

## Research Article

# Intake of Dietary Supplement among people exercising in gyms in Ludhiana City

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A survey was intended to study the use of dietary supplements among gym trainees in the city Ludhiana, Punjab. A total of 2496 gym trainees from 13 gyms of Ludhiana city were interviewed. Out of these, 200 gym trainees (18-30 years) hundred each Supplement Users (SUs) and Non-Supplement Users (NSUs) of both genders were selected. Data were collected through interview-cum-questionnaire schedule from participants regarding their use of dietary supplements. The statistical analysis was done using SPSS version 23. Mean standard deviation and percentages for various parameters were computed. The results show that overall prevalence of use of dietary supplements was 70 per cent. The highest intake of supplements was reported by males (77%) as compared to females (47%). Overall, protein supplements (98%) were highly preferred by males and multivitamins/minerals (60%) were commonly consumed by females. The main reason for exercising at gym by SUs and NSUs was to lose weight (52 & 59 %), to gain muscle mass (42 & 31 %) and for health reasons (37 & 30%), respectively. The main reason for taking supplements by majority of females was to improve general health (72%) and to cover nutritional deficiencies (62%) whereas males used supplements to build muscles (68%) and gain muscle strength (66%). The primary source of information was internet among males (78%) and females (60%).

A very few number witnessed to have experienced some side-effects by the use of supplements. The main reason for not taking supplements by NSU was satisfaction with natural diet (54%). A comparison of nutrient intakes revealed that the dietary intake of all the nutrients was adequate among both the genders ( $\geq 100\%$  of RDAs) except iron and zinc intake among SUs and NSUs female and vitamin A among both the genders. It is concluded that supplements should be used in those cases where nutritional deficiencies are identified otherwise a balanced diet with variety of foods is recommended. There should be a provision of nutritionist/dietician in every particular gym for the proper guidance.

**Keywords:** Dietary Supplements, Gym Trainees, Supplement Users, Non-Supplement Users

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**Introduction**

The consumption of dietary supplements is increasing at a larger rate in today's scenario. Dietary supplements (DSs) are commercially available products which are consumed and ingested by the gym trainees or athletes as an addition to their usual diet [1]. There has been striking growth in the use of dietary supplements. According to Dietary Supplement Health and Education Act of 1994 (DSHEA) supplements in the form of diet include various ingredients such as protein, vitamins, minerals, concentrate, herbs, metabolite, enzymes, organ tissues or extracts [2]. Indians are more inclined towards eating right and looking good. Physical attractiveness has become a highly desired and a key aspect of people's lives. Hence, a majority of people are joining fitness clubs or gyms [3]. The reasons for the growth of gyms are increased obesity, increased awareness for a fit body and sedentary lifestyle. In addition to this, many sports persons also go to the gym to improve their performance, enhance agility, reduce risk of injuries and for better results regarding their health. Earlier it was mainly dominated by the male population but today there are 45 per cent of females who are members of gym. Increased cases of osteoporosis have given a warning bell to the women to make their health and fitness their top most priority.

According to a survey conducted by the Associated Chambers of Commerce and Industry of India 2012, in top rated Indian cities, 78 per cent of the young generation from urban India consumes different types of dietary supplements on daily basis [4]. Further the use of supplements among gym trainees is motivated mostly by the search of 'Ideal Body'. Various reasons have been identified for the consumption of dietary supplements but the most commonly reported are for health promotion and disease prevention [5]. Male athletes use supplements to increase strength and to improve performance whereas female use to improve general health. In addition to above reasons, loss

of excessive weight and boost in immune system, prevention of diseases along with meeting the special nutritional requirements for high level of physical activities are also some of the reasons [6, 7]. One of the main reasons for the consumption of supplement is crave for achieving quick results. However, the most commonly purchased supplements were protein (74.3 percent), carbohydrate (31.4 percent) and creatine (25.7 percent) [8]. The type of supplements ingested depends upon the age, gender, practiced sport and specific exercise programme. Study explored that adults were more credible to take multivitamins and mineral supplements while the younger generation was credible to take creatine and protein. Large proportion of protein and creatine were consumed by men as compared to women. The main reason for the choice of supplement depends upon the type of exercise program and sport [9].

Just as a coin has two sides, in a similar way these dietary supplements have their positives and negatives with their short term and long term side effects. Short term side effects include many health problems like headache, muscle cramping, digestive problems etc. On the other hand long term side effects involve cardiovascular problems, kidney stones, kidney failures, gout etc.

Keeping in mind that the health risks associated with consumption of DSs are still under investigation, researches have shown that they are linked with many adverse health consequences. These supplements are easily accessible to the customers through various drug stores and online websites. Athletes are the greatest consumers of these supplements followed by the trainees exercising in gyms. Also, it is reported that about 70 percent of the DSs available in Indian market are unauthorized.

People who are physically active do not require extra nutrients, except a balanced diet. The Canadian diet consultants, Sports Medicine College and Diet Association of America reported that a person whose density of micronutrients and energy is low or who restrict one or the other essential nutrients in their diet or who are involved in dense weight-loss exercise, only they require nutritional supplementation [10]. However, consuming severely high doses of protein can result in loss of calcium from bones which increase the risk of osteoporosis. Further they can also cause a stress on the kidneys due to increased levels of ketones which are waste a product of protein metabolism [11].

It is sad to say that awareness level and judicious use of dietary supplements by the people is still questionable. It has been found that gym users rely on their trainers as a prime source of nutrition information and rarely on the registered dieticians/ health professionals. A lot of unauthorized gyms are opening with a motive of making a lucrative amount but fail to build healthy atmosphere with the customers and end up by providing the attractive schemes and memberships which may not be beneficial for the trainees. Thus, keeping this in mind present study entitled "Intake of Dietary Supplement among people exercising in gyms in Ludhiana City" was planned.

