Call for Editorial Board Members

As you are well aware that we are a medical and health sciences publishers; publishing peer-reviewed journals and books since 2004.

We are always looking for dedicated editorial board members for our journals. If you completed your master's degree and must have at least five years experience in teaching and having good publication records in journals and books.

If you are interested to be an editorial board member of the journal; please provide your complete resume and affiliation through e-mail (i.e. info@rfppl.co.in) or visit our website (i.e. www.rfppl.co.in) to register yourself online.

Call for Publication of Conference Papers/Abstracts

We publish pre-conference or post-conference papers and abstracts in our journals, and deliver hard copy and giving online access in a timely fashion to the authors.

For more information, please contact:

For more information, please contact:
A Lal
Publication–in-charge
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091 (India)
Phone: 91-11-79695648
E-mail: info@rfppl.co.in

Free Announcements of your Conferences/Workshops/CMEs

This privilege to all Indian and other countries conferences organizing committee members to publish free announcements of your conferences/ workshops. If you are interested, please send your matter in word formats and images or pictures in JPG/JPEG/Tiff formats through e-mail attachments to sales@rfppl.co.in.

Terms & Conditions to publish free announcements:

1. Only conference organizers are eligible up to one full black and white page, but not applicable for the front, inside front, inside back and back cover, however, these pages are paid.
2. Only five pages in every issue are available for free announcements for different conferences.
3. This announcement will come in the next coming issue and no priority will be given.
4. All legal disputes subject to Delhi jurisdiction only.
5. The executive committee of the Red Flower Publication reserve the right to cancel, revise or modify terms and conditions any time without prior notice.

For more information, please contact:
A Lal
Publication-in-charge
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi – 110 091 (India)
Phone: 91-11-79695648
E-mail: info@rfppl.co.in

Win Free Institutional Subscription!

Simply fill out this form and return scanned copy through e-mail or by post to us.

Name of the Institution_____
Name of the Principal/Chairman_____
Management (Trust/Society/Govt./Company)_____
Address 1_____
Address 2_____
Address 3_____
City_____
Country_____
PIN Code_____
Mobile_____
Email_____

We are regular subscriber of Red Flower Publication journals.

Year of first subscription_____

List of ordered journals (if you subscribed more than 5 titles, please attach separate sheet)

Ordered through

Name of the Vendor	Subscription Year	Direct/subs Yr

Name of the journal for which you wish to be free winner

Terms & Conditions to win free institutional subscription

1. Only institutions can participate in this scheme
2. In group institutions only one institution would be winner
3. Only five institutions will be winner for each journal
4. An institution will be winner only for one journal
5. The free subscription will be valid for one year only (i.e. 1 Jan – 31 Dec)
6. This free subscription is not renewable, however, can be renewed with payment
7. Any institution can again participate after five years
8. All legal disputes subject to Delhi jurisdiction only
9. This scheme will be available to participate throughout year, but draw will be held in last week of August every year
10. The executive committee of the Red Flower Publication reserve the right to cancel, revise or modify terms and conditions any time without prior notice.

I confirm and certify that the above information is true and correct to the best of my knowledge and belief.

Place: Signature with Seal

Date:

