1).

Among respondents giving supplements (n=383), 34% started such feeding at the age of 2 to <3 years, while 31% did so at the age of 3 to <4 years; 7% started such feeding even before their child was 1 year old (Fig). In all, 64% of respondents spent less than \$250/month per child on such supplements, 22% spent \$251 to \$500/month, and 12% and 2% respectively spent \$501 to \$1000 and >\$1000 on health supplements per month. Regarding parents who did or did not provide regular nutritional health supplements, there was no statistically significant difference in demography and socio-economic status, except that there was a greater proportion of younger subjects among the former (Table 2).

Concerning parents' self-rated knowledge about maximum dosage of health supplements among regular supplement providers, 64% of 383 respondents stated that they knew what the limit was, 26% knew there was a limit but did not know what it was. By contrast, 10% did not know if there was any upper limit. Among those who claimed that they knew what the limit was, only 14% (n=34) had full confidence in how to calculate it.

Beliefs of parents who gave and did not give regular health supplements were compared using the Chi squared test (Table 3). Overall, 38 to 84% parents who gave regular health supplement to their children believed the practice was useful/important for normal child development, for improving immune function, to ensure the child has sufficient nutrients, for intellectual development, and for improving behaviour. In contrast, among parents who did not give regular health supplements, 22 to 58% held such beliefs. These differences between the groups were statistically significant. Notably, fewer parents who gave health supplements knew their risks than those who did not give them (66% vs 75%; P=0.018).

Besides, the respondents also revealed statistically significant differences between the two groups with respect to their point of view on all statements about attitudes towards health supplements, with the exception of the use of a food pyramid as gold standard for a balanced diet. Interestingly, it appeared that parents who were non-regular providers of health supplements were more inclined to using it as an alternative to good eating habits and believed that taking more supplements meant that the child would also be healthier (Table 4).

Logistic regression was used to adjust for possible confounding between factors (Table 5). It showed that respondents with the belief of "It is useful/important for normal child development" (odds ratio [OR]=1.93; 95% confidence interval

TABLE 1. Pattern of nutritional health supplement consumption (n=383)

Supplement	Frequency			Any frequency
	≥Daily	<Daily – weekly	<Weekly – monthly	
Vitamin alone	24.3%	23.2%	11.7%	59.2%
Minerals alone (other than calcium alone)	1.6%	4.4%	7.8%	13.8%
Vitamin + minerals	7.8%	11.2%	7.3%	26.3%
Calcium alone	4.4%	9.1%	8.9%	22.4%
Cod fish oil	31.3%	26.9%	10.4%	68.6%
Sparrow nest	1.0%	5.0%	14.4%	20.4%
Chicken essence	0.3%	1.0%	5.7%	7.0%
Others	3.7%	1.0%	0.3%	5.0%
Total*	74.4%	81.8%	66.5%	-

\* Totals could exceed 100% because some parents gave more than one type of supplement

TABLE 2. Profiles of parents providing regular and non-regular nutritional health supplements (total no. of respondents=730)

Profile	No. of regular providers of health supplements	No. of non-regular providers of health supplements	P value
Gender (n=644)			0.102
Male:female	61:275	72:236	
Age in years (n=647)			0.028
≤41	291	246	
≥42	47	63	
Education level (n=647)			0.787
Secondary school or below	119	105	
University or above	220	203	
Occupation given (n=642)			0.517
Administration/manager	127	117	
Health care	22	26	
Technical	16	14	
Customer services	12	17	
Sales	18	19	
Housewife	95	67	
Others	46	46	
Household income in HK\$ (n=622)			0.370
≤\$10 000	8	6	
\$10 001 – 20 000	19	15	
\$20 001 – 30 000	32	43	
\$30 001 – 40 000	56	56	
≥\$40 001	212	175	

[CI], 1.18-3.16; P=0.009), "It is useful/important for immune function" (OR=1.79; 95% CI, 1.05-3.05; P=0.032) were statistically significant and related to regular use of nutritional health supplement. In addition, respondents who agreed with the statement "Health supplements ensure that a child with food preferences has balanced nutrition" was significantly associated with non-regular providers of health supplements (OR=0.62; 95% CI, 0.43-0.90; P=0.012).

**Discussion**

To the best of our knowledge, this is the first study to examine the prevalence of nutritional health supplement use in children attending kindergartens in Hong Kong. Past studies<sup>1-3,12</sup> surveyed the use of supplements by teens or adults, and usually asked the question as "Have you taken health supplement in past 12 months?" These studies were more prone to recall bias, and did not specify whether the consumption was one-off or regular use. The current study was unique in the target group (kindergarten children), time frame (over the past 3 months) and a focus on regular usage (which is more prone to cause adverse effects if inappropriate).

