



(RESEARCH ARTICLE)



A study of nutraceutical prescription pattern among patients in an out-patient setting at Birat medical college teaching Hospital

Saibijaya Rijal ^{1,*} and Prem Kumar Mandal ²

¹ Department of Pharmacy, School of Medicine and Allied Health Sciences, Manmohan Technical University, Budiganga-4, Morang, Nepal.

² Birat Medical College Pharmacy, Birat Medical College Teaching Hospital, Tankisinwari-2, Morang, Nepal.

Magna Scientia Advanced Research and Reviews, 2024, 10(01), 330–340

Publication history: Received on 01 January 2024; revised on 18 February 2024; accepted on 21 February 2024

Article DOI: <https://doi.org/10.30574/msarr.2024.10.1.0034>

Abstract

The demand for nutraceutical has been increasingly rapidly which can be due to increasing awareness regarding health benefit of nutraceutical product. This study aims to understand the prescription pattern and find out knowledge, attitude of patients regarding nutraceutical product.

A cross-sectional study was conducted at Birat Medical College Teaching Hospital, Budiganga, Nepal to assess the demographic characteristic as well as level of knowledge and attitude towards nutraceutical product and further total cost patients spent on nutraceutical alone was also assessed. Pearson Chi-square test (χ^2) was used to investigate the association between demographic variables and patients' knowledge and attitude towards nutraceuticals. One-way ANOVA was performed to compare the cost of nutraceutical among the different outpatient departments. Nearly half of the patients (49.25%) had inadequate knowledge whereas more than half of the patients (67.75%) had moderate positive attitude. The mostly prescribed nutraceuticals were minerals (45%) followed by multivitamins (23%). More than two-third patient believed nutraceutical can be used when person feel tired and rundown. The average amount that a patient spent on nutraceutical product was found out to be NPR. 746.88 per prescription. No significant association was found in the cost of nutraceutical among the various Out Patient Department (OPD) wise. ($P=0.281$, $P>0.05$). Moderate positive attitude and inadequate knowledge regarding nutraceutical product among the patient's addresses the need to develop regulation, educational strategy regarding nutraceutical use and further increase general public awareness on rational use of these products.

Keywords: Attitude; Knowledge; Nutraceutical; Prescription pattern

1. Introduction

Nutraceutical is a food or a part of food that provides medical or health benefits that include prevention or treatment of disease i.e. Nutraceutical product must not only supplement the diet but also should have potential to prevent the disease [1]. The food source used as a nutraceutical can be categorized as Dietary fiber, Probiotic, Prebiotic, Antioxidant and have received considerable interest nowadays as it is nutritional and being safe with therapeutic value [2]. The demand for Nutraceutical has been increasingly rapidly due to which its market is also on a growing trend. As of 2021 the global Nutraceutical market size was valued USD 454.55 Billion and is estimated to reach at USD 991.09 Billion in 2030 registering a CAGR (Compound Annual Growth Rate) of 9% from the year 2021 to 2030. The Nutraceutical market scope in 2022 is expected to be around USD 493.06 Billion. The primary reason for increase in demand can be increasing awareness regarding health benefit of Nutraceutical product [3]. However, unethical prescribing for financial incentive from the manufacturers, sale of nutraceutical by street vendors has been increasing rampantly and the Government

* Corresponding author: Saibijaya Rijal

should take necessary action to halt such unethical practice [4]. This study aims to understand the prescription pattern and find out knowledge, attitude of patients regarding nutraceutical product.

2. Material and methods

A Descriptive cross-sectional study was conducted at Birat Medical Teaching Hospital from January 2023- June 2023. The sample size was calculated using the Raosoft online calculator [5]. Ethical approval was obtained from Nepal Health Research Council (NHRC). Four hundred patients those who were prescribed nutraceutical product and willing to participate were included in the study. Both verbal as well as written consents from the patients were taken prior the conductance of research and patients were selected using convenience sampling technique. The objectives of the study were explained to the patients before collecting data from them. Once getting the permission from the patients the data was collected and entered in data collection form [6]. The obtained data was entered in IBM SPSS (International Business Machine Statistical Package of Social Science) version 16 and MS EXCEL (Microsoft Excel) 2019. Data analyzed included the result on demographic of patients (age, gender, ethnicity, religion, educational status, marital status and occupation), question related to knowledge of nutraceutical and attitude towards nutraceuticals. Appropriate statistical techniques were used for data analysis and were presented in the form of tables, graphs and diagram. Pearson Chi-square test (χ^2) was used to investigate the association between socio-demographic variables and patients' knowledge and attitude towards nutraceutical. One-way ANOVA was performed to compare the cost of nutraceutical among the different outpatient departments.