Revised Rates for 2023 (Institutional) **Title of the Journal**	**Frequency**	**India(INR) Print Only**	**India(INR) Online Only**	**Outside India(USD) Print Only**	**Outside India(USD) Online Only**
Community and Public Health Nursing	Triannual	6500	6000	507.81	468.75
Indian Journal of Agriculture Business	Semiannual	6500	6000	507.81	468.75
Indian Journal of Anatomy	Quarterly	9500	9000	742.19	703.13
Indian Journal of Ancient Medicine and Yoga	Quarterly	9000	8500	703.13	664.06
Indian Journal of Anesthesia and Analgesia	Bi-monthly	8500	8000	664.06	625
Indian Journal of Biology	Semiannual	6500	6000	507.81	468.75
Indian Journal of Cancer Education and Research	Semiannual	10000	9500	781.25	742.19
Indian Journal of Communicable Diseases	Semiannual	9500	9000	742.19	703.13
Indian Journal of Dental Education	Quarterly	6500	6000	507.81	468.75
Indian Journal of Diabetes and Endocrinology	Semiannual	9000	8500	703.13	664.06
Indian Journal of Emergency Medicine	Quarterly	13500	13000	1054.69	1015.63
Indian Journal of Forensic Medicine and Pathology	Quarterly	17000	16500	1328.13	1289.06
Indian Journal of Forensic Odontology	Semiannual	6500	6000	507.81	468.75
Indian Journal of Genetics and Molecular Research	Semiannual	8000	7500	625	585.94
Indian Journal of Law and Human Behavior	Semiannual	7000	6500	546.88	507.81
Indian Journal of Legal Medicine	Semiannual	9500	9000	742.19	703.13
Indian Journal of Library and Information Science	Triannual	10500	10000	820.31	781.25
Indian Journal of Maternal-Fetal & Neonatal Medicine	Semiannual	10500	10000	820.31	781.25
Indian Journal of Medical and Health Sciences	Semiannual	8000	7500	625	585.94
Indian Journal of Obstetrics and Gynecology	Quarterly	10500	10000	820.31	781.25
Indian Journal of Pathology: Research and Practice	Triannual	13000	12500	1015.63	976.56
Indian Journal of Plant and Soil	Semiannual	7500	7000	585.94	546.88
Indian Journal of Preventive Medicine	Semiannual	8000	7500	625	585.94
Indian Journal of Research in Anthropology	Semiannual	13500	13000	1054.69	1015.63
Indian Journal of Surgical Nursing	Triannual	6500	6000	507.81	468.75
Indian Journal of Trauma and Emergency Pediatrics	Quarterly	10500	10000	820.31	781.25
Indian Journal of Waste Management	Semiannual	10500	10000	820.31	781.25
International Journal of Food, Nutrition & Dietetics	Triannual	6500	6000	507.81	468.75
International Journal of Forensic Science	Semiannual	11000	10500	859.38	820.31
International Journal of Neurology and Neurosurgery	Quarterly	11500	11000	898.44	859.68
International Journal of Pediatric Nursing	Triannual	6500	6000	507.81	468.75
International Journal of Political Science	Semiannual	7000	6500	546.88	507.81
International Journal of Practical Nursing	Triannual	6500	6000	507.81	468.75
International Physiology	Triannual	8500	8000	664.06	625
Journal of Aeronautical Dentistry	Quarterly	8000	7500	625	585.94
Journal of Animal Feed Science and Technology	Semiannual	9000	8500	703.13	664.06
Journal of Cardiovascular Medicine and Surgery	Quarterly	11000	10500	859.38	820.31
Journal of Emergency and Trauma Nursing	Semiannual	6500	6000	507.81	468.75
Journal of Food Additives and Contaminants	Semiannual	6500	6000	507.81	468.75
Journal of Food Technology and Engineering	Semiannual	6000	5500	468.75	429.69
Journal of Forensic Chemistry and Toxicology	Semiannual	10500	10000	820.31	781.25
Journal of Global Medical Education and Research	Semiannual	7000	6500	546.88	507.81
Journal of Global Public Health	Semiannual	13000	12500	1015.63	976.56
Journal of Microbiology and Related Research	Semiannual	9500	9000	742.19	703.13
Journal of Nurse Midwifery and Maternal Health	Triannual	6500	6000	507.81	468.75
Journal of Orthopedic Education	Triannual	6500	6000	507.81	468.75
Journal of Pharmaceutical and Medicinal Chemistry	Semiannual	17500	17000	1367.19	1328.13
Journal of Plastic Surgery and Transplantation	Semiannual	27500	27000	2148.44	2109.38
Journal of Psychiatric Nursing	Triannual	6500	6000	507.81	468.75
Journal of Radiology	Semiannual	9000	8500	703.13	664.06
Journal of Social Welfare and Management	Quarterly	8500	8000	664.06	625
New Indian Journal of Surgery	Quarterly	9000	8500	703.13	664.06
Ophthalmology and Allied Sciences	Triannual	7000	6500	546.88	507.81
Pediatrics Education and Research	Quarterly	8500	8000	664.06	625
Physiotherapy and Occupational Therapy Journal	Quarterly	10000	9500	781.25	742.19
RFP Gastroenterology International	Semiannual	7000	6500	546.88	507.81
RFP Indian Journal of Hospital Infection	Semiannual	13500	13000	1054.69	1015.63
RFP Indian Journal of Medical Psychiatry	Semiannual	9000	8500	703.13	664.06
RFP Journal of Biochemistry and Biophysics	Semiannual	8000	7500	625	585.94
RFP Journal of Dermatology	Semiannual	6500	6000	507.81	468.75
RFP Journal of ENT and Allied Sciences	Semiannual	6500	6000	507.81	468.75
RFP Journal of Gerontology and Geriatric Nursing	Semiannual	6500	6000	507.81	468.75
RFP Journal of Hospital Administration	Semiannual	8000	7500	625	585.94
Urology, Nephrology and Andrology International	Semiannual	8500	8000	664.06	625

