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ADVERSE EFFECTS AND KNOWLEDGE OF DIETARY SUPPLEMENT USAGE AMONG UNDERGRADUATE MEDICAL STUDENTS IN SURAT CITY: A CROSS-SECTIONAL STUDY

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Abstract:

Dietary supplements are widely consumed globally, yet their regulation, safety, and clinical benefits remain controversial. The aim was to assess the implementation of pharmacological knowledge and attitudes towards the usage of dietary supplements among undergraduate medical students at a teaching medical college in Surat, India. A cross-sectional questionnaire-based study was conducted among 230 undergraduate medical students. The validated survey tool assessed demographic details, dietary habits, awareness of supplement benefits and risks, patterns of supplement use, and attitudes toward physician disclosure and adverse drug reaction (ADR) reporting. Data were analyzed using descriptive statistics. Among 230 respondents (62.6% female, 37.4% male), only 3% reported chronic diseases, and 47% engaged in regular physical activity. Supplement consumption was common: multivitamins/minerals (35.7%), Vitamin B complex (33.5%), herbal supplements (31.3%), and energy drinks (23.0%) were the most frequently used products. While students were aware that supplements should not replace a balanced diet, knowledge regarding drug–supplement interactions, toxicity of certain products, and ADR reporting remained limited. Physically active students reported greater use of protein-based and performance-enhancing supplements, whereas non-active students leaned more toward general wellness products. Although knowledge of dietary supplements was moderate, gaps remain regarding adverse effects, ADR reporting, and physician communication. Structured educational interventions are warranted in medical curricula to enhance rational supplement use.

Key words: Dietary supplements, Medical student, Knowledge-attitude-practice, Adverse effects, nutraceuticals.

Introduction: Dietary supplements encompass a wide range of products including vitamins, minerals, amino acids, herbal preparations, and performance enhancers, all marketed with claims to improve health, prevent nutritional deficiencies, or enhance physical and cognitive performance (1). Globally, the prevalence of supplement use is high, with reports indicating that nearly half of adults in countries such as the United States and several European nations consume them regularly (2). In recent years, India has witnessed a parallel surge in supplement use, driven by growing health awareness, the influence of the fitness industry, and academic or lifestyle-related pressures among young adults and students (3) . Unlike prescription medicines, dietary supplements are subject to relatively fewer safety regulations. Consequently, adverse health outcomes have been reported, ranging from hepatotoxicity linked to certain herbal preparations (e.g., green tea extract, kava kava) to cardiovascular complications associated with stimulant-containing products such as energy drinks (4). Misuse is often fuelled by misinformation, peer influence, or aggressive marketing rather than medical advice, thereby increasing the likelihood of inappropriate consumption (5). Medical students constitute a particularly significant consumer group. As future physicians, they are expected to critically evaluate the benefits and risks of health products, including supplements. However, being young adults under academic stress, many may also adopt supplement use without sufficient pharmacological knowledge or professional guidance (6). Previous research in both India and abroad has shown that medical students frequently consume multivitamins, protein powders, herbal products, and energy drinks, while their awareness of drug–supplement interactions and adverse drug reaction (ADR) reporting remains limited (7,8). Given these concerns, this study was undertaken to assess the implementation of pharmacological knowledge and attitudes toward dietary supplement usage among undergraduate medical students at a teaching medical college in Surat City. The focus was on identifying gaps in knowledge, unsafe practices, and opportunities for educational interventions that could promote rational and evidence-based use of supplements (9).

Materials and Methodology:

- **Aim:** To assess the implementation of pharmacological knowledge and attitude towards the usage of dietary supplements by undergraduate medical students at a teaching medical college in Surat city.
- **Objective:** To get structured data to analyse and get informative insights about the misconceptions of easily available dietary supplements and their pattern of consumption among undergraduate students.
- **Study Design and Participants:** A cross-sectional descriptive survey was conducted among undergraduate MBBS students in the Department of Pharmacology, SMIMER, Surat. A total of **230 students** voluntarily participated. Participation implied consent, and anonymity was ensured.
- **Study Tool:** The survey consisted of three sections:

1. **Demographics:** Gender, BMI, physical activity, presence of chronic diseases.
2. **Knowledge and Attitudes:** 17 structured questions on perceptions about benefits, necessity, adverse effects, ADR reporting, and physician disclosure.
3. **Practices:** Types of supplements consumed, frequency, reasons for use, and sources of purchase.

- **Inclusion Criteria**: Third-first and third-final year undergraduate medical students who gave consent to participate in the study.
- **Exclusion Criteria:** Incompletely filled forms were excluded from the study.
- **Data Analysis/Study Instrument:** Data was collected by giving a questionnaire which was previously presented in the Department of Pharmacology among faculty and residents. The questionnaire included the student's personal information and signature, the title of the study, the appropriate instructions, and 18 questions regarding dietary supplements, their knowledge and attitude towards it, the reasons for its usage and the sources of information of these products. It also included whether they would report any adverse effects caused by the product. Data was entered and analysed in Microsoft-Excel, association was tested using descriptive and frequency statistics, and the results were expressed as counts and percentages.

Ethical Consideration: The study was conducted after the approval of study protocol by the institutional ethics committee (IEC) of SMIMER, Surat and strict confidentiality of data was maintained.

