

Content available at: <https://www.ipinnovative.com/open-access-journals>

Indian Journal of Pharmacy and Pharmacology

Journal homepage: <https://www.ijpp.org.in/>

## Original Research Article

## Knowledge and perceptions about food and drug interactions: A survey among second year medical undergraduate students in a government medical college in southern India

Harish G Bagewadi<sup>1</sup>, Priyadarshini M Deodurg<sup>1</sup>, Syed Wasif<sup>1,\*</sup><sup>1</sup>Dept. of Pharmacology, Gulbarga Institute of Medical Sciences, Gulbarga, Karnataka, India

## ARTICLE INFO

## Article history:

Received 03-10-2020

Accepted 12-01-2021

Available online 19-04-2021

## Keywords:

Food and drug interactions

Questionnaire

Medical students

Knowledge

## ABSTRACT

**Background:** Food drug interactions occur due to interaction between the drug and food products leading to decreased efficacy of the medication by bringing about change in pharmacokinetics, pharmacodynamics of the drugs.

**Objectives:** To evaluate the knowledge attitude regarding the food and drug interactions among the second year medical under graduate students.

**Materials and Methods:** This was a questionnaire -based, cross-sectional study in which a self developed, pre-tested, semi-structured questionnaire was used. Respondents were 152 second year medical students. Questions were framed to obtain information about various issues concerned with knowledge about food and drug interactions.

**Results:** It was seen that majority of 82% of the students were aware about food and alcoholic beverage interfering with drug in the body. 64% of the students had the knowledge about impact of food drug interaction depends on a various factors like drug dosage, person's age, & health status.

**Conclusion:** Sound knowledge about food and drug interactions is a vital part to accomplish the therapeutic efficacy in the medications in the patients. In this regard, students are future doctors and their knowledge to regarding food and drug interaction needs to be upgraded.

© This is an open access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## 1. Introduction

Food drug interactions occur due to interaction between the drug and food products leading to decreased efficacy of the medication by bringing about change in pharmacokinetics, pharmacodynamics parameters of the drugs.<sup>1</sup> The absorption, distribution, metabolism, bioavailability, excretion of some drugs is influenced by the food. In previous study showed that there exists association between the number of medications a resident received with the number of drug-nutrient interactions for which a he was at risk.<sup>2</sup> Food and drug interaction mainly leads to either increased or decreased bioavailability. This change in the parameter amounts to the failure of treatment or even the

risk of adverse effects of the treatment.<sup>3</sup> Grapefruit juice is a selective intestinal CYP3A4 inhibitor. This drastically amounts to increase in the drug in the plasma and leading to untoward drug toxicities. The worrying problem arise in elderly where they consume multiple drugs due to their prolonged medical ailments.<sup>1</sup> Various pharmacokinetic, pharmacodynamics parameters are modified in the elderly patients. Many studies have established the fact that food drug interactions incidence varies from 3% to 30%.<sup>4</sup> Alteration in the intrinsic activity of the drugs caused by the effects of additional food, herbs, beverages on the enzymes, altered receptor sensitivities of the drug are responsible for the food drug interactions.<sup>5</sup> Many of the people are of the wrong notion that herbs and foods are completely safe without any side effects and they do not interfere with drug effects.<sup>6</sup> The true fact lies that food

\* Corresponding author.

E-mail address: [drsyedwasif@gmail.com](mailto:drsyedwasif@gmail.com) (S. Wasif).

definitely effects the absorption, distribution, metabolism, bioavailability, excretion of some drugs causing adverse drug reactions and therapeutic failure of the drugs.<sup>7</sup> It is observed in some studies that one third of adults in the western world they often use herbal products by not bringing to this doctors knowledge.<sup>8</sup> It is evident from the literature lacuna that food drug interaction happened with garlic and warfarin, St John's Wort, grape fruit juice and oral contraceptives.<sup>9</sup> The patients who are suffering with prolonged illness like depression, chronic liver disease, chronic renal disease, congestive heart failure diabetes, hypertension needs eagle eye view to look for the untoward food drug interactions.<sup>10</sup> It is always paramount importance to bring to the notice of the treating doctor regarding intake of concomitant any herb, food substances while taking drugs for their ailments.<sup>11</sup> To investigate this type of food drug interactions prevalence we had planned to evaluate the knowledge, perceptions regarding the food and drug interactions among the second year undergraduate medical students.

