

Dietary Supplements Use and Associated Determinants Among Adult Population in Southern Bangladesh

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Abstract

Dietary supplement use is now widespread worldwide; however, very few studies have been taken to determine the characteristics of people who take supplements in Bangladesh. The current study aimed to assess dietary supplement use and determine its associated factors among adult population in southern Bangladesh. This was a cross sectional study where data regarding dietary use and other associated factors were collected through a structured questionnaire based on one year personal recall method from 300 male and females aged between 15-65 years in three districts of southern Bangladesh. χ^2 tests, binary logistic regression and other required data analyses were carried out by Statistical Package for Social Science (SPSS)-22.0 software at level of significance at 10% and 5%. About 41% participants used any of different dietary supplements during their last one year. Dietary Supplement (DS) use was more common among female (45%) than male (39%) participants. About 33% of DS user initiated supplements use without any physicians' prescription. Its use was found to increase with age, education, lower physical activity and to decrease with obesity and smoking. Participants who regularly took their meal at home were 44.7% less likely to use DS than the participants who did not ($\beta = -0.593$, $OR = 0.553$; $p < 0.05$). Participants who reported their overall health condition as "good" were less likely to use DS than who did not ($\chi^2 = 5.583$; $p < 0.1$). Body mass index was not significantly associated with supplement use. The most commonly reported reasons for DS use were "to improve health" (38%) and "to recover from disease" (36%). Dietary supplement use is common behavior among the population of southern Bangladesh. Various demographic and lifestyle factors can affect the use of dietary supplements. Further qualitative and quantitative dietary supplement assessment is necessary for its public health concern.

Keywords

Dietary Supplement, Body Mass Index, Socio-demographic Factors, Bangladesh

1. Introduction

The term "dietary supplement" is defined by the Dietary Supplement Health and Education Act 1994 as a product which is intended to supplement the diet that contains one or more dietary ingredients including vitamins, minerals, amino acids, herbs or other botanicals and it can be taken orally as a capsule, pill or liquid [1]. DS can be sometimes regarded as

vital source of essential nutrients because of its widespread use and providing daily recommendation of one or more nutrients [2]. Some notable reasons behind dietary supplements intake include prevention of disease, supplying nutritional needs, improving health condition, increasing energy [3].

The intended use of dietary supplements is to ensure that a person gets enough essential nutrients [4]. Dietary supplements should not be used to treat any disease or as

preventive healthcare. An exception to this recommendation is the appropriate use of vitamins [5]. Supplements may create harmful consequences in several ways such as excessive consumption of fat-soluble vitamins and minerals can be deposited in the body [6]. The products may also cause harm related to their rapid absorption in a short period of time, quality issues such as contamination, or by adverse interactions with other foods and medications [7].

Many characteristics of respondents who choose dietary supplements are known such as users tend to be older, more physically active, less likely to smoke, low body mass index (BMI) and have higher educational and socioeconomic status in comparison with non-users. However, the real motivations for DS use remain unclear [8, 9].

Most of the studies available related to dietary supplement and its contributors were all executed on the people of developed countries. But, yet hardly any research conducted on the extent of dietary supplement consumption by the people from country like; Bangladesh. The associated determinants which were found behind the supplement use in the developed societies might not replicate in our socio-demographic perspective. So, it is high time to find out the magnitude of dietary supplement use in our country. People with which socio demographic characteristics are more prone to consume dietary supplements are needed to determine.

Therefore, the main objectives of this present study is to assess dietary supplements use and its associates among adult population in the southern part of Bangladesh.

2. Methodology

This cross-sectional study was conducted from December 2016 to April 2017. 300 participants were enrolled from 3 different location of the southern part of Bangladesh namely Jessore, Khulna, and Jhenaidah. The participants were included on the basis of different age group. People aged less than 15 years and more than 65 years were excluded from the study. Pregnant women were also excluded from this study.

The baseline questionnaire included various demographic, lifestyle, and medical history items, socio economic status, gender, height, weight, age, education, smoking, physical activity, prior illness, and use of dietary supplement and medications. Age group designation was based on the age of the participant at completion of the baseline questionnaire (questionnaire date minus date of birth). The questionnaire also included the name and amount of dietary supplement which he or she consumed. Gender-specific quartiles, anthropometry, smoking history, food frequency table were used to examine associations with supplement use.