Results: Demographics

- **Total participants:** 230
- **Gender:** 62.6% female (n=144), 37.4% male (n=86)
- **Chronic diseases:** Only 3% (n=7) reported
- **Physical activity:** 47% (n=109) engaged in regular physical activity

Table 1. Demographic Characteristics of Participants (n=230)

Variable	Count	%
Female	144	62.6%
Male	86	37.4%
Chronic disease (Yes)	7	3.0%
Chronic disease (No)	223	97.0%
Physical activity (Yes)	109	47.4%
Physical activity (No)	121	52.6%

Knowledge and Attitudes:

- The majority of respondents (61.04%) answered **Yes** when asked if they think that consumption of dietary supplements does any negative effect on their health, while 28.57% felt it could have non-serious negative effects.
- A smaller proportion (6.93%) reported that they **did not know**, and only 3.03% believed it would **not** have negative effects.
- The majority believed supplements are useful for **preventing deficiencies and promoting recovery** 207(89.61%), but not a substitute for a balanced diet; 8 (3.46%) felt they are only needed to prevent disease.
- Awareness of **drug–supplement interactions**: Yes: 141 (61.04%), No: 23 (9.96%) To some extent: 66 (28.57%)
- **ADR reporting:** While most students agreed adverse effects should be reported 162 (70.13%), a subset indicated they might only report "sometimes" 29 (12.55%), while 39 (16.88%) felt NO need to report the ADR.
- **Physician disclosure:** Many students agreed it is important 220 (95.24%), but some admitted they would disclose only if asked 10 (4.33%).

Supplement Consumption Patterns: Most commonly used supplements:

- **Multivitamins/minerals:** 82 students (36%)
- **Vitamin B group:** 77 (33%)
- **Herbal supplements:** 72 (31%)
- **Energy drinks:** 53 (23%)
- **Protein powder:** 40 (17%)
- **Vitamin D3 & Iron:** 38 each (~16%)
- Others: Protein bars (33), Vitamin C (31), Fatty acids (21), Calcium (24), Probiotics (10)

Table 2. Types of Dietary Supplements Consumed by Medical Students (Arranged in descending order or usage frequency)

Supplement	Count	% of total (n=230)
Multivitamins & minerals	82	35.7%
Vitamin B group	77	33.5%
Herbal supplements	72	31.3%
Energy drinks	53	23.0%
Protein powder	40	17.4%
Vitamin D3	38	16.5%
Iron	38	16.5%
Protein/Sports bars	33	14.3%
Vitamin C	31	13.5%
Fatty acids (Omega 3, etc.)	21	9.1%
Calcium	24	10.4%
Probiotics	10	4.3%
Caffeine pills	8	3.5%
Others (Glutamine, Buffers, etc.)	≤11	<5%

Comparison by Physical Activity:
Physically active students were more likely to consume **protein powder, energy drinks, protein/sports bars, and fatty acids**, aligning with performance and endurance goals. Conversely, non-active students relied more on **multivitamins, Vitamin B complex, and iron**, reflecting general wellness and nutritional supplementation.

Sources of Information & Purchase:
- Sources: The majority of respondents (50.65%) reported **media/internet** as their primary source, followed by **gym instructors/sports coaches** (13.42%), **family** (11.69%), and **friends** (7.79%). Smaller proportions cited **workshops/classes** (9.96%) and **books/magazines** (6.06%).
- Purchase: The majority of respondents (59.74%) reported obtaining them from **medical stores**, followed by **general stores** (13.42%) and **media/internet** (11.69%). A smaller proportion obtained supplements through **gym instructors/sports trainers** (8.66%), while **others** accounted for 6.06%.

Discussion
This study reveals a high prevalence of supplement use among medical students, consistent with findings from both India and international literature. Multivitamins and Vitamin B complexes were the most common, reflecting a general belief in their role for energy and academic performance (10,11). The significant use of **herbal supplements** highlights cultural and regional influences, while

high consumption of **energy drinks and protein powders** among physically active students mirrors global fitness trends.

However, the study also identifies knowledge gaps. Many students underestimated the risks of **herbal and stimulant-containing supplements**, despite documented cases of hepatotoxicity (green tea extract, kava kava) and cardiovascular risks (energy drinks, ephedra). Similarly, misconceptions about the safety of iron and fat-soluble vitamins (A, E, D) were noted. (12)

The reluctance to consistently report ADRs or disclose supplement use to physicians is concerning. Lack of ADR reporting can delay recognition of supplement-related harms, and nondisclosure may expose patients to drug–supplement interactions during clinical practice.

Integrating focused modules on **nutraceuticals, dietary supplements, and pharmacovigilance** into the MBBS curriculum could enhance awareness. Students should be trained to critically evaluate marketed products, recognize red flags, and encourage patient disclosure.

Conclusion:

Dietary supplements are widely used among undergraduate medical students in Surat City. While knowledge regarding their utility exists, many misconceptions persist regarding safety and ADR reporting. A significant number of students who tend to be physically active and aware of their health, feel the need to consume dietary supplements regularly; however, all of them agree that a balanced diet can not be replaced by dietary supplements. Incorporating structured educational modules on dietary supplements into medical curricula may help bridge these gaps and promote rational, evidence-based use, as the majority of them procured their products from medical stores on their own, which they tend to get to know from hearsay, media and gym surroundings.

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