In order to assess the respondents' knowledge towards nutraceutical, each correct answer was coded as "Yes" and scored as "1", and an Incorrect answer was coded as "No" and scored as "0" for both "No" and "I do not know" response. The cumulative as well as mean scores were calculated. Based on the obtained mean score, participant's knowledge was categorized as "Adequate" (0.75–1), "moderately adequate" (0.5–0.749) and "Inadequate" (<0.5). Likewise, in order to assess respondents' attitude, a five-point Likert scale was used that ranges from; "Strongly agree" (1) to "Strongly disagree" (5). Based on the mean score, the respondents who scored above the mean score were defined as having a "positive attitude" (4–5), "moderate positive attitude" (3–3.99) and those below the mean score a "negative attitude" (<3).

3. Results

Out of 400 patients 281 (70.25%) were female and 119 (29.75%) were male. 173 (43.25%) were in the age group 15-29 years. Majority of the patients were Brahmin (52.5%) and Religion was Hindu (87.75%). 159 (39.75%) of the patient had education up to secondary level. Marital status and occupation show that 368 (92%) were married and 230 (57.5%) were housewife simultaneously (Table 1).

Majority of the patients (26%) believed that the reason for consuming nutraceuticals was to prevent disease (Table 2). Out of 400 patients 197 (49.25%) had inadequate knowledge, 138 (34.50%) had moderate knowledge and only 65 (16.25%) had adequate knowledge on nutraceutical product (Figure 1).

Majority of patients (n=300) believed that nutraceuticals can be used when person feel tired or rundown, make physically feel better (n=246). However, patient disbelieved that one can skip meal for nutraceutical (n=220) and it is just waste of money (n=165). (Table 3). Regarding the attitude of patients towards nutraceuticals, majority of patients (n=271, 67.75%) had moderate positive attitude, a few patients (n=101, 25.25%) had negative attitude followed by positive attitude (n=28, 7%) (Table 5).

Figure 2 shows the categories of nutraceutical prescribed. Out of 400 patients, majority of patients were prescribed minerals (45 %), followed by multivitamins (23 %), probiotics (17 %), enzymes (9 %) and proteins (6 %) simultaneously.

The overall association between socio-demographic variables and patients' knowledge and attitude towards nutraceuticals are presented on Table 4 and Table 5. There was no association between socio-demographic variables and patients knowledge level on nutraceutical ($P > 0.05$) except Marital status ($P = 0.028$, $P < 0.05$). However, A significant association was found between socio-demographic variable and patients attitude level on nutraceuticals ($P < 0.05$) except Gender ($P = 0.064$, $P > 0.05$).

Comparison of cost of nutraceutical prescribed department wise are presented on Table 6. The average amount that a patient spent on nutraceutical product was found out to be NPR. 746.88 per prescription where maximum range to be

NPR. 790.51 in Medical ward and minimum range to be NPR 675.6 in other department (Eyes Nose Throat department, Dermatology department, pediatric department, oncology department, etc.). No significant association was found in the cost of nutraceutical among the various Out Patient Department (OPD) wise. ($P=0.281$, $P>0.05$).