## **Materials and Methods**

### ***Locale of the study***

The study was conducted in thirteen gyms namely Anabolic, Inshape Fitness, Magic, Fettle Fitness Hub, Universal, RGHC Health Care Centre, Body Tuner, Khera's Fitness Freak, Hi tech, Talwalkar, Arogya, PAU gym and Burn gym of Ludhiana city of Punjab.

### ***Selection of subjects***

A screening was done to assess the prevalence of use of dietary supplements among gym trainees. A total of 2496 gym trainees (both females and males) were interviewed regarding the use of dietary supplements. Among these 200 gym trainees were selected to carry the further research. Hundred gym trainees supplement users (SUs) and 100 non supplement users (NSUs) both females and males were selected in the age group of 18- 30 years from thirteen gyms who were exercising in gym at least for 5 months of Ludhiana city.

### ***Development of interview-cum-questionnaire schedule***

An interview-cum-questionnaire schedule was developed to collect information on various aspects i.e. general information, socio-economic factors, dietary intake, physical activity and information about supplements used by the gym trainees. Pre-testing of questionnaire was carried out on ten respondents (5 males and 5 females). The pre-tested respondents were excluded from the study sample and finalized schedule was used for collection of information.

### ***Information about supplements***

Data on type and awareness of supplements, source of information and reason for the use of use of supplements was collected.

**Dietary intake**

The dietary intake of the trainees was assessed by using 24 hour recall method for three consecutive days. Diet Cal [12], computer software was used to assess average daily nutrient intake. The nutrient adequacy was compared with Recommended Dietary Allowances [13].

Nutrient adequacy was categorized using a classification [14].

Category	Recommended level
Adequacy	100% and above
Marginally adequate	75% and above
Marginally inadequate	50 to 74.9%
Inadequate	Below 50%

**Statistical analysis**

Mean, standard deviation, and percentages for various parameters were computed. The statistical analysis was done using SPSS version 23. The comparison of female and male users and non-users was done using t-test and Z-test.

**Results and Discussion****General information of the selected gym trainees**

The general information of the selected gym trainees is shown in **Table 1**.

**Table 1** General information of selected gym trainees (N=200)

General Information	Female (n=100)		t- valu e	Male (n=100)		t- valu e	Total (N=200)	
	Users (n=50)	Non-users (n=50)		Users (n=50)	Non-users (n=50)		Users (n=100)	Non-users (n=100)
	Number (%)			Number (%)			Number (%)	
<b>Marital Status</b>								
Married	10 (20.0)	14 (28.0)		7 (14.0)	5 (10.0)		17 (17.0)	19 (19.0)
Unmarried	40 (80.0)	36 (72.0)		43 (86.0)	45 (90.0)		83 (83.0)	81 (81.0)
<b>Family type</b>								
Joint	17 (34.0)	15 (30.0)		18 (36.0)	14 (28.0)		35 (35.0)	29 (29.0)
Nuclear	33 (66.0)	35 (70.0)		32 (64.0)	36 (72.0)		65 (65.0)	71 (71.0)
<b>Education Level</b>								
Matric	0 (0)	0 (0)		1 (2.0)	0 (0)		1 (1.0)	0 (0.0)
Intermediate	0 (0)	5 (10.0)		2 (4.0)	8 (16.0)		2 (2.0)	13 (13.0)
Graduate	18 (36.0)	22 (44.0)		33 (66.0)	23 (46.0)		51 (51.0)	45 (45.0)
Post Graduate	32 (64.0)	23 (46.0)		14 (28.0)	19 (38.0)		46 (46.0)	42 (42.0)
<b>Profession</b>								
Student	26 (52.0)	29 (58.0)		24 (48.0)	31 (62.0)		50 (50.0)	60 (60.0)
Business	4 (8.0)	3 (6.0)		22 (44.0)	16 (32.0)		26 (26.0)	19 (19.0)
Service	13 (26.0)	7 (14.0)		4 (8.0)	3 (6.0)		17 (17.0)	10 (10.0)
Housewife	7 (14.0)	11 (22.0)		-	-		7 (7.0)	11 (11.0)
<b>Dietary Habits</b>								
Vegetarian	28 (56.0)	26 (52.0)		8 (16.0)	11 (22.0)		36 (36.0)	37 (37.0)
Non-Vegetarian	17 (34.0)	22 (44.0)		39 (78.0)	34 (68.0)		56 (56.0)	56 (56.0)
Ovotarian	5 (10.0)	2 (4.0)		3 (6.0)	5 (10.0)		8 (8.0)	7 (7.0)
<b>Family Income, Rs/month</b>								
<200000	37 (74.00)	39 (78.00)		35 (70.00)	40 (80.00)		72 (72.0)	79(79.0)
200000-400000	9 (18.00)	8 (16.00)		9 (18.00)	6 (12.00)		18 (18.0)	14 (14.0)
>400000	4 (8.00)	3 (6.00)		6 (12.00)	4 (8.00)		10 (10.0)	7 (7.0)
Family Income, Rs/month (Mean $\pm$ SD)	1,27600 $\pm$ 119 813	1,30900 $\pm$ 112 552	0.14 NS	1,50400 $\pm$ 149 812	1,30100 $\pm$ 132 551	0.71 NS	1,39,000 $\pm$ 134 813	1,30500 $\pm$ 122 551

NS: Non-Significant

### Socio-Demographics

Subjects were selected between the age group of 18-30 years of both the genders (100 each males and females). Most of them were unmarried (SU=83% and NSU=81%) and belonged to nuclear families (SU=65% and NSU=71%). Majority of the respondents reported having a college degree (graduation [SU=51% and NSU=45%] or post graduation (SU=46% and NSU=42%)).