## 2. Materials and Methods

The Study population included 152 students of 2<sup>nd</sup> year medical students of Gulbarga institute of medical sciences, Kalaburagi. They were explained about the study and their consent taken. Identity of the students was concealed. The study was cross-sectional which included a structured, self-administered questionnaire based one. The validity of questionnaire was duly checked by the subject experts. A pilot study was done in a small group of students to assess the clarity and understanding of questions, any drawbacks of the study was rectified. The permission from the Institutional Ethics Committee was taken prior to the conduct of the study. In our study, the questionnaire was obtained from the similar previous study done by Benni JM et al.<sup>12</sup> Food and drug interactions questionnaire was composed of 23 questions which included dichotomous, open ended questions depending on the food and drug interactions prevalence and their relevance. The food and drug interactions pertaining to food with relation to antihypertensive drugs, antithyroid drugs, antidepressants, anticoagulants, anti-retroviral therapy, peptic ulcer drugs and analgesics were imbibed. Questions pertaining to counseling regarding food and drug interactions were also included. Statistical analysis: Data was expressed as counts and percentages. Graph pad prism software version 5.01 was used to analyze data.

## 3. Results

From the Table 1, it was seen that majority of 82% of the students were aware about food and alcoholic beverage interfering with drug in the body. Only 38% of the students were knew about the reporting of food drug interactions.

64% of the students had the knowledge about impact of food drug interactions depends on a various factors like drug dosage, person's age, & health status. From the Table 2, with respect to timings of food and drug intake, most of the students, were familiar with proton pump inhibitors 86%, non-steroidal anti-inflammatory drugs 78%and but were less aware of the thyroid hormones (levothyroxine) 64%.

It was evident that majority of the students 68% gave correct response scored high on the interaction of theophylline with large amounts of tea, coffee. 84% of the students agreed to avoid taking milk & dairy products, iron-rich food and supplements with Tetracyclines. Only 32% of the students had the knowledge of cheese reaction and gave correct response regarding food and drug interactions such as consumption of cheese, legumes, wine, beer with MAO inhibitors. Majority of the students 67% were aware about the fact that Drugs like Griseofulvin, Ketoconazole and Albendazole should be taken with fatty diet. It was observed that majority of the student 83% were aware about the interaction of the drugs like Metronidazole, Cefaperazone with alcohol. 70% of the students gave correct response to the avoidance of Spironolactone with potassium rich foods. 63% of the students opined that Didanosine and Indinavir must be taken on empty stomach. Majority of 84% of the students agreed that before a drug is dispensed: the package inserts listing the direction of use, warnings, interactions and precautions should be read in order to avoid food drug interactions.

## 4. Discussion

The concept of drug interactions incorporates food drug interactions, herb drug interactions, drug to drug interactions etc. It is earnestly to note of the fact that food and drug interactions exhibit plethora of manifestations including bioavailability, metabolism compared to drug - drug interaction.<sup>13,14</sup> The therapeutic efficacy of many of the drugs is governed by the effects of concomitant administration of food with the drug presenting with varied interactions.<sup>14</sup> Food drug interactions bring about marked changes in the absorption, distribution, metabolism, excretion, bioavailability, volume of distribution, therapeutic efficacy.<sup>15–18</sup> In the literature lacuna it is found that many studies demonstrated the existence of gap in the knowledge regarding food and drug interactions among the doctors and health care professionals.<sup>19</sup>

In our study, 46% of the students gave correct response rates regarding avoidance of concurrent administration of foods like Spinach, broccoli, cauliflower, peas along with drugs like Heparin / Warfarin. Our study findings are similar to the other previous studies<sup>12,19,20</sup> showing the magnitude of lack of knowledge about food and drug interactions among health care professionals. It is seen from the previous studies that food products like broccoli, spinach and other green leafy vegetables which are rich in