Table 1 Demographic Information (N = 400)

SN	Demographic Detail	Frequency (n)	Percentage (%)
1	Age in Years		
	15-29	173	43.25%
	30-44	111	27.75%
	45-59	70	17.5%
	Above 60	46	11.75%
2	Gender		
	Male	119	29.75%
	Female	281	70.25%
3	Ethnicity		
	Brahmin	210	52.50%
	Chettri	100	25%
	Newar	49	12.25%
	Others	41	10.25%
4	Religion		
	Hindu	351	87.75%
	Buddhist	3	0.75%
	Christian	3	0.75%
	Others	43	10.75%
5	Education Status		
	Just read and write	9	2.25%
	Primary	58	14.50%
	Secondary	159	39.75%
	Higher secondary	136	34.00%
	Illiterate	38	9.50%
6	Marital status		
	Married	368	92.00%
	Unmarried	26	6.50%
	Divorced	3	0.75%
	Others	3	0.75%
7	Occupation		
	Housewife	230	57.50%
	Service	74	18.50%
	Business	54	13.50%
	Others	42	10.50%

Table 2 Percentage distribution of respondent's knowledge towards Nutraceuticals

SN	Question related to knowledge of Nutraceutical	Frequency (n)	Percentage (%)
1	Do you Know what Nutraceutical are?		
	Yes	137	34.25%
	No	263	65.75%
2	Do you think use of Nutraceutical is always safe?		
	Yes	80	20%
	No	196	49%
	Don't know	124	31%
3	Do you think taking a drug, food or drink with Nutraceutical might interact with each other?		
	Yes	101	25.25%
	No	157	39.25%
	Don't know	142	35.50%
4	What are the reasons for consuming Nutraceuticals?		
	Treatment of any disease	101	25.25%
	Maintains good health	75	18.75%
	Ensure adequate nutrition	52	13%
	Weight loss	33	8.25%
	Enhance appearance	0	0%
	Meet increased energy needs	3	0.75%
	Prevent disease	104	26%
	No specific reason	32	8%