Two measurements of weight were taken in kilograms and recorded to the nearest 0.1 kg using a pre-calibrated Seca® scale with the patients in light clothing and shoes removed. Height was measured in inches and recorded to the nearest 0.1 in using a standard height meter when the participant was in an upright standing position without shoes. Body mass index is a calculated number representing a person's level of fat or obesity level. According to the Centers for Disease

Control and Prevention (CDC) a BMI of 30 or above indicates obesity. BMI is calculated and experimented as $BMI = \text{Weight (in kilograms)} / \text{Height}^2 \text{ (in meters)}$ as per WHO [10].

Dietary supplements were considered as the use of vitamins and minerals in the form of tablet, syrup or injection. For each of the following items, participants were asked to respond yes or no whether they used that supplement at least one year during the past year: multivitamins or multivitamins with minerals, vitamin A, vitamin C, vitamin E, beta-carotene, calcium, selenium, or iron. If the answer was affirmative, the participant was asked to select the frequency category describing how many tablets were taken: one to three per week, four to six per week, one a day, two a day, or three or more a day. Length of supplementation was asked for each supplement to which the participant reported use (1 year or less).

After collecting data, the questionnaire was cross-checked to identify any discrepancy in information quality. The checked data were then analyzed using SPSS (22 version, statistical data analysis software).

3. Results

The number of male participant's (63.3%) were higher than female participants (36.7%). 41.3% participants were 15 to 30 years old, whereas 34% were 31 to 45 years and 24.3% were 46 to 65 years old respectively. Majority of the respondents (43.0%) were accustomed with moderate physical activities whereas 36.3% respondents were leading sedentary lifestyle. 23% respondents were illiterate, only 18% completed primary education and 31% completed secondary education. About 20% participants were job holder, 31% were housewives, 12.7% were farmers and 11.3% were day labor (Table 1). 41.3% of the total study population consumed dietary supplement at least once over the past year, and 58.7% of participants did not take any type of dietary supplement over the past year (Table 2).

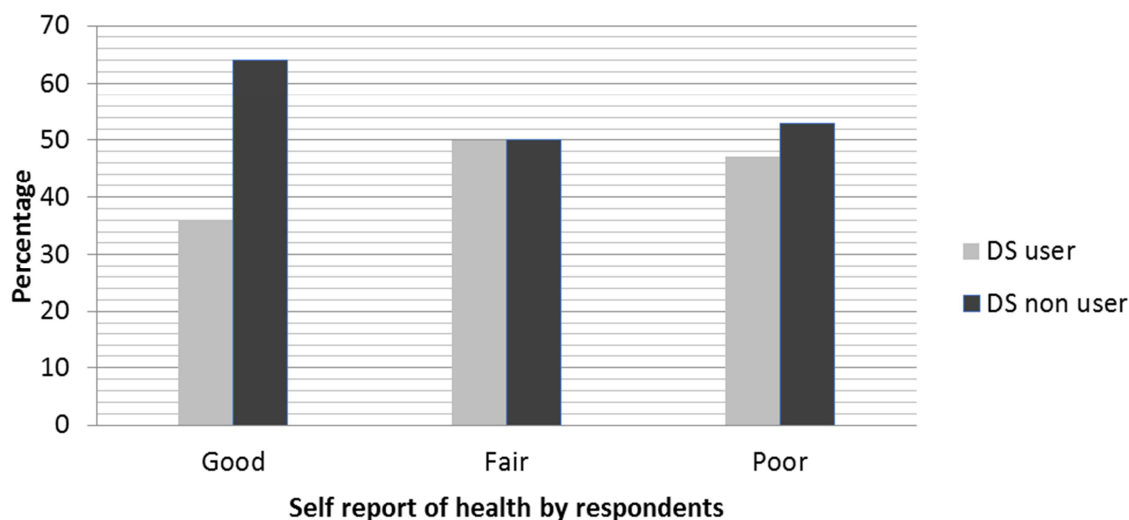
Table 1. Socio-demographic characteristics of the study population.