Almost half of the subjects were non-vegetarian (56% each SU and NSU) followed by vegetarian and ovotarian. The family incomes of most of the subjects were above 2 lakhs.

### Physical activity

The physical activity information of the selected gym trainees is shown in **Table 2**. Among both female SUs and NSUs, majority of the subjects i.e. 86 and 77 per cent, were used to do combination of aerobics and resistance exercise, respectively whereas remaining subjects were engaged in resistance exercise. On the contrary in case of both male SUs and NSUs majority of the subjects i.e. 70 and 60 per cent were used to do only resistance exercise whereas rest were involved in the combination of both aerobics and resistance exercise. A previous study stated that if increasing muscle mass and strength is the goal, a program including resistance training (RT) is required although aerobic training (AT) was more successful for lean body mass gains, RT for the reduction of fat and body mass in sedentary, overweight as well as obese adults [15].

**Table 2** Physical activity information of selected gym trainees (N=200)

	Female (n=100)		t-value	Male (n=100)		t-value	Total (N=200)	
	Users (n=50)	Non-users (n=50)		Users (n=50)	Non-users (n=50)		Users (n=100)	Non-users (n=100)
	Number (%)			Number (%)			Number (%)	
<b>Type of Exercise</b>								
Aerobics and Resistance	43 (86.0)	38 (77.0)	-	15 (30.0)	20 (40.0)	-	58 (58.0)	58 (58.0)
Resistance	7 (14.0)	11 (23.0)	-	35 (70.0)	30 (60.0)	-	42 (42.0)	42 (42.0)
<b>Workout (days/7)</b>								
Weekly	1 (2.0)	0 (0)	-	0 (0)	1 (2.0)	-	1 (1.0)	1 (1.0)
Twice a week	0 (0)	0 (0)	-	0 (0)	1 (2.0)	-	0 (0.0)	1 (1.0)
Thrice a week	1 (2.0)	2 (4.0)	-	2 (4.0)	5 (10.0)	-	3 (3.0)	7 (7.0)
Daily	48 (96)	48 (96)	-	48 (96.0)	43 (86.0)	-	96 (96.0)	91 (91.0)
	Mean±SD	Mean±SD	-	Mean±SD	Mean±SD	-	Mean±SD	Mean±SD
Time period for joining of gym (months)	23±35	18±26	0.71 <sup>NS</sup>	41±40	25±38	2.02*	32±38	22±32
Daily duration of exercise (minutes)	93±38	95±25	0.23 <sup>NS</sup>	78±28	83±31	0.86 <sup>NS</sup>	86±33	89±28

NS: Non-significant; \*Significant at 5%; \*\*Significant at 1%

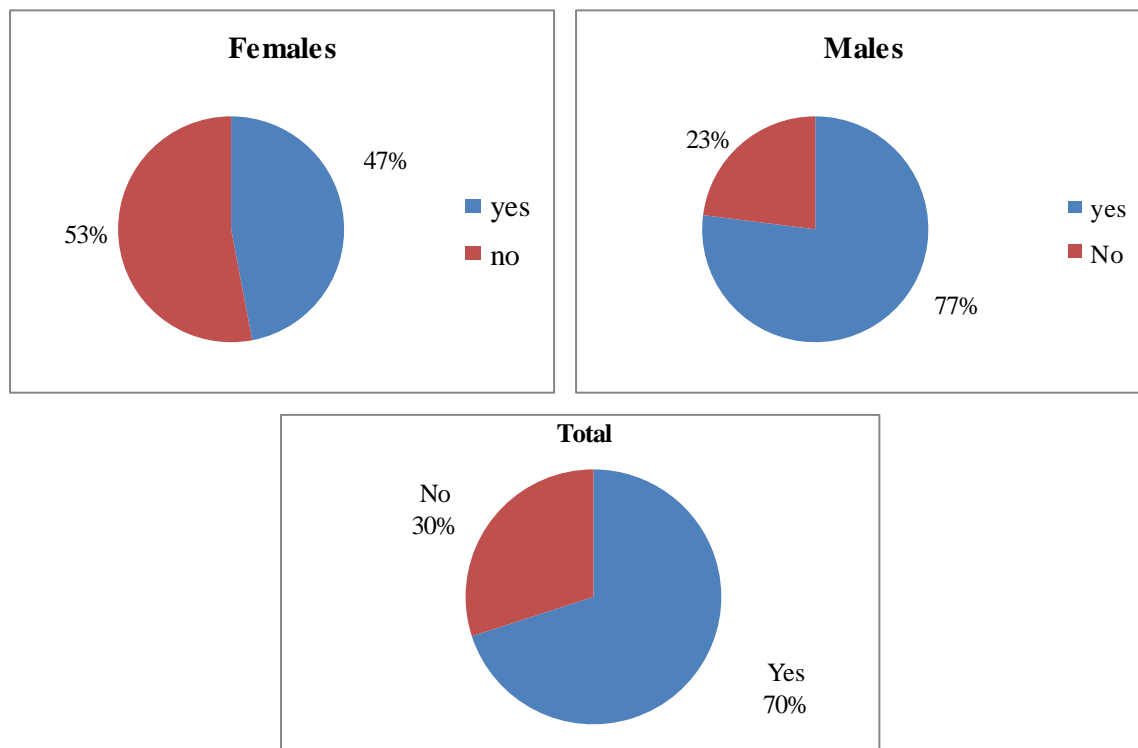
Almost all the selected gym trainees were exercising daily. None reported to exercise twice a day. A significant difference ( $p \leq 0.05$ ) was found in duration of joining gym which was from last 41 months for SUs male trainees and 25 months for NSUs male trainees. The results indicated that both male SUs and NSUs have been exercising for more than two years and specifically SU had joined gym much earlier as compared to their counterparts NSUs. Similar results were cited by Lacerda *et al* [16]. They reported that around 46.1 percent of the participants have been exercising for over a year.