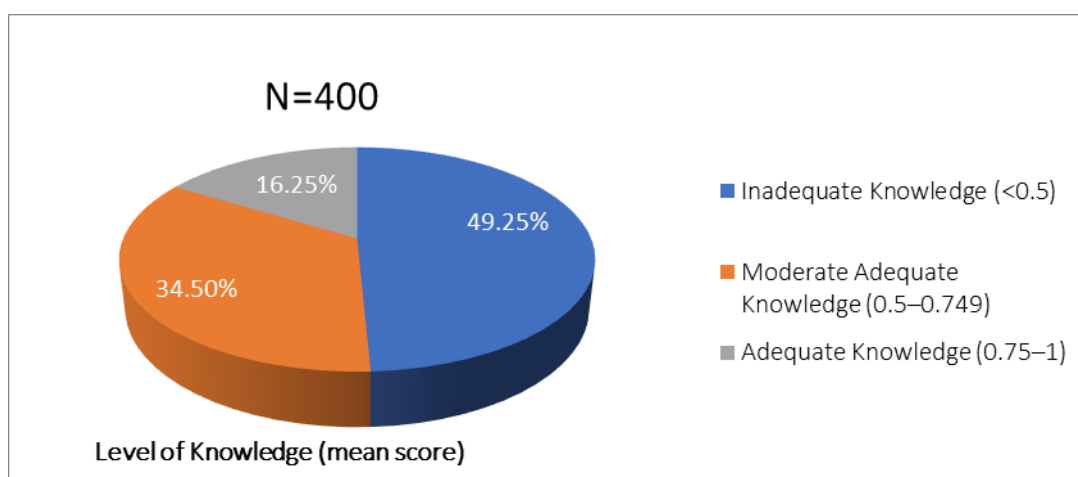


Figure 1 Summary of Knowledge level

Table 3 Percentage distribution of respondents' attitude towards nutraceutical

SN	Attitude Variable	Percentage distribution of respondents' attitude towards nutraceutical				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Nutraceutical are needed if a person feels tired and rundown	101(25.25%)	199 (49.75%)	60 (15%)	30(7.5%)	10 (2.5%)
2	Nutraceutical make one feel better physically	68 (17%)	178 (44.5%)	95 (23.75%)	50 (12.5%)	9 (2.25%)
3	Nutraceutical usually improve a person's appearance	52 (13%)	161 (40.25%)	95 (23.75%)	61 (15.25%)	31 (7.75%)
4	Body fat can be lost by taking certain type of Nutraceutical	67 (16.75%)	151 (37.75%)	86 (21.5%)	67 (16.75%)	29 (7.25%)
5	One can skip meal and just take Nutraceutical	57 (14.25%)	21 (5.25%)	102 (25.5%)	73 (18.25%)	147 (36.75%)
6	The Nutrient supplied by food need to be supplemented	63 (15.75%)	139 (34.75%)	105 (26.25%)	76 (19%)	17 (4.25%)
7	Nutraceutical is necessary for all ages	35 (8.75%)	148 (37%)	130 (32.5%)	73 (18.25%)	14 (3.5%)
8	Nutraceutical is generally harmless	30 (7.5%)	138 (34.5%)	122 (30.5%)	92 (23%)	18 (4.5%)
9	Regular use of supplement prevents chronic disease	63 (15.75%)	176 (44%)	114 (28.5%)	38 (9.5%)	9 (2.25%)
10	Nutraceutical can prevent cancer	70 (17.5%)	200 (50%)	105 (26.25%)	9 (2.25%)	16 (4%)
11	Health professional should promote use of supplement	68 (17%)	144 (36%)	94 (23.5%)	80 (20%)	14 (3.5%)
12	Nutraceutical should be sold only on prescription of registered medical practitioner	49 (12.25%)	130 (32.5%)	122 (30.5%)	83 (20.75%)	16 (4%)
13	Manufacture and sale of Nutraceutical should be monitored by a regulatory body	47 (11.75%)	147 (36.75%)	111 (27.75%)	73 (18.25%)	22 (5.5%)
14	Use of Nutraceutical is just waste of money	21 (5.25%)	77 (18.25%)	141 (35.25%)	125 (31.25%)	40 (10%)

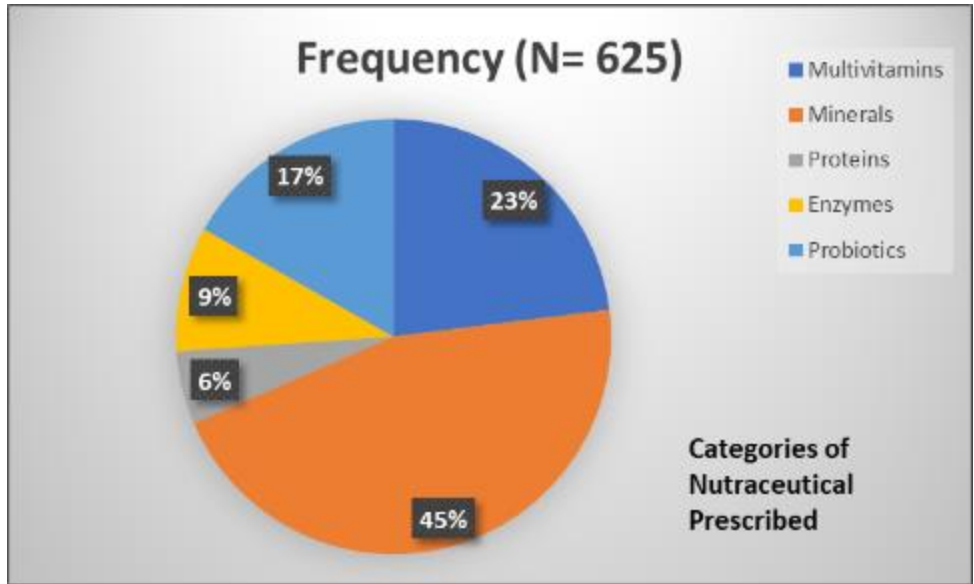


Figure 2 Categories of Nutraceutical Prescribed

Table 4 Association between socio-demographic variables and patients’ knowledge towards nutraceuticals

Variable	Total participants (N=400) (%)	Level of Knowledge			Chi square test	Sig.
		Inadequate Knowledge	Moderate Adequate Knowledge	Adequate Knowledge		
Age in years						
15-29	173(43.25%)	87	62	24	5.836	0.442
30-44	111(27.75%)	59	33	19		
45-59	70(17.5%)	35	23	12		
Above 60	46(11.75%)	16	20	10		
Gender						
Male	119(29.75%)	63	42	14	2.597	0.273
Female	281(70.25%)	134	96	51		
Ethnicity						
Brahmin	210(52.5%)	109	70	31	6.885	0.332
Chettri	100(25%)	52	32	16		
Newar	49(12.25%)	23	16	10		
Others	41(10.25%)	13	20	8		
Religion						
Hindu	351(87.75%)	178	118	55	9.965	0.126
Buddhist	3(0.75%)	3	0	0		
Christian	3(0.75%)	2	0	1		
Others	43(10.75%)	14	20	9		