Characteristics	Frequency	Percentage
Gender		
Male	190	63.3
Female	110	36.7
Age (years)		
15-30	124	41.3
31-45	103	34.3
46-65	73	24.3
Physical activity level		
Sedentary	109	36.3
Moderate	129	43.0
Heavy	62	20.7
Educational qualification		
Illiterate	70	23.3
Primary	54	18.0
Secondary	93	31.0
Graduate	83	27.7
Occupation		
Housewife	93	31.0
Student	41	13.7

Characteristics	Frequency	Percentage
Service	59	19.7
Farmers	38	12.7
Business	30	10.0
Day labor	34	11.3
Others	5	1.7

Table 2. Dietary Supplement use by the study population.

Supplement Use	Number of respondent	Percentage
DS user	124	41.30
Non-user	176	58.70
Total	300	100.00

Figure 1. Dietary supplement use according to self-report of health by the respondent ($p=0.061^*$).

DS consumption rate (50%) was higher to the group of participants who reported their health status as fair whereas the other groups consisted about 35.9% and 47.1% of DS consumption rate who reported their health status as good and poor respectively (Figure 1).

Table 3. Dietary supplement use as per gender, educational status, physical activity level, smoking status, and monthly income.

Characteristics	Dietary supplement use (percentage)		Total	p value
	User	Non-user		
Gender				
Male	74(38.9%)	116(61.1%)	190	0.27
Female	50(45.5%)	60(54.5%)	110	
Age (years)				
15-30	50(40.3%)	74(59.7%)	124	0.564
31-45	40(38.8%)	63(61.2%)	103	
46-65	34(46.6%)	39(53.4%)	73	
Hours of sleep				
Less than 7 hours	49(47.6%)	54(52.4%)	103	0.246
7-8 hours	72(38.5%)	115(61.5%)	187	
9 or more hours	3(30%)	7(70%)	10	
House location				
Rural	76(38.2%)	123(61.8%)	199	0.121
Urban	48(47.5%)	53(52.5%)	101	
Marital Status				
Married	101(43%)	134(57%)	235	0.271
Unmarried	23(35.4%)	42(64.6%)	65	
Religion				
Muslim	117(41.5%)	165(58.5%)	282	0.828
Hindu	7(35.4%)	11(61.1%)	18	
Educational status				
Illiterate	24(34.3%)	46(65.7%)	70	0.429
Primary	21(38.9%)	33(61.1%)	54	
Secondary	40(43.0%)	53(57.0%)	93	
Graduate	39(47.0%)	44(53.0%)	83	
Physical activity level				
Sedentary	48(44.0%)	61(56.0%)	109	0.398
Moderate	55(42.6%)	74(57.4%)	129	
Heavy	21(33.9%)	41(66.1%)	62	
Smoking status				
Smoker	24(42.1%)	33(57.9%)	57	0.895

Characteristics	Dietary supplement use (percentage)		Total	p value
	User	Non-user		
Non- smoker	100(41.2%)	143(58.8%)	243	0.306
Occupation				
Housewife	42(45.2%)	51(54.8%)	93	
Student	17(41.5%)	24(58.5%)	41	
Service	27(45.8%)	32(54.2%)	59	
Farmers	11(28.9%)	27(71.1%)	38	
Business	8(26.7%)	22(73.3%)	30	
Day labor	17(50.0%)	17(50.0%)	34	
Others	2(40.0%)	3(60.0%)	5	
Monthly income (BDT)				0.403
≤ 10000	82(39.2%)	127(60.8%)	209	
10001 to 20000	19(42.2%)	26(57.8%)	45	
≥20001	23(50.0%)	23(50.0%)	46	

In this study, (38.9%) male and (45.5%) female respondents used dietary supplement. Highest use (46.6%) of dietary supplement found in 46 to 65 years age group and lowest use (38.8%) found in 31 to 45 years age group. Participant who used to sleep less than 7 hours were the highest consumer of dietary supplement, they were about 48.0%. Nevertheless, statistically dietary supplement use based on sleeping hours was found insignificant ($p < 0.05$). The study showed that the number of rural participants (66.3%) were higher than urban participants (33.7%). Comparatively urban participants use more supplement (47.5%) than rural participants (38.2%). However, there was no significant association ($p > 0.05$) between DS consumption and house location of the population.