Terms of Supply:

1. Agency discount 12.5%. Issues will be sent directly to the end user, otherwise foreign rates will be charged.
2. All back volumes of all journals are available at current rates.
3. All journals are available free online with print order within the subscription period.
4. All legal disputes subject to Delhi jurisdiction.
5. Cancellations are not accepted orders once processed.
6. Demand draft/cheque should be issued in favour of "**Red Flower Publication Pvt. Ltd.**" payable at **Delhi.**
7. Full pre-payment is required. It can be done through online (http://rfppl.co.in/subscribe.php?mid=7).
8. No claims will be entertained if not reported within 6 months of the publishing date.
9. Orders and payments are to be sent to our office address as given below.
10. Postage & Handling is included in the subscription rates.
11. Subscription period is accepted on calendar year basis (i.e. Jan to Dec). However orders may be placed any time throughout the year.

Order from

Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India)
Mobile: 8130750089, Phone: 91-11-79695648 E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

International Journal of Food, Nutrition and Dietetics

International Journal of Food, Nutrition & Dietetics (IJFND) (pISSN 2322-0775; eISSN: 2455-569X), a broad-based peer-reviewed journal publish the most exciting researches with respect to the subjects of nutrition and food sciences. The journal covers current thinking on food and nutrition emphasizing the practical and social application of ideas. Special editions focusing on topics including micronutrients, special diets for management of health problems and cost sector catering provide readable content that is an invaluable resource for practitioners and academics wishing to inform themselves, their colleagues, or the public on modern thinking, research, and attitudes to food and nutrition.

Readership: Academics and researchers in the field, Dietitians, Food company managers, Food research institutes, Health care professionals, Nutritionists.

Indexing Information: Index Copernicus, Poland; Genamics JournalSeek; Gaudeamus Academia; Science Library Index; International Committee of Medical Journal Editors (ICMJE).

For all other quiries Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India), Phone: 91-11-79695648, Fax: 91-11-22754205, E-mail: info@rfppl.co.in, Web:www.rfppl.co.in

Printed at Saujanya Printing Press, D-47, Okhla Industrial Area, Phase-1, New Delhi - 110 020.

International Journal of Food, Nutrition & Dietetics (IJFND) (pISSN: 2322-0775, eISSN: 2455-569X), a broad-based peer-reviewed journal publish the most exciting researches with respect to the subjects of nutrition and food sciences. The journal covers current thinking on food and nutrition emphasizing the practical and social application of ideas. Special editions focusing on topics including micronutrients, special diets for management of health problems and cost sector catering provide readable content that is an invaluable resource for practitioners and academics wishing to inform themselves, their colleagues, or the public on modern thinking, research, and attitudes to food and nutrition.

Readership: Academics and researchers in the field, Dietitians, Food company managers, Food research institutes, Health care professionals, Nutritionists

Indexing Information: Genamics JournalSeek Gaudeamus Academia, Science Library Index, International Committee of Medical Journal Editors (ICMJE).

Subscription Information for the year 2022

India

Institutional (1 year) (Print+Online): INR 6500

Rest of the World

Insitutional (1 year) (Print+Online): USD 507.31

Payment instructions

Online payment link:

http://rfppl.co.in/payment.php?mid=15

Cheque/DD:

Please send the US dollar check from outside India and INR check from India made.