Education status						
Illiterate	38(9.5%)	26	10	2	12.334	0.137
Just read and write	9(2.25%)	3	6	0		
Primary	58(14.5%)	27	20	11		
Secondary	159(39.75%)	79	53	27		
Higher secondary	136(34%)	62	49	25		
Marital status						
Married	368(92%)	187	120	61	14.181	0.028
Unmarried	26(6.5%)	6	17	3		
Divorced	3(0.75%)	2	0	1		
Others	3(0.75%)	2	1	0		
Occupation						
Housewife	230(57.5%)	118	75	37	7.351	0.290
Service	74(18.5%)	39	26	9		
Business	54(13.5%)	27	17	10		
Others	42(10.5%)	13	20	9		

Table 5 Association between socio-demographic variables and patients' attitude towards nutraceuticals

Variable	Total participants (N=400)	Level of Attitude			Chi square test	Sig.
		Negative Attitude	Moderate Positive Attitude	Positive Attitude		
Age in years						
15-29	173(43.25%)	50	114	9	14.252	0.027
30-44	111(27.75%)	25	82	4		
45-59	70(17.5%)	14	49	7		
Above 60	46(11.75%)	12	26	8		
Gender						
Male	119(29.75%)	39	71	9	5.508	0.064
Female	281(70.25%)	62	200	19		
Ethnicity						
Brahmin	210(52.5%)	56	144	10	15.301	0.018
Chettri	100(25%)	24	71	5		
Newar	49(12.25%)	9	35	5		
Others	41(10.25%)	12	21	8		
Religion						
Hindu	351(87.75%)	89	242	20		

Buddhist	3(0.75%)	0	3	0	13.465	0.036
Christian	3(0.75%)	0	3	0		
Others	43(10.75%)	12	23	8		
Education status						
Illiterate	38(9.5%)	10	25	3	16.400	0.037
Just read and write	9(2.25%)	3	5	1		
Primary	58(14.5%)	20	35	3		
Secondary	159(39.75%)	35	120	4		
Higher secondary	136(34%)	33	86	17		
Marital status						
Married	368(92%)	90	257	21	19.915	0.003
Unmarried	26(6.5%)	10	10	6		
Divorced	3(0.75%)	0	2	1		
Others	3(0.75%)	1	2	0		
Occupation						
Housewife	230(57.5%)	60	160	10	14.937	0.021
Service	74(18.5%)	17	53	4		
Business	54(13.5%)	12	36	6		
Others	42(10.5%)	12	22	8		

Table 6 Comparison of cost of nutraceutical prescribed department wise

SN	OPD	N	Mean ± SE	95% Confidence Interval for Mean		P Value
				Lower Bound	Upper Bound	
1	Medical	191	790.51±39.16	713.2544	867.7718	0.281
2	Surgical	32	739.75±10.09	533.8961	945.6039	
3	Orthopedic	98	691.19±47.78	596.3603	786.0274	
4	Obstetrics and Gynecology	54	730.83±66.27	597.9054	863.7613	
5	Others	25	675.6 ± 77.72	515.1855	836.0145	
	Total	400	746.88±25.58	696.5786	797.1814	

4. Discussion

The present study showed that out of 400 patients, majority of patients (n=197, 49.25%) had inadequate knowledge about nutraceuticals. Similar studies done on Nepal [6] found the inadequate knowledge of nutraceuticals to be 46.5%. Compared to a study done on Malaysia [7] have reported inadequate knowledge about nutraceuticals to an extent of 60.9%. This difference can be due to type of study design undertaken by various studies, nature of occurrence of disease, patient's characteristic and knowledge level. 26% of patient's responded that the reason for consuming nutraceuticals was to prevent disease which is contrary to finding of Gosavi et al [8].