The study found that most of the participants were Muslim. The Muslim participants use more DS (41.5%) than Hindu participants (38.9%) and no significant association ($p > 0.05$) between DS consumption and religion of the

population.

The study found that married participants used more DS than unmarried participants. However, there was no significant association ($p > 0.05$) between DS consumption and marital status of the population. Dietary supplement use was increased with raise in educational level. Among illiterate 34.3% respondent used dietary supplement and among graduate 47.0% respondents used it. About half (44.0%) of the sedentary respondents were used dietary supplement. 42.1% smoker reported dietary supplement use. Within the monthly income group, the rate of DS consumption was higher (50.0%) who had personal income higher than 20000 BDT, and it was gradually decreased according to decreased personal income. 48.0% of participants used DS among the population who had taken any meal of a day out of home whereas about 37.9% of participants used DS among the population who had not taken any meal of a day out of home. (Table 3)

Table 4. Association of dietary supplement use with BMI, taking meals out of home, stomach problem, depression and milk ingestion.

	Dietary supplement use		Total	p value
	User	Nonuser		
BMI* (Body Mass Index)				0.972
<18.5	12(38.7%)	19(61.3%)	31	
18.5-24.9	87(41.2%)	124(58.8%)	211	
25-29.9	22(43.1%)	29(56.9%)	51	
≥ 30	1(33.3%)	2(66.7%)	3	
Taking meals out of home				0.09*
Yes	49(48.0%)	53(52.0%)	102	
No	75(37.9%)	123(62.1%)	198	0.426
Stomach problem				
Yes	42(44.7%)	52(55.3%)	94	0.694
No	82(39.8%)	124(60.2%)	206	
Depression				0.88
Yes	45(42.9%)	60(57.1%)	105	
No	79(40.5%)	116(59.5%)	195	0.88
Milk indigestion				
Yes	22(53.7%)	19(46.3%)	41	0.88
No	102(39.5%)	156(60.5%)	258	

* BMI = <18.5= underweight, 18.5-24.9=normal, 25-29.9=overweight, and ≥ 30=obese

According to BMI measurement, among underweight respondents 38.7% use dietary supplement. 41.2% normal, 43.1% overweight and 33.3% obese respondents use dietary supplement. The study found that who had a tendency to take any meal of a day out of home they used more supplement.

48.0% of participants used DS among the population who had a tendency to take any meal of a day out of home whereas about 38.0% of participants used DS among the population who had a tendency to take any meal of a day out of home. The study shows us about 44.0% participants used

DS among people who had stomach problem, whereas about 40% participants did not use DS among people who had no stomach problem. DS using rate was little higher to the participants who had the problem of depression (43.0%). In this study DS using rate was higher to the participants who

had the problem of milk indigestion. About 53.7% people used DS among the participants had milk indigestion, whereas about 39.5% people used DS among the participants who had no milk indigestion (Table 4).