This study supported the hypothesis that use of nutritional health supplements was common among parents with preschool children. In the current study, 52% of respondents gave regular health supplements to their preschool children, of whom 85.5% (n=328) provided vitamin and minerals supplements, and 81.8% (n=314) were given at least weekly.

The current study also revealed high recourse to cod fish oil; 69% of respondents gave it to their children regularly; 31% gave it once daily or more often, though this was less prevalent than a 60% rate reported in another local study.<sup>12</sup> By contrast, we found a higher rate of vitamin consumption (86%), compared to 68% described in another local survey.<sup>2</sup> These differences are likely due to different target samples and questions asked.

The high rate of health supplement consumption poses health concerns. About one in five and one in eight spent \$251 to \$500 and \$501 to \$1000 per month, respectively on such nutritional health supplements. This was money inappropriately spent that could have been better used for other purposes. Potentially, such unnecessary use of health supplements may also lead to adverse events. As reported by Hon et al,<sup>9</sup> over-dosage with vitamins and minerals, as well as fish oils were a leading cause of hospital admissions due to unintentional poisoning in children. Our survey also showed that only 64% of respondents providing regular health supplements to their children knew the limit on what should be consumed. Furthermore, significantly fewer regular users knew that there was a risk from health

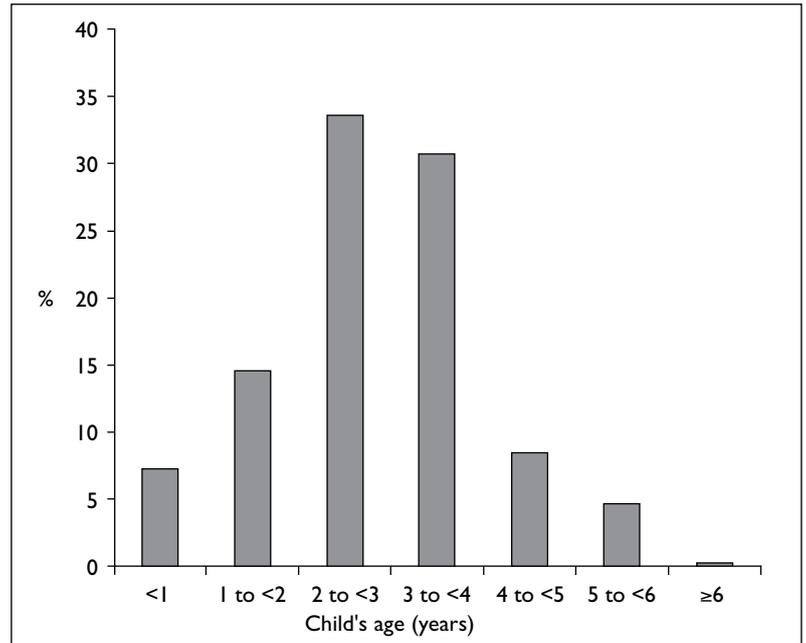


FIG. Age when the child started taking regular nutritional health supplements

TABLE 3. Beliefs of regular and non-regular providers of nutritional health supplements (n=716)

Beliefs	% Believe in the statement		P value
	Regular providers (n=383)	Non-regular providers (n=333)	
It is useful/important for normal child development	79	50	<0.001
It is useful/important for immune function	84	58	<0.001
It is useful/important to ensure a child has sufficient nutrients	77	54	<0.001
It is useful/important for intellectual development	64	37	<0.001
It is useful/important for improving child behaviour	38	22	<0.001
There is risk to health supplement intake	66	75	0.018

supplement intake than non-regular users (66% vs 75%, P=0.018). Even if they know a limit existed, only 14% of the respondents were fully confident on how to calculate the safe dosage limit in children. There is therefore a need for public education on "less (health supplement) is more (health)" and the provision of true facts about 'Health Foods'.<sup>13</sup>

Factors associated with parents giving nutritional health supplements to their children were explored. After adjustment, only beliefs that "It is useful/important for normal child development" (OR=1.93; 95% CI, 1.18-3.16; P=0.009), "It is useful/important for immune function" (OR=1.79; 95% CI, 1.05-3.05; P=0.032) were associated with use of regular health supplements. This was in line with HKU Public

Opinion Programme study.<sup>12</sup> Although isolated reports showed that health supplements were useful in improving growth of stunted children, or that they improved efficacy of tuberculosis treatment,<sup>14</sup> such studies were in diseased, malnourished, and impoverished children. Hong Kong is a developed city

and there is practically no evidence of malnutrition. As stated by professional bodies,<sup>5,6</sup> intake based on recommendations of a balanced food pyramid suffices and it is not necessary to give so-called nutritional healthy supplement to normal growing children.