Regarding the attitude towards nutraceuticals, majority of patient's perceived that nutraceuticals are needed, if a person feel tired and rundown (n=300) or to prevent cancer (n=270). The study done by Shrestha et al [6] found that majority of participants perceived nutraceutical prevent chronic disease (60.5%) or even cancer (35.3%) which shows similarity in patient's perception towards prevention of cancer. Moderately positive attitude (n=271, 67.75%) of patients towards nutraceuticals can be related with both patient's knowledge and attitude towards nutraceuticals as 26% of patients perceive that reason for consuming nutraceutical was to prevent disease and the fact that majority of patients agreed that nutraceutical are needed if a person feel tired as well as rundown and further patients disbelieved towards use of nutraceutical to be a waste of money (n=165) also indicate positive attitude towards nutraceuticals.

The respondent believed nutraceuticals to be monitored by regulatory bodies and to be sold only on prescription is consistent with the view given by medical practitioner in a study done by Navyashree et al [9].

The study also showed majority of patient's perceiving nutraceutical as a product that can improve person's appearance (53.25%) and about 55% patients disagreed with the fact that one can skip meal and just take nutraceuticals. A study conducted in Manila [10] shows similar result in terms of improving persons appearance (53%) and slightly higher result (66.5%) in terms of skipping meal and taking nutraceutical product. However, the remaining 19.5% agreed to the fact that one can skip meal and just take nutraceutical, such people need to be counseled appropriately to prevent skipping of meal and be dependent on nutraceutical product only.

In this study about 50.5% of the patient perceived the nutrient supplied by food need to be supplemented. A study conducted by Dickinson et al [11] found 42% of the respondent perceived nutraceutical to fill the nutrition gaps. This can be due to fact that people who are busy in their daily lives and does not have enough time and skip meals, such people take nutraceutical product to fulfill their nutritional gap as they believe daily food intake alone cannot fulfill the nutrition demand.

Our result showed majority of patient (45.75%), mainly perceived nutraceutical is necessary for all ages and 42% patient thought nutraceutical is harmless. A similar question when asked to a health science student and other individual in a study conducted in Saudi Arabia [12] about 33.3% of health science students and 20.7% of other individuals have given their opinion regarding dietary supplement to be necessary for all ages. Likewise, 72.5% of health science students and 49.8% of other individuals felt dietary supplement to be completely safe.

The most commonly prescribed nutraceutical product were minerals (45%) and multi-vitamins (25%) which is similar to the finding of various studies [8,13].

The average amount that a patient spent on nutraceutical was found to be NPR 746.88. These result for the average cost per prescription of the nutraceutical product deviated from the study conducted by Mohammed et al [14] and Shrestha et al [6].

A significant association between socio-demographic variable like marital status and patient's knowledge whereas, no association between socio-demographic variable like gender and patient's attitude was found which differ from the findings of other studies [15,16]. This can be due the difference in choice of study site, choice of participants, type of questionnaire used, use of statistical method.

Various studies claim nutraceutical product to have health benefit and helps to prevent many degenerative and chronic disease [1, 17, 18] and the demand for Nutraceutical has been increasingly rapidly due to which its market is also on a growing trend [3]. Despite having so many benefits some studies suggest nutraceutical lacks adequate information on safety, efficacy, quality and have adverse events [19, 20, 21, 22]. Large number of Nutraceutical product lack pharmacological or toxicological studies due to which no toxicity or safety data are available further knowledge in the area of pharmacokinetic/toxicokinetic is Indispensable [23].

Since this study was carried out only in outpatient department of Birat Medical College Teaching Hospital, this study cannot be generalized for whole country. This study was a cross-sectional which only gave a snap shot of participant's knowledge and attitude regarding nutraceuticals. Further, this study only access patient's knowledge, attitude but not practice relating to nutraceuticals due to which we couldn't access prevalence of nutraceutical use among patient. A similar study can be done on larger sample with more than one hospital for generalization within Nepal and on in-ward as well as in-patient who are on nutraceutical product.