**Table 1:** Evaluation of perceptions about food and drug interactions (n=152)

S.No	Items	Respondents (%)
1	Have you heard of food and alcoholic beverage interfering with drug in the body?	Yes -82% No - 18%
2	Food can speed up or slow down the action of a drug, do you agree?	Yes - 48% No - 52%
3	Is it necessary to report the food and drug interactions to concerned higher centres?	Yes - 38% No - 62%
4	Impact of food and drug interactions depends on a varied parameters like drug dosage, person's age, & health status?	Yes- 64% No - 36%
5	In order to avoid food and drug interactions it is utmost important to go through the package inserts listing the direction of use, warnings, interactions and precautions. Each patient require counseling regarding interactions of drug with food and beverages.	Yes - 84% No - 16%

**Table 2:** Evaluation of knowledge about food and drug interactions(n=152)

S. No.	Items	Respondents (%)
1	Omeprazole / Ranitidine, antihistamines- should be taken before food consumption.	Yes-86% No - 14%
2	Glipizide, Isoniazid, antacids should be taken prior to food consumption.	Yes - 95% No - 05%
3	NSAIDs, Steroids are advised after food intake.	Yes - 78% No - 22%
4	Thyroid hormones should be taken prior to the food consumption.	Yes - 64% No - 36%
5	Propranolol, ACE Inhibitors must be administered on empty stomach.	Yes - 58% No - 42%
6	A patient on drugs like Theophylline should avoid consuming large amount of tea, coffee.	Yes -68% No - 32%
7	Avoid taking milk & dairy products, iron rich foods with Tetracyclines.	Yes- 84% No - 16%
8	Patients on MAO Inhibitors should avoid cheese, legumes, wine & beer.	Yes - 32% No - 68%
9	Caffeine increases the risk of Quinidine, Diazepam, Pseudoephedrine & Theophylline drug toxicities like nervousness, tremor, insomnia.	Yes- 58% No - 42%
10	Chronically consumption of garlic/ginger along with coumarins should be avoided.	Yes- 38% No - 62%
11	Citrus fruit juices increases absorption of Ketoconazole.	Yes - 73% No - 37%
12	Griseofulvin, Ketoconazole, Albendazole should be consumed with high fatty food.	Yes - 67% No - 33%
13	Patients on drugs like Metronidazole, Cefaperazone should avoid alcohol.	Yes -83% No - 17%
14	Antihistamines should not be given with alcoholic beverages.	Yes- 84% No - 16%
15	Spironolactone must be avoided with concomitant usage of potassium rich foods.	Yes - 70% No - 30%
16	Didanosine and Indinavir must be administered on empty stomach.	Yes - 63% No - 37%
17	Patients on Heparin / Warfarin should avoid foods like Spinach, broccoli, cauliflower, peas.	Yes - 46% No - 54%
18	A patient on thyroid supplements for hypothyroidism must avoid foods like sprouts, turnips, cauliflower, millet and cabbage.	Yes - 62% No - 38%

vitamin K help in the blood clot formation process and there by antagonizes the effects of the anticoagulant drugs like warfarin, heparin.<sup>21,22</sup>

Majority of the students 84% gave correct response rates for the knowledge of avoiding taking milk & dairy products, iron-rich food and supplements with Tetracyclines, as it is evident from the literature lacuna that Tetracyclines to be avoided with milk as it forms insoluble complex with calcium affecting its bioavailability and stains the teeth as side effect. In the present study, majority of the students gave correct response scores pertaining to the perception of food and drug interactions with relation to timings of drugs administration and food intake. 78% of the students were aware about NSAIDs, PPIs, Glipizide timing of administration of drugs with food, but students scored less correct response scores regarding timing of administration of thyroid hormones. Our study revealed that only 32% of the students gave correct response scores for the knowledge regarding cheese reaction, usage of MAO Inhibitors in patients and their concomitant avoidance of cheese, legumes, wine & beer which causes cheese reaction. The possible reasons for such low correct response scores rates and gap in their knowledge among medical students could be due to lack of awareness, less clinical exposure, improper history taking skills etc.