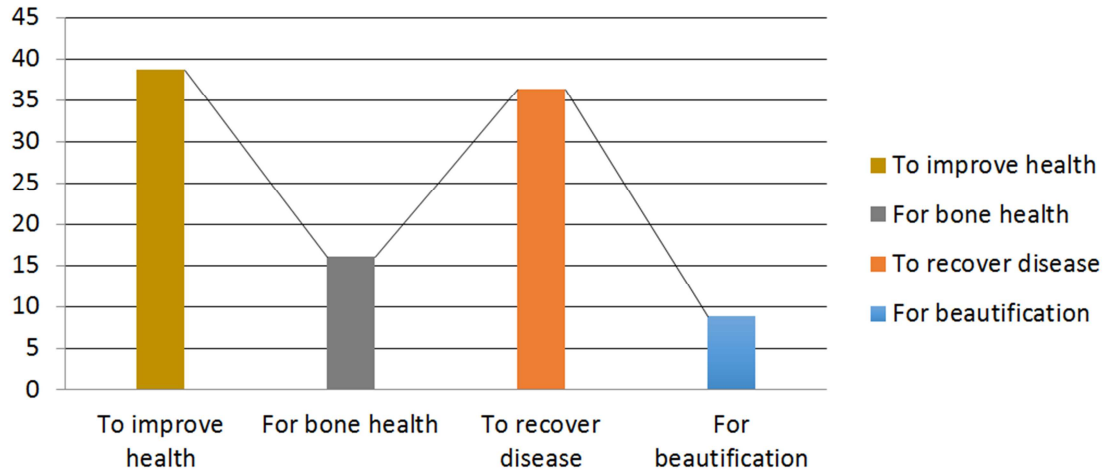


Figure 2. Self-reported reason behind supplements' consumption.

The study found that DS user consumed DS for various reasons, about 38% user consumed DS for improving health, 36% user consumed DS for recovering disease, 16% user consumed DS for bone health, and 9% user consumed DS for beautification (Figure 2).

Table 5. Regression coefficients for factor towards intention of dietary supplement use.

		B	S.E.	p value	Odd Ratio	95% C.I. for Odd Ratio	
						Lower	Upper
Age (years)		.021	.014	.138	1.021	.993	1.049
Gender (female)		.654	.592	.270	1.922	.602	6.135
Religion (Hindu)		-.657	.608	.281	.519	.157	1.709
Marital status (unmarried)		-.344	.575	.550	.709	.230	2.188
Monthly income in Tk.		.000	.000	.152	1.000	1.000	1.000
BMI		.019	.047	.685	1.019	.929	1.119
Occupation (Housewife)	Student	.339	.839	.686	1.403	.271	7.272
	Service	-.996	.932	.285	.369	.059	2.295
	Farmer	-.368	.846	.663	.692	.132	3.635
	Business	-.969	.855	.257	.379	.071	2.028
	Day labor	.319	.869	.713	1.376	.251	7.551
	Others	.178	1.321	.893	1.195	.090	15.914
Physical level (sedentary)	moderate	-.111	.337	.742	.895	.462	1.733
	heavy	-.558	.570	.327	.572	.187	1.749
Smoking status (nonsmoker)		-.197	.392	.616	.821	.381	1.772
Taking meal out of home (no)		-.593	.301	.049**	.553	.306	.997
Stomach problem (no)		.044	.304	.885	1.045	.576	1.896
Sleep hour (less than 7 hours)	7 to 8 hours	-.357	.291	.221	.700	.395	1.239
	≥9 hours	-1.03	.832	.217	.358	.070	1.828
House location (urban)		.540	.502	.282	1.715	.641	4.589
Self report on health (good)	fair	.654	.336	.052*	1.924	.995	3.719
	poor	.508	.660	.441	1.662	.456	6.053
	primary	.504	.443	.255	1.656	.695	3.945
Education status (illiterate)	secondary	.911	.438	.037**	2.487	1.055	5.863
	graduate	.780	.688	.257	2.181	.567	8.391
Meat/fish/egg consumption (regular)		-.361	.357	.312	.697	.346	1.403
Vegetable consumption (regular)		-.168	.402	.676	.846	.385	1.858
Fruit consumption (regular)		.521	.296	.078*	1.684	.943	3.010

*=statistically significant at 10% level of significance, **=statistically significant at 5% level of significance.

From the table 5, The calculated regression coefficient for gender (female) against dietary supplement use found as $\beta =$

0.654 which implies that the estimated change in dietary supplement use for every female is 0.654 logit odds than

male while other independent variables remains fixed. Further, from its exponential value, $\text{Exp}(\beta) = 1.922$ we can say females are 1.922 times as more likely to take dietary supplement than their male counterparts. From the $\beta = 0.021$ in case of age we can show expected change in dietary supplement for every change of one year of age is 0.021 logits while other independent variables remains fixed, again by its $\text{Exp}(\beta) = 1.021$ we can mean that for every increase of one year of age, the risk of consuming dietary supplement increases 1.021 times while other independent variables remains fixed.