A non-significant difference was found among female SUs and NSUs. The mean of joining of gym was 23 months in SUs and 18 months in NSUs. The mean time spent by females for exercising in gym was 93-95 minutes daily whereas by males was 78-83 minutes daily. The difference was non-significant among both SUs and NSUs of both the genders.

### Percentage of gym trainees using dietary supplements

**Figure 1** shows the percentage gym trainees using dietary supplements. The results depicted that majority (70%) of

the trainees were consuming dietary supplements. The highest intake was in males (77%) as compared to females (47%). Our results are in line with Salami *et al* [17] they reported that 38 per cent gym trainees were using supplements with highest prevalence in men (73%). Similarly, Goston and Correia (2010) [18] reported the prevalence of nutritional supplements was 36.8 per cent among people exercising in gyms. Men consume the highest supplements (44.6%) followed by women.



**Figure 1** Percentage of supplement use among gym trainees

### *Use of supplements*

**Table 3** depicts the use of different types of supplements used by the selected users. A significantly higher differences was found in whey protein ( $p \leq 0.01$ ), protein bar ( $p \leq 0.05$ ) and branched chain amino acid ( $p \leq 0.01$ ) by males as compared to their female counterparts which depicted that males consumed more of the protein supplements because they were more focused towards muscle building and gaining strength. Our results are in line with Goston and Correia [18]. They revealed that most commonly consumed supplements on daily basis were rich in proteins and amino acids i.e. 58 per cent. Further Bianco *et al* [19] concluded that a considerable number of commercial gym users take protein supplements alone or combined with creatine and amino-acid.

In multivitamin/mineral significantly higher differences was observed in vitamin C, Vitamin E ( $p \leq 0.01$ ) and iron ( $p \leq 0.01$ ) by female SUs as compared to their male counterparts. The female SUs consume more of the multivitamin/minerals supplements so as to maintain their general health and to cover nutritional deficiencies. Saeedi *et al* [20] found that multivitamin-mineral (43.8%) and iron tablets (30.5%) were commonly used nutritional supplement. In a cross sectional study carried by Khoury and Jonville [10], it was displayed that men and younger exercisers were found to focus more on muscle building and performance enhancement supplements while older exercisers and women were more concerned with health promoting products such as minerals, vitamins etc. Our findings are in line with McDowall [21] also reviewed the literature and reported that vitamins and minerals were the most frequently used supplements for good health and illness prevention.

In other supplement category, it was concluded that significantly higher difference was observed in creatine ( $p \leq 0.01$ ), creatine was only consumed by the male SUs because creatine is thought to improve strength, increase lean muscle mass and help the muscles recover more quickly during exercise. Saeedi *et al* [20] indicated that females use more iron and mint water supplements whereas males use more creatine and amino acids. More nutritional supplements were used by male for increasing energy whereas females use for nutritional deficiencies.

**Table 3** Percent use of different types of supplement by the selected users (N=100)

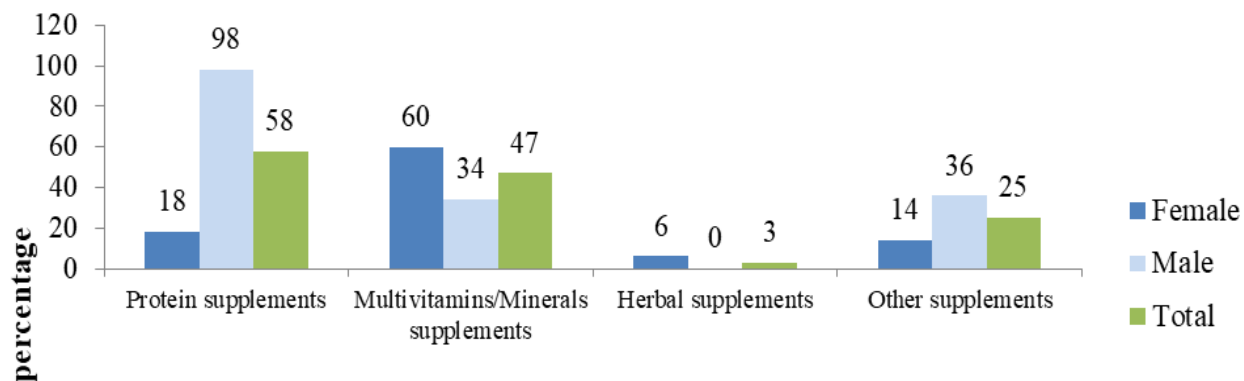
	Females (n=50) Number (%)	Males (n=50) Number (%)	Z-value	Total (N=100) Number (%)
<b>1. Protein</b>				
Whey Protein	8 (16.00)	45 (90.00)	7.41**	53 (53.0)
Isolate Protein	1 (2.00)	5 (10.00)	1.68 <sup>NS</sup>	6 (6.0)
Protein Bar	1 (2.00)	7 (14.00)	2.21*	8 (8.0)
Soya Protein	3 (6.00)	2 (4.00)	0.46 <sup>NS</sup>	5 (5.0)
Branched chain amino acid (BCAA)	2 (4.00)	16 (32.00)	3.64**	18 (18.0)
<b>2. Multivitamins/Minerals</b>				
Biotin	2 (4.00)	0 (0.00)	1.43 <sup>NS</sup>	2 (2.0)
Omega 3	5 (10.00)	4 (8.00)	0.35 <sup>NS</sup>	9 (9.0)
Multivitamins	25 (50.00)	17 (34.00)	1.62 <sup>NS</sup>	42 (42.0)
Vitamin A	3 (6.00)	0 (0.00)	1.76 <sup>NS</sup>	3 (3.0)
Vitamin B	1 (2.00)	0 (0.00)	1.01 <sup>NS</sup>	1 (1.0)
Vitamin C	8 (16.00)	0 (0.00)	2.95**	8 (8.0)
Vitamin E	5 (10.00)	0 (0.00)	2.29*	5 (5.0)
Calcium	4 (8.00)	1 (2.00)	1.38 <sup>NS</sup>	5 (5.0)
Iron	11 (22.00)	0 (0.00)	3.52**	11 (11.0)
<b>3. Herbal</b>				
Herbal	3 (6.00)	0 (0.00)	1.76 <sup>NS</sup>	3 (3.0)
Wheat Grass	1 (2.00)	0 (0.00)	1.01 <sup>NS</sup>	1 (1.0)
<b>4. Other supplements</b>				
Creatine	0 (0.00)	14 (28.0)	4.03**	14 (14.0)
Glutamine	1 (2.00)	2 (4.0)	0.59 <sup>NS</sup>	3 (3.0)
Fat Burner	4 (8.00)	3 (6.0)	0.39 <sup>NS</sup>	7 (7.0)
Mass Gainer	0 (0.00)	1 (2.0)	1.01 <sup>NS</sup>	1 (1.0)
Sports Drink	2 (4.00)	3 (6.0)	0.46 <sup>NS</sup>	5 (5.0)
Detox	1 (2.00)	0 (0.00)	1.01 <sup>NS</sup>	1 (1.0)
Antioxidant	1 (2.00)	0 (0.00)	1.01 <sup>NS</sup>	1 (1.0)
NS: Non-significant; *Significant at 5%; **Significant at 1%				
Total will not be 100 due to multiple use of supplements				