Our study findings are in accordance with the previous studies done by Ahmed Hilal Sheriff et al.<sup>23</sup> In our study, Majority 95% of the students gave correct response scores for the knowledge of Glipizide, Isoniazid, antacids should be taken before food intake. Previous studies have demonstrated the fact that food greatly decreases isoniazid bioavailability,<sup>24</sup> therefore must be administered on empty stomach. Glipizide, antidiabetic drug which belong to a sulfonylurea class of drug should be taken 30 minutes before food intake. It is evident that antacids must be taken 30 minutes prior to the food intake to increase their maximal therapeutic efficacy.<sup>25</sup>

In our study, only 58% of the students gave correct response scores for the knowledge of timing of administration of Propranolol, ACE Inhibitors which must be taken on empty stomach. In similar study done by Manrique et al.<sup>26</sup> majority of the professional opined that to enhance therapeutic effects, drugs such as Atenolol, Captopril, Isoniazid and Rifampicin that interact with foods should be taken on an empty stomach. A study done by Nazari et al.<sup>27</sup> showed that the administration of Captopril on an empty stomach will decrease its absorption significantly. In our study, only 67% of the students gave correct response scores for the knowledge of drugs like Griseofulvin, Ketoconazole, Albendazole should be taken with food rich in high fat content. Our study findings are similar in accordance with the similar study done by Enwerem et al.<sup>28</sup> where in nurses groups with 0-4 and  $\geq 20$  years of nursing experience, gave less correct response scores regarding the interaction of Griseofulvin,

Ketoconazole and Albendazole with fatty diets, which points out the existence of gap in the knowledge among health care professionals. These drugs have antifungal and anthelmintic properties. In the literature lacuna it is evident that antifungal drugs absorption is greatly increased when they are administered along with foods rich in fat.<sup>29</sup>

Our limitation in this study is it was conducted over short period of time and less number of participants. Our strength in this study is we could explore the gap in the knowledge of the students regarding different food drug interactions, and could identify the knowledge gaps. Multicenter study with larger samples will be beneficial. Geographic food habits, effects of flora and fauna, existence of different cultures, food habits stigmas and even the individual specificity need to be considered.

## 5. Conclusion

Therefore, additional training and integration of knowledge and expertise about food and drug interactions among students who are the budding future doctors, healthcare professionals is needed to improve the therapeutic efficacy, patient's drug compliance and patient's safety.

## 6. Conflict of Interest

The authors declare no conflict of interest.

## 7. Acknowledgement

The authors would like to thank all the second year medical students for their active participation in the study.

## References

1. Shils ME, Shike M. Modern nutrition in health and disease. Lippincott Williams & Wilkins; 2006.
2. Lewis CW, Frongillo EA, Roe DA. Drug-Nutrient Interactions in Three Long-Term-Care Facilities. *J Am Dietetic Assoc.* 1995;95(3):309–15. doi:10.1016/s0002-8223(95)00079-8.
3. Genser D. Food and Drug Interaction: Consequences for the Nutrition/Health Status. *Ann Nutr Metab.* 2008;52(1):29–32. doi:10.1159/000115345.
4. Gosney M, Tallis R. Prescription of contraindicated and interacting drugs in elderly patients admitted to hospital. *Lancet.* 1984;324(8402):564–7. doi:10.1016/s0140-6736(84)90775-x.
5. Baxter K, Davis M, Driver S. Stockly's Drug interaction. and others, editor. Suffolk: Hodder and Stoughton by pharmaceutical press; 2000.
6. Ismail MYM. Drug-food interactions and role of pharmacist. *Asian J Pharma Clin Res.* 2009;2:1–10.
7. Huang SM, Hall SD, Watkins P, Love LA, Singh CS, Betz JM. Drug interactions with herbal products and grape fruit juice: a conference report. *Clin Pharmacol Ther.* 2004;75:1–12.
8. Zhou S, Koh HL, Gaob Y, Gong ZY, Lee EJ. Herbal bioactivation: the good, the bad and the ugly. *Life Sci.* 2004;74:935–68.
9. Izzo AA, Ernst E. Interactions Between Herbal Medicines and Prescribed Drugs. *Drugs.* 2009;69(13):1777–98. doi:10.2165/11317010-000000000-00000.
10. Arcy PF. Nutrient-drug interactions. *Adverse Drug React Toxicol Rev.* 1997;14:233–54.
11. Williams L, Hill DP, Davis JA, Lowenthal DT. The influence of food on the absorption and metabolism of drugs: an update.