For religion, $\beta = -0.657$ tells that people from hindu religion have comparatively less chance of dietary supplementary use than muslims. It can also be said from $\text{Exp}(\beta) = 0.519$ that, hindu participants are 0.519 times likely to take dietary supplement than their muslim counterparts, which can be simplified as $(1 - 0.519) = 0.481$ that hindu participants are 48.1% less likely to consume dietary supplement relative to their muslim counterparts. None of the above regression found statistically significant ($p > 0.1$).

Surprisingly, monthly income ($\beta = 0.000$, odd ratio = 1.00) was found to show no effect on the chance of DS use ($p > 0.1$). Participants who are not used to take any of their regular meal out of home had a 44.7% ($\beta = -0.593$, OR = 0.553) lower tendency to use DS than the participants who take any of their regular outside of home. And this association was statistically significant ($p < 0.05$).

Participants who reported their overall health condition as "good" were less likely to use DS than who claimed their health as "fair" and "poor". It was found fair health participants were found 92.4% more likely to use DS ($p < 0.1$). We observed that the probability of DS use by participants who completed secondary school was 2.487 times more compared to the participants who were illiterates ($p < 0.05$). Overwhelmingly, regular fruit eaters were more likely to use DS i.e., they are about 68% more probable to take DS than who don't take fruits regularly ($p < 0.1$).

4. Discussion

The present cross-sectional study found the percent of DS users as 41.30%, although the definition of supplement users and demographic characteristics of study populations vary from study to study. A number of nutritional surveys conducted in adult and elderly populations have shown that 35-60 percent of the subjects use dietary supplements [11-13].

36.9% of the respondents who use dietary supplement in this current study reported their health status as good. A study carried out by Sotoudeh et al. [14] found that 20.9% respondents using DS, reported their health condition as good than their non-using counterparts.

Women were found to use dietary supplements higher than men in this current study. Similarly, Burnett et al. and Lee et al. also found that intake of DS was significantly higher among women [15, 16].

Ishihara et al. [17] conducted a study in Japan reported that

DS intake was higher among elder respondents. In Malaysia, Chong [18] found that older respondents aged between 36 to 55 years had higher tendency to take Over-the-counter (OTC) dietary supplements. In this current study, about half of the elder (between 46 years and 65 years) respondents took DS.

Several studies have reported that, DS consumption is relatively high among educated people [19-21]. This finding has been replicated in our study present study, where educational level was also associated with DS use. About half of participants who had completed graduation used dietary supplements.

Kim et al. [22], showed that higher income level had been strongly related with increased DS use. We found 50% of the respondents from higher income group used dietary supplements.

The rate of DS use was higher among less physically active group (sedentary) than people habituated to moderate and heavy activity level [23]. We found, 44% of the respondents who were leading sedentary life, reported DS intake. In another study, unlike, our finding it was reported that subjects with high levels of physical activity are more likely to take dietary supplements [12, 24].

In this study, we found 42.1% smoker reported DS use. Kim et al. [22], also found that 49.2% of the respondents who had smoking habits, told they use Dietary supplements.

We found that DS using rate fluctuated along with different BMI levels of users. In our study, it was observed that DS using rate gradually increased with increase of BMI up to 29.9 i.e., underweight participants to overweight participants. Remarkably, the use of dietary supplement decreased after BMI 29.9 kgm^{-2} i.e., participants beginning being obese decrease use of dietary supplements. Almost a similar finding by Block et al. [9], underweight and obese people took less DS than who were normal and overweight.

The present study found out major reasons behind DS consumption among the participants as for improvement of health (38.7%), for recovering from disease (36.3%), for maintaining bone health (16.1%) and for beautification purpose. Bailey et al. [24] founded some reasons behind DS consumption, in his study most of the user consumed DS for improving health (33%), and for heart (18%), & bone health (36%). However, the demographic and lifestyle factors of our study did not explain all of the variation between users and non-users of dietary supplements.

5. Conclusion

The present study revealed that the extent of dietary supplements use was high among southern population of Bangladesh, especially among women and older people. Demographic and lifestyle factors of the population such as monthly income, educational status, sedentary lifestyle and smoking status were reported to positively correlate with DS consumption. The need of increased awareness with basic knowledge from the reliable source regarding the proper dose and side effects of dietary supplements is highly felt among the users.

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