### *Type of supplements taken according to gender*

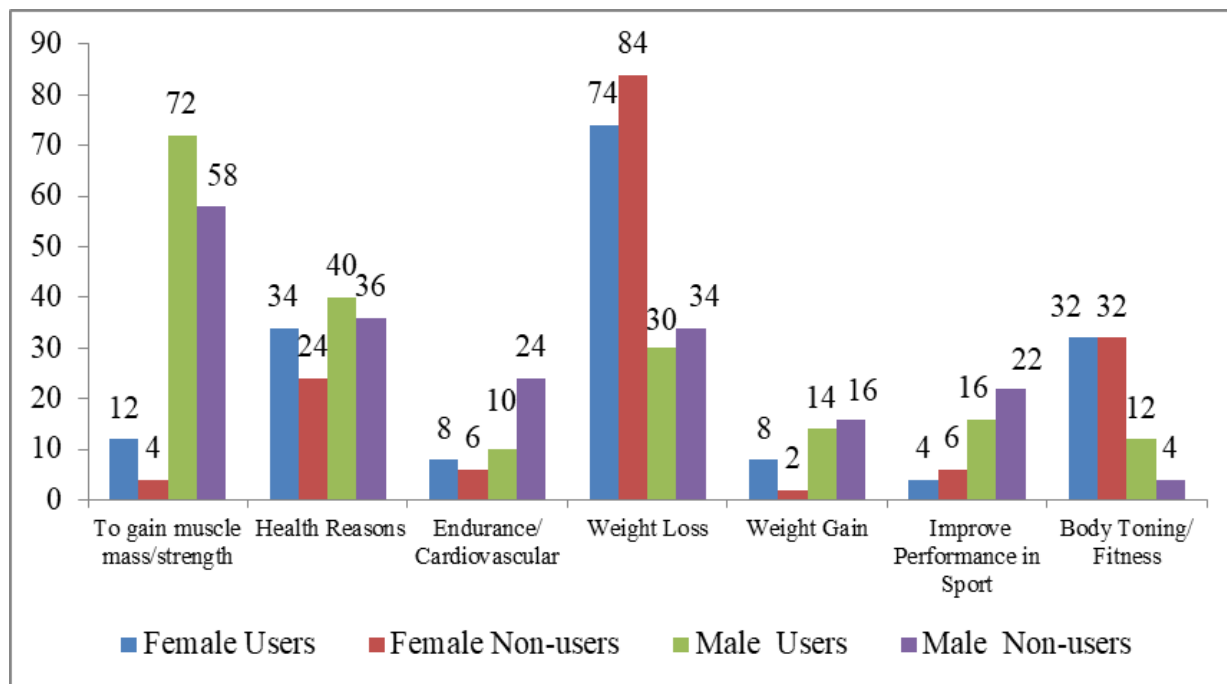
**Figure 2** shows the overall prevalence of use of different types of supplements by both female and male users revealed commonly used were protein supplements (58%) followed by multivitamin/minerals (47%), other supplements (25%) and herbals (3%). Protein supplement were found to be among the top (98%) used supplement among male gym trainees. Whereas the use of multivitamin/minerals was higher among female gym trainees. Morrison *et al* [2] showed that 42 per cent consumed protein shakes/bars (PRO), vitamin E (VE: 23.4%), Ephedra was consumed 28 per cent at least once a week, multivitamin/minerals (MVM: 45%) and vitamin C (34.7%). Younger took supplements for body building whereas older took supplements to prevent future illness. Another study by Malik and Malik [22] on prevalence of nutritional supplements in gyms of Haryana indicated that most commonly used supplements were glucose, multivitamins, protein powder, calcium tablets and ayurvedic medicines with the overall percentages of 36.9, 32.8, 20.4, 20.2 and 15.7 percent respectively.