- Eur J Drug Metab Pharmacokinetics*. 1996;21(3):201–11. doi:10.1007/bf03189714.
12. Benni JM, Jayanthi MK, Tubaki BR, Renuka M. Knowledge and awareness of food and drug interactions (FDI): a survey among health care professionals. *Int J Pharmacol Clin Sci*. 2012;1:97–105.
  13. Spence JD. Drug interactions with grapefruit juice: whose responsibility is it to warn the public? *Clin Pharmacol Ther*. 1997;61:395–400.
  14. Bushra R, Aslam N, Khan A. Food Drug Interactions. *Oman Med J*. 2011;26(2):77–83. doi:10.5001/omj.2011.21.
  15. Aman SF, Hassan F, Naqvi BS, Hasan SM. Studies of food drug interactions. *Pak J Pharm Sci*. 2010;23:313–20.
  16. Beermann B, Groschinsky-Grind M. Gastrointestinal absorption of hydrochlorothiazide enhanced by concomitant intake of food. *Eur J Clin Pharmacol*. 1978;13(2):125–8. doi:10.1007/bf00609756.
  17. Hu Z, Yang X, Ho PC, Chan SY, Heng PW, Chan E. Herb-drug interactions: a literature review. *Drugs*. 2005;65:1239–82.
  18. Bland SE, Vermeulen L. Drug-food interactions. *J Pharm Soc Wisconsin*. 1998;p. 28–35.
  19. Lasswell AB, DeForge BR, Sobal J, Muncie HL, Michocki R. Family medicine residents' knowledge and attitudes about drug-nutrient interactions. *J Am Coll Nutr*. 1995;14(2):137–43. doi:10.1080/07315724.1995.10718485.
  20. Couris RR, Tataronis GR, Dallal GE, Blumberg JB, Dwyer JT. Assessment of Healthcare Professionals' Knowledge About Warfarin-Vitamin K Drug-Nutrient Interactions. *J Am Coll Nutr*. 2000;19(4):439–45. doi:10.1080/07315724.2000.10718944.
  21. Wells PS, Holbrook AM, Crowther NR, Hirsh J. Interactions of warfarin with drugs and food. *Ann Intern Med*. 1994;121:676–83.
  22. Booth SL, Charnley JM, Sadowski JA, Saltzman E, Bovill EG, Cushman M. Dietary Vitamin and Stability of Oral Anticoagulation: Proposal of a Diet with Constant Vitamin K1 Content. *Thromb Haemost*. 1997;77(03):504–9. doi:10.1055/s-0038-1655997.
  23. Sheriff AH. Knowledge and awareness of food and drug interaction among dental students. *Int J Pharm Technol*. 2017;9:29254–62.
  24. Self TH, Chrisman CR, Baciewicz AM, Bronze MS. Isoniazid drug and food interactions. *Am J Med Sci*. 1999;317(5):304–11.
  25. Sharma HL, Sharma KK. Principles of Pharmacology. 1st ed. Hyderabad: Paras Medical Publishers; 2007.
  26. Manrique-Torres YJ, Lee DJ, Islam F, Nissen LM, Cichero JAY, Stokes JR, et al. Crushed Tablets: Does the Administration of Food Vehicles and Thickened Fluids to Aid Medication Swallowing Alter Drug Release? *J Pharm Pharmaceutical Sci*. 2014;17(2):207–19. doi:10.18433/j39w3v.
  27. Nazari AM, Salamzadeh J, Hajebi G, Gilbert B. The role of clinical Pharmacists in educating nurses to reduce drug food interactions (absorption Phase) in hospitalized patients. *Iran J Pharm Res*. 2011;10(1):173–7.
  28. Enwerem NM, Okunji P. Knowledge, Attitudes and Awareness of Food and Drug Interactions among Nurses with Different Levels of Experience. *Int J Nurs*. 2015;2(1):1–9. doi:10.15640/ijn.v2n1a1.
  29. Omotoso GO, Onanuga IO, Oyewopo AO, Enaibe BU. Liver enzymes derangement and the influence of diet in animals given oral albendazole. *Niger Med J*. 2013;54(5):310–2. doi:10.4103/0300-1652.122333.

### Author biography

**Harish G Bagewadi**, Associate Professor

**Priyadarshini M Deodurg**, Professor and HOD

**Syed Wasif**, Assistant Professor

**Cite this article:** Bagewadi HG, Deodurg PM, Wasif S. Knowledge and perceptions about food and drug interactions: A survey among second year medical undergraduate students in a government medical college in southern India. *Indian J Pharm Pharmacol* 2021;8(1):42–46.