5. Conclusion

Our study shows majority of participants (67.75%) having moderate positive attitude towards nutraceutical but nearly half of the study participants (49.25%) had inadequate knowledge regarding nutraceutical product. The people who are using Nutraceutical product need to be knowledgeable regarding its benefit or adverse effect, further sufficient study on nutraceutical should be carried out which not only improve quality life of the people but also avoid complication and reduce financial burden. Introducing different regulation on use of nutraceutical product in Nepal can provide significant impact on information available and enable consumer to be conscious regarding use of nutraceutical product.

Compliance with ethical standards

Acknowledgments

The authors would like to acknowledge Birat Medical College Teaching Hospital for unfailing support and cooperation during collection of the data and Manmohan Technical University for providing help throughout the conductance of this study.

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

Ethical approval was obtained from Nepal Health Research Council (NHRC).

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] Kalra E. K. (2003). Nutraceutical--definition and introduction. *AAPS pharmSci*, 5(3), E25. <https://doi.org/10.1208/ps050325>
- [2] Verma G, Mishra M. A review on nutraceuticals: Classification and its role in various disease. *International Journal of Pharmacy & Therapeutics*. 7. 152-160. Available from (4) (PDF) A review on nutraceuticals: Classification and its role in various disease (researchgate.net) Cited 2022 Aug 4
- [3] Nutraceutical Market Size, Share & Trends Analysis Report By Product (Dietary Supplements, Functional Foods, Functional Beverages), By Region, And Segment Forecasts, 2020–2027. <https://www.grandviewresearch.com/industryanalysis/nutraceuticals-market>
- [4] Lamichhane G, Pandeya PR. Regulatory aspects of nutraceuticals and functional foods in Nepal. *Nutrafoods*. 2020(2):186–92. DOI: 10.17470/NF-020-0025
- [5] Raosoft. Sample Size Calculator. Available from: <http://www.raosoft.com/samplesize.html>. Cited 5 Aug 2022
- [6] Shrestha R, Shrestha S, K. C. B, Shrestha S (2021) Evaluation of nutritional supplements prescribed, its associated cost and patients knowledge, attitude and practice towards nutraceuticals: A hospital based cross-sectional study in Kavrepalanchok, Nepal. *PLoS ONE* 16(6): e0252538. <https://doi.org/10.1371/journal.pone.0252538>
- [7] Mahmood NA, Hassan MR, Ahmad S, MohdNawi H, Pang NTP, Syed Abdul Rahim SS, et al. Nutraceutical Use among Patients with Chronic Disease Attending Outpatient Clinics in a Tertiary Hospital. *Evidence-Based Complementary and Alternative Medicine*. 2020; 2020. <https://doi.org/10.1155/2020/9814815> PMID: 33224262
- [8] Gosavi S, Subramanian M, Reddy R, Shet BL. A study of prescription pattern of neutraceuticals, knowledge of the patients and cost in a tertiary care hospital. *Journal of Clinical and Diagnostic Research:JCDR*. 2016; 10(4): FC01. <https://doi.org/10.7860/JCDR/2016/18424.7620> PMID: 27190824
- [9] R N, Rai M, Ravindran A. Awareness and Practices Towards Nutraceuticals among Medical Practitioners of a Tertiary care Teaching Hospital in South India- A pilot study. *IOSR Journal of Dental and Medical Sciences*. 2017 May;16(05):12-6. DOI: 10.9790/0853-1605061216