### *Reasons for exercising according to the selected gym trainees*

**Figure 3** shows the reasons for exercising by the selected gym trainees. The most common reason for exercising at gym among females was to lose weight (SU=74% and NSU=84%) whereas in males gaining muscle mass/strength (SU=72% and NSU=58%) was the primary reason. Other reasons were to maintain general health, body toning, endurance/cardiovascular, improve performance in sports and weight gain. Overall non-significant results were found between both females and males. Morrison *et al* [2] reported the main reason for exercising at gym was body building (29.7%) followed by health reasons (19.6%), endurance and cardiovascular (8.7%), weight loss (8.2%) and improve performance in sports (7.2%).



**Figure 2** Percent use of different types of supplement by the selected users



**Figure 3** Reasons for exercising by the selected gym trainees (Total will not be 100 due to multiple reasons)

### Reasons for supplement use

**Table 4** revealed that among females, the prominent reason was to improve general health (72%) followed by to restore nutrients (66%) and to cover nutritional deficiencies (62%). On the other hand among males, to gain/build muscles (68%) was the highlighting reason followed by to gain strength (66%) and to improve general health (48%).

Our results are in line with Khoury and Jonville [10] they revealed that men and younger adults were found to focus more on muscle building and performance enhancement supplements while older adults and women were more concerned with health promoting products such as minerals, vitamins etc. Another research by McDowall [21] reported that generally females were found to consume supplements more frequently to overcome their health problems and achieving a balanced diet whereas males reported to take supplements for improving their performance. Similarly Alves and Lima [23] reported that most common reason for the use of supplement was to achieve ideal body followed by attempt to compensate for an inadequate diet, prevent disease, better athletic performance and improve immunity.

### Reasons for not consuming supplements

**Table 5** show reasons for not taking supplements by the non-users. Statistically significant ( $p \leq 0.05$ ) difference was found among males and females for reason of not using supplements. Females (66%) were more satisfied with natural diet as compared to males (42%). The restriction made by families was 20 per cent among males and four per cent among females. Twenty per cent females were not taking supplements due to side-effects and 10 per cent fake products in India as compared to males 18 and 8 per cent respectively. Males (8%) do not consume because they need proper guidance as compared to females (2%) regarding the use of supplements.

**Table 4** Reasons for supplement use (N=100)

Reasons	Females (n=50)	Males (n=50)	z-value	Total (N=100)
	Number (%)	Number (%)		Number (%)
To fulfill proteins requirements.	1 (2.00)	11 (22.00)	3.08**	12 (12.0)
Body building	0 (0.00)	5 (10.00)	2.29*	5 (5.0)
To repair injuries	3 (6.00)	10 (20.00)	2.08*	13 (13.0)
To achieve goals and balanced diet	0 (0.00)	2 (4.00)	1.43 <sup>NS</sup>	2 (2.0)
To improve performance	1 (2.00)	4 (8.00)	1.38 <sup>NS</sup>	5 (5.0)
To stay fit and active	6 (12.00)	2 (4.00)	1.47 <sup>NS</sup>	8 (8.0)
For weight training	3 (6.00)	0 (0.00)	1.76 <sup>NS</sup>	3 (3.0)
For healthy skin and hair	3 (6.00)	0 (0.00)	1.76 <sup>NS</sup>	3 (3.0)
To maintain haemoglobin level	1 (2.00)	0 (0.00)	1.01 <sup>NS</sup>	1 (1.0)
To Lose weight	12 (24.00)	7 (14.00)	1.27 <sup>NS</sup>	19 (19.0)
To gain strength	11 (22.00)	33 (66.00)	4.43**	44 (44.0)
To prevent future illness	10 (20.00)	8 (16.00)	0.52 <sup>NS</sup>	18 (18.0)
To gain/build muscles	3 (6.00)	34 (68.00)	6.42**	37 (37.0)
To increase immunity	15 (30.00)	10 (20.00)	1.15 <sup>NS</sup>	25 (25.0)
Decrease stress	0 (0.00)	4 (8.00)	2.04*	4 (4.0)
To gain weight	1 (2.00)	7 (14.00)	2.21*	8 (8.0)
Due to health problems	8 (16.00)	0 (0.00)	2.95**	8 (8.0)
To cover nutritional deficiencies	31 (62.00)	6 (12.00)	5.18**	37 (37.0)
To restore nutrients	33 (66.00)	13 (26.00)	4.01*	46 (46.0)
Extra energy	14 (28.00)	9 (18.00)	1.19 <sup>NS</sup>	23 (23.0)
To improve general health	36 (72.00)	24 (48.00)	2.45*	60 (60.0)

NS: Non-significant; \*Significant at 5%; \*\*Significant at 1%  
Total will not be 100 due to multiple reasons

**Table 5** Reasons for not consuming supplements (N=100)

Reasons	Females (n=50)	Males(n=50)	z-value	Total (N=100)
	Number (%)	Number (%)		Number (%)
Family do not allow	2 (4.00)	10 (20.00)	2.46*	12 (12.0)
Satisfied with natural diet.	33 (66.00)	21 (42.00)	2.41*	54 (54.0)
Need proper guidance about it.	1 (2.00)	4 (8.00)	1.38 <sup>NS</sup>	5 (5.0)
Side Effects	10 (20.00)	9 (18.00)	0.25 <sup>NS</sup>	19 (19.0)
Fake products in India	5 (10.00)	4 (8.00)	0.35 <sup>NS</sup>	9 (9.0)

NS: Non-significant; \*Significant at 5%  
Total will not be 100 due to multiple reasons