Respondents who agreed with the statement "Health supplements ensure that a child with food preferences has balanced nutrition" (OR=0.62; 95% CI, 0.43-0.90; P=0.012) was associated with non-regular providers of health supplements, which contrasted with the attitudes noted in a Korean study.<sup>15</sup> In the Korean study, "Korean mothers often gave vitamin or mineral supplements to their children to compensate the inadequate of nutrient due to possible poor or unbalanced meals". It is possible that parents in Hong Kong had a better understanding of the importance of the food pyramid and therefore health supplements were not considered a substitute to healthy eating. However, 95% and 97% of parents in the regular and non-regular use groups respectively, agreed with the statement on the food pyramid but at the same time 81% and 93% respectively also agreed to "Health supplements are good substitutes to good eating habits". It must be admitted that there was no validated tool to measure attitudes towards health supplements, and this statement may be ambiguous. The tool used in this study may or may not be valid and the results are to be interpreted with caution. Further exploration into the incongruence between knowledge, attitude and practices is required so that public education can be more focused.

**Limitation**

In this study, only three kindergartens were selected out of convenience, and might not represent the typical profile of kindergartens in Hong Kong. One of the kindergartens had only 41 students, with 20 parents responding to the questionnaire, and so the results were heavily weighted towards the other two kindergartens. In addition, only 647/730 valid returns provided demographic information for statistical analysis; about 50 parents from each of the two groups did not provide such information. The occupation category that we used was also not conventional. Within these limitations, reported socio-economic status (monthly household income and education level) was higher than that of the Hong Kong population.<sup>16</sup> It is therefore likely that use of health supplements might be over-estimated, as the parents were more able to afford buying "more than the basics".

Attempts were also made to measure attitudes of parents and any associations with health supplement consumption. Despite extensive literature search, no suitable tool for this purpose could be identified, and a self-designed tool was used and might affect the validity of this measurements. Besides, initial

TABLE 4. Attitudes of regular and non-regular providers of nutritional health supplements (n=716)

Statement	% Agreeing with statement		P value
	Regular providers (n=383)	Non-regular providers (n=333)	
Food pyramid is the 'gold standard' to a balanced diet	95%	97%	0.45
I am too busy to educate my child on a balanced diet	63%	72%	0.014
I am worried my child's development lags behind the others	49%	60%	0.003
Health supplements are good substitutes to good eating habits	81%	93%	<0.001
Health supplements ensure that a child with food preferences has balanced nutrition	47%	67%	<0.001
The more the supplements provided, the healthier the child	84%	94%	<0.001

TABLE 5. Factors associated with regular provision of nutritional health supplements

Factors	Adjusted odds ratio	95% Confidence interval	P value
<b>Demographics</b>			
Gender (male as reference)	0.78	0.51-1.19	0.241
Age (35-41 years as reference)	0.69	0.43-1.09	0.108
<b>Beliefs</b>			
There is risk to health supplement intake	0.89	0.61-1.3	0.541
It is useful/important for normal child development	1.93	1.18-3.16	0.009
It is useful/important for immune function	1.79	1.05-3.05	0.032
It is useful/important to ensure a child has sufficient nutrients	1.16	0.72-1.88	0.546
It is useful/important for intellectual development	1.43	0.9-2.29	0.134
It is useful/important for improving child behaviour	0.87	0.55-1.39	0.557
<b>Attitude</b>			
I am too busy to educate my child on a balanced diet	1.09	0.74-1.6	0.664
I am worried my child's development lags behind the others	0.85	0.6-1.22	0.380
Health supplements are good substitutes to good eating habits	0.86	0.45-1.64	0.646
Health supplements ensure that a child with food preferences has balanced nutrition	0.62	0.43-0.90	0.012
The more the supplements provided, the healthier the child	0.55	0.27-1.12	0.101

measurement of the belief/attitudes was through a 4-point Likert scale, which was later collapsed into dichotomous outcomes during statistical analysis. While this may affect the magnitude of the effects, it was unlikely to have any impact on the direction of the results.

The behaviour (giving health supplement to their children) may be influenced by peers, child-rearing experiences, exposure to advertisements or other factors that we have not investigated on, and not just to knowledge, beliefs, and attitudes. Future studies should explore the impact of these factors towards parental behaviours.

As in all other cross-sectional surveys, our study provided a snapshot of the practice in the past 3 months. Besides, information provided was from recall and subject to various information biases.

## Conclusion

There appears to be a high rate of health supplement provision among healthy kindergarten children in Hong Kong. Parents have wrong beliefs that health

supplements provided to normal-growing children are important for growth and body immunity. About one third of parents had limited knowledge on potential side-effects of over-dosage and did not know the limit of consumption. The plethora of health supplement advertisements that food preference of whatever nature can be managed by supplements instead of encouragement of a balanced diet need attention. Education on “(health supplement) is more (health)” and true facts about ‘Health Foods’<sup>13</sup> is recommended.

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