- [10] Cruz AJ, Tanchoco CC. Survey on awareness, perception, and extent of usage of nutraceuticals and dietary supplements in metro manila. *J Med Food*. 2000; 3(4):181–8. Epub 2000/01/01. <https://doi.org/10.1089/jmf.2000.3.181> PMID: 19236175.
- [11] Dickinson A, Bonci L, Boyon N, Franco JC. Dietitians use and recommend dietary supplements: report of a survey. *Nutr J*. 2012 Mar 14;11:14. doi: 10.1186/1475-2891-11-14. PMID: 22416673; PMCID: PMC3331817.
- [12] Alowais MA, Selim MA. Knowledge, attitude, and practices regarding dietary supplements in Saudi Arabia. *J Family Med Prim Care* 2019;8:365-72. DOI 10.4103/jfmpc.jfmpc_430_18.
- [13] Sharma A, Adiga S, M A. Knowledge, attitude and practices related to dietary supplements and micronutrients in health sciences students. *J Clin Diagn Res*. 2014 Aug;8(8):HC10-3. doi: 10.7860/JCDR/2014/9329.4683. Epub 2014 Aug 20. PMID: 25302213; PMCID: PMC4190735.
- [14] Mohammed AH, Kellarai A, Mateti UV, Rawal KB, Raju BN, Shetty S, et al. Prescription pattern and cost analysis of nutraceuticals among type 2 Diabetes Mellitus patients: A cross-sectional study. *J Clin Diagn Res [Internet]*. 2022; Available from: [https://www.jcdr.net/articles/PDF/17366/59366_CE\(AD\)_F\(SS\)_PF1\(AG_OM\)_PFA\(SS\)_PB\(AG_SS\)_PN\(SS\).pdf](https://www.jcdr.net/articles/PDF/17366/59366_CE(AD)_F(SS)_PF1(AG_OM)_PFA(SS)_PB(AG_SS)_PN(SS).pdf) Cited 2023 Oct 26
- [15] Azizi M, Aghaee N, Ebrahimi M, Ranjbar K. Nutrition knowledge, the attitude and practices of college students. *Phys Educ Sport Phys Educ Sport* 2011;9:349-57 Available from (4) (PDF) 4. Nutrition knowledge, the attitude and practices of college students (researchgate.net) Cited 2023 Oct 26
- [16] Alhomoud FK, Basil M, Bondarev A. Knowledge, Attitudes and Practices (KAP) Relating to Dietary Supplements Among Health Sciences and Non-Health Sciences Students in One of The Universities of United Arab Emirates (UAE). *J Clin Diagn Res*. 2016 Sep;10(9):JC05-JC09. doi: 10.7860/JCDR/2016/19300.8439. Epub 2016 Sep 1. PMID: 27790468; PMCID: PMC5071968.
- [17] Jain, N., Ramawat, K.G. (2013). Nutraceuticals and Antioxidants in Prevention of Diseases. In: Ramawat, K., Mérillon, JM. (eds) *Natural Products*. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-22144-6_70.
- [18] Prankash, D, Gupta C, Sharma G. Importance of phytochemicals in nutraceuticals. *JCMRD* 2012, 1, 70–78. Available from (4) (PDF) Importance of Phytochemicals in Nutraceuticals (researchgate.net) Cited 29 Oct 2023
- [19] Bent, S., Goldberg, H., Padula, A., & Avins, A. L. (2005). Spontaneous bleeding associated with ginkgo biloba: a case report and systematic review of the literature: a case report and systematic review of the literature. *Journal of general internal medicine*, 20(7), 657–661. <https://doi.org/10.1111/j.1525-1497.2005.0121.x>
- [20] Kim, Y. J., Choi, M. S., Park, Y. B., Kim, S. R., Lee, M. K., & Jung, U. J. (2013). *Garcinia Cambogia* attenuates diet-induced adiposity but exacerbates hepatic collagen accumulation and inflammation. *World journal of gastroenterology*, 19(29), 4689–4701. <https://doi.org/10.3748/wjg.v19.i29.4689>
- [21] Curtis CL, Harwood JL, Dent CM, Caterson B. Biological basis for the benefit of nutraceutical supplementation in arthritis. *Drug Discov Today*. 2004; 9(4):165–72. Epub 2004/02/13. [https://doi.org/10.1016/S1359-6446\(03\)02980-5](https://doi.org/10.1016/S1359-6446(03)02980-5)
- [22] Chopra AS, Lordan R, Horbańczuk OK, et al. The current use and evolving landscape of nutraceuticals. *Pharmacol Res*. 2022;175:106001. doi:10.1016/j.phrs.2021.106001
- [23] Gupta, R.C., Srivastava, A., Lall, R. (2018). Toxicity Potential of Nutraceuticals. In: Nicolotti, O. (eds) *Computational Toxicology. Methods in Molecular Biology*, vol 1800. Humana Press, New York, NY. https://doi.org/10.1007/978-1-4939-7899-1_18