### Source of information of supplements by the supplement users

**Table 6** shows the sources of receiving information of supplements by the supplement users. Significant ( $p \leq 0.05$ ,  $0.01$ ) differences were found between both females and males in receiving information from various sources such as books, family, health food retailer, Dietitian/nutritionist/Physician and coach. The results indicated that use of books in females (42%) were found significantly higher ( $p \leq 0.01$ ) than males (12%) which indicated that females read books more as compared to males. When considering family as a source, females (46%) were found significantly higher ( $p \leq 0.01$ ) than males (6%) which revealed that females consider family as an ideal source of information as compared to males. In contrast, male (12%) were found significantly higher ( $p \leq 0.05$ ) in considering health food retailer as their source of information regarding the use of supplements than female (2%). Females considered nutritionist/physician (46%) more as compared to male (26%). On the other hand more percentage of males (36%) considers coaches as their source of information than females (16%). No significant difference was found in rest of the sources among both females and males. Males (20%) consider labels on supplements as source more as compare to females (16%). Males (40%) take more advice from friends/word of mouth regarding use of supplements as in comparison to females (36%). Magazines, journals and newspapers were used more by females (12%) as compared to males (8%). Whereas more number of female (6%) consider pharmacist as a source of information regarding the use of supplements as compared to male (4%). Seventy- eight per cent of the males and 60 per cent of females use internet as the main source of supplement information. Overall internet was the most prominent and highly used source for receiving



information of supplements i.e. 60% females and 78% males. Among females second most commonly used source was family and physician with (46% each) followed by books (42%), friends (36%), coach and labels (16% each), newspapers (12%), pharmacist (6%) and food retailer (2%). While in case of males, friends (40%) were the second highest source of information followed by their coaches (36%), physician (26%), labels (20%), books and food retailer (12% each), newspapers (8%), family (6%) and pharmacist (4%). A similar finding has been reported by Sparks [24] He revealed that non-athlete college going males were mostly misinformed in context to protein requirements as they get their information from unreliable sources such as internet and body building websites. In relation to this Froiland *et al* [25] found that male gathered their information regarding supplements from fellow athletes, coaches and from store nutritionist whereas females gathered their information from family members. Another similar study conducted by Duellman *et al* [26] recorded that the main source of information among high school athletes were coaches, parents and friends who were also not even specialized in this field. A study by Kelkar *et al* [27] revealed that the Indian sportsmen lack proper nutrition education and they had a strong influence of coaches, peers and tradition.

**Table 6** Source of information of supplements by the supplement user (N=100)

Sources	Females (n=50)	Males (n=50)	z-value	Total (N=100)
	Number (%)	Number (%)		Number (%)
Books	21 (42.00)	6 (12.00)	3.38**	27 (27.0)
Dietary supplement labels	8 (16.00)	10 (20.00)	0.52 <sup>NS</sup>	18 (18.0)
Family	23 (46.00)	3 (6.000)	4.56**	26 (26.0)
Friends	18 (36.00)	20 (40.00)	0.41 <sup>NS</sup>	38 (38.0)
Health food retailer	1 (2.00)	6 (12.00)	1.96*	7 (7.0)
Magazines/journals/newspapers	6 (12.00)	4 (8.00)	0.67 <sup>NS</sup>	10 (10.0)
Pharmacist	3 (6.00)	2 (4.00)	0.46 <sup>NS</sup>	5 (5.0)
Dietitian/nutritionist/Physician	23 (46.00)	13 (26.00)	2.08*	36 (36.0)
The internet	30 (60.00)	39 (78.00)	1.95 <sup>NS</sup>	69 (69.0)
Coach	8 (16.00)	18 (36.00)	2.28*	26 (26.0)

NS: Non-significant; \*Significant at 5%; \*\*Significant at 1%  
Total will not be 100 due to multiple sources

### **Adverse effects of the supplements among users**

The survey results showed a very few number witnessed to have experienced some side-effects by the use of supplements i.e. only two per cent of the females had side effect of aggressiveness and breathlessness. On the other hand in case of males only two per cent had side-effects of liver dysfunction/inflammation and change in voice tone. Four per cent each had reported acne, aggressiveness, headache and baldness. Non-significant differences were found among females and males. Silva *et al* [8] found similar results and reported the various ill effects among users i.e. acne, headache, insomnia and aggressiveness. Another findings by Malik and Malik [22] reported that majority of respondents (97.4%) did not suffer any side effects whereas male between the ages of 16-25 years were buying anabolic steroids frequently without any medical prescription. Shreevidya and Badal [28] reported that some consumers have experienced some side effects of supplements examples digestive problems (22%), constipation (20%) and diarrhea (19%) whereas 30 per cent consumers have never experienced any side-effects.

### **Average monthly expenditure on supplements by the users**

**Table 7** represents average monthly expenditure on supplements by the users. The results showed that males spend significantly ( $p \leq 0.05$ , 0.01) higher on whey protein, BCCA, creatine, mass gainer, fat burner glutamine and calcium whereas females spend significantly ( $p \leq 0.05$ , 0.01) higher on vitamin C, E, A, iron, herbal, protein bars, antioxidants and detox supplements. The findings reported that on an average monthly expenditure on whey protein was significantly higher ( $p \leq 0.05$ ) by males (Rs 9184) than females (Rs 2255). A similar trend was seen in BCAA, being significantly ( $p \leq 0.05$ ) higher in males (Rs 3250) as compared to females (Rs 2743). On the other hand among females average monthly expenditure on protein bar was significantly ( $p \leq 0.01$ ) higher (Rs 1800) than males (Rs 801). No significant difference was found among females and males on the expenditure on isolate protein and soya protein. In case of multivitamins/minerals, a significant ( $p \leq 0.01$ , 0.05) difference were seen on the monthly expenditure of vitamin A (Rs 486), vitamin B (Rs 10), vitamin C (Rs 504), vitamin E (Rs 48) and iron (Rs 427) being solely consumed by females.

**Table 7** Average monthly expenditure on supplements by the users, N=100

Supplements	Females (Rs) (n=50)	Males (Rs) (n=50)	t value	Total (Rs) (N=100)
	Mean±SD	Mean±SD		Mean±SD
<b>Protein Supplements</b>				
Whey Protein	2255 ± 1073	9184± 21612	2.24*	5719.97±11343.24
Isolate Protein	5000.0±0	5420.0±3616	0.81 <sup>NS</sup>	5210.00±1808.45
Protein Bar	1800 ± 0	801 ± 300	23.26**	1300.64±150.28
Soya Protein	300 ±0.0	300 ± 0.0	0.00 <sup>NS</sup>	300.00±0.00
Branch Chain Amino Acid (BCAA)	2743 ±1253	3250± 1060	2.16*	2996.88±1157.22
<b>Multivitamins/Minerals</b>				
Biotin	100 ± 0.0	0±0	0.00 <sup>NS</sup>	50.00±0.00
Omega 3	1561 ± 1103	612 ± 476	5.53**	1086.75±789.86
Multivitamin	932 ±531	629 ± 784	2.24*	780.77±658.10
Vitamin A	486 ± 791	0±0	4.31**	243.33±395.48
Vitamin B	10.0±0	0±0	0.00 <sup>NS</sup>	5.00±0.00
Vitamin C	504 ± 437	0±0	8.07**	252.25±218.81
Vitamin E	48 ± 15	0±0	21.60**	24.00±7.78
Calcium	550 ± 100	700 ± 0	10.50**	625.00±50.00
Iron	427 ±602	0±0	4.97*	213.77±301.30
<b>Herbal Supplements</b>				
Herbal	2927 ± 1110	0±0	18.46*	1463.83±555.13
Wheat Grass	500.0± 0	0±0	0.00 <sup>NS</sup>	250.00±0.00
<b>Other Supplements</b>				
Creatine	0±0	1814 ± 187	6.79**	907.14±935.80
Glutamine	2500 ± 0	2750 ± 353	4.95**	2625.00±176.78
Fat Burner	1119 ± 323	1474 ± 527	4.02**	1296.67±425.40
Mass Gainer	0 ± 0	12000 ± 0	0.00 <sup>NS</sup>	6000.00±0.00
Sports Drink	145 ± 0.0	290 ± 0.0	0.00 <sup>NS</sup>	217.50±0.00
Antioxidant	700 ± 0	0±0	0.00 <sup>NS</sup>	350.00±0.00
Detox	750 ± 0	0±0	0.00 <sup>NS</sup>	375.00±0.00

NS: Non-significant; \*Significant at 5%; \*\*Significant at 1%  
Mean and percent daily nutrient intake by the selected gym trainees

**Table 8** Mean and percent daily nutrient intake by the selected gym trainees (N=200)

Nutrients	Female (n=100)		a RDA	% adequacy of nutrient	Male (n=100)		% adequacy of nutrient	a RDA		
	Users (n=50)	Non-users (n=50)			Users (n=50)	Non-users (n=50)				
	Mean±SD	Mean±SD			Mean±SD	Mean±SD				
Energy, Kcal	1568±565	1514±473	1900	82	79	2163±536	2165±650	93	93	2320
Carbohydrate, g	208.00±79.01	197.24±66.87	285	72	69	221.12±80.20	235.93±73.40	63	67	348
Protein, g	51.22±27.02	53.53±20.32	55	93	97	122.45±47.04	107.46±51.49	204	179	60
Total Fat, g	55.87±23.82	53.46±20.86	40	139	133	83.91±25.42	83.08±30.38	167	166	50
Vitamin A, µg	234.86±126.21	220.96±115.35	600	39	36	327.88±163.07	338.29±179.95	54	56	600
Thiamine, mg	1.04±0.35	1.05±0.32	1	103	105	1.38±0.41	1.45±0.47	1154	121	1.2
Riboflavin, mg	1.11±0.45	1.08±0.39	1.1	100	98	1.71±0.53	1.61±0.56	122	115	1.4
Niacin, mg	8.27±5.47	9.45±6.30	12	68	78	23.29±14.37	19.81±14.60	145	123	16
Folic Acid, µg	325.01±107.77	354.77±146.76	200	162	177	397.94±185.22	383.82±166.80	198	203	200
Vitamin C, mg	177.86±83.68	237.49±142.30	40	444	593	195.90±131.94	165.54±84.62	489	413	40
Iron, mg	11.93±4.23	12.03±4.92	21	56	57	15.33±5.62	16.75±6.23	90	98	17
Calcium, mg	915.25±409.58	873.30±377.19	600	152	145	1191.00±507.37	1218.32±480.42	198	203	600
Magnesium, mg	351.65±115.20	354.55±115.53	310	113	114	470.60±142.25	473.39±153.09	138	139	340
Zinc, mg	6.37±2.43	6.46±2.09	10	63	64	9.39±2.93	10.05±3.37	78	83	12

NS: Non-significant; \*Significant at 5%

<sup>a</sup> Recommended dietary allowances (RDA) for sedentary female and male (ICMR 2010)

**Table 8** represents Mean and percent daily nutrient intake by the selected gym trainees. A comparison of the nutrient intake revealed that the dietary intake of all the nutrients was adequate by both the genders ( $\geq 100\%$  of recommended dietary allowances) except iron and zinc intake among supplement users and non-supplement user females and vitamin A in both the genders. This showed that without any addition of supplements the trainees were able to meet their daily nutrient requirement from food only.

## Conclusions

In conclusion, large proportion of gym trainees consumes dietary supplements for various reasons without any proper guidance. The consumption of supplements was higher among males as compared to females. Male gym trainees were using more of protein supplements whereas females were consuming multivitamins/minerals. As per the food intake trainees were able meet their daily requirement of nutrients compared with recommended dietary allowances.

## Recommendations

- Supplements should be used in those cases where nutritional deficiencies are identified otherwise a balanced diet with a variety of foods is recommended.
- There should be a provision of nutritionist/dietician in every gym for providing information on use of dietary supplements.

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