Payable to 'Red Flower Publication Private Limited'. Drawn on Delhi branch

Wire transfer/NEFT/RTGS:

Complete Bank Account No. 604320110000467

Beneficiary Name: Red Flower Publication Pvt. Ltd.

Bank & Branch Name: Bank of India; Mayur Vihar

MICR Code: 110013045

Branch Code: 6043

IFSC Code: BKID0006043 (used for RTGS and NEFT transactions)

Swift Code: BKIDINBBDOS

Send all Orders to:

Subscription and Marketing Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091(India),
Phone: 91-11-79695648, E-mail: sales@rfppl.co.in, Website: www.rfppl.co.in

International Journal of Food, Nutrition and Dietetics

Volume 10 Number 3
September – December 2022

Contents

Original Articles

Red Flower Publication (P) Ltd.

Presents its Book Publications for sale

1. **Beyond Medicine: A to E for Medical Professionals) (2020)**
   Kalidas Chavan **INR390/USD31**
2. **Biostatistical Methods For Medical Research (2019)**
   Sanjeev Sarmukaddam **INR549/USD44**
3. **Breast Cancer: Biology, Prevention And Treatment (2015)**
   Dr. A. Ramesh Rao **INR 395/USD31**
4. **Chhotanagpur A Hinterland of Tribes (2020)**
   Ambrish Gautam **INR250/ USD20**
5. **Child Intelligence (2004)**
   Dr. Rajesh Shukla, Md, Dch. **INR100/ USD50**
6. **Clinical Applied Physiology and Solutions (2020)**
   Varun Malhotra **INR263/USD21**
7. **Comprehensive Medical Pharmacology (2019)**
   Dr. Ahmad Najmi **INR599/USD47**
8. **Critical Care Nursing in Emergency Toxicology (2019)**
   Vivekanshu Verma **INR460/USD34**
9. **Digital Payment (Blue Print For Shining India) (2020)**
   Dr. Bishnu Prasad Patro **INR329/USD26**
10. **Drugs in Anesthesia (2020)**
    R. Varaprasad **INR449/USD35**
11. **Drugs In Anesthesia and Critical Care (2020)**
    Dr. Bhavna Gupta **INR595/USD46**
12. **MCQs in Medical Physiology (2019)**
    Dr. Bharati Mehta **INR300/ USD29**
13. **MCQs in Microbiology, Biotechnology and Genetics (2020)**
    Biswajit Batabyal **INR285/USD22**
14. **MCQs In Minimal Access & Bariatric Surgery (2019)**
    Anshuman Kaushal **INR450/USD35**
15. **MCQs In Minimal Access and Bariatric Surgery (2nd Edition) (2020)**
    Anshuman Kaushal **INR545/USD42**
16. **Patient Care Management (2019)**
    A.K. Mohiuddin **INR999/USD78**
17. **Pediatrics Companion (2001)**
    Rajesh Shukla **INR 250/USD50**
18. **Pharmaceutics-1 (A Comprehensive Hand Book) (2021)**
    V. Sandhiya **INR525/ USD50**
19. **Poultry Eggs of India (2020)**
    Prafulla K. Mohanty **INR390/USD30**
20. **Practical Emergency Trauma Toxicology Cases Workbook (2019)**
    Dr. Vivekanshu Verma, Dr. Shiv Rattan Kochar, Dr. Devendra Richhariya **INR395/USD31**
21. **Practical Record Book of Forensic Medicine & Toxicology (2019)**
    Dr. Akhilesh K. Pathak **INR299/USD23**
22. **Recent Advances in Neonatology (2020)**
    Dr. T.M. Ananda Kesavan **INR 845/USD66**
23. **Shipping Economics (2018)**
    Dr. D. Amutha **INR347/USD45**
24. **Skeletal and Structural Organizations of Human Body (2019)**
    Dr. D.R. Singh **INR659/USD51**
25. **Statistics In Genetic Data Analysis (2020)**
    S.Venkatasubramanian **INR299/USD23**
26. **Synopsis of Anesthesia (2019)**
    Dr. Lalit Gupta **INR1195/USD75**

Order from

Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091(India)
Mobile: 8130750089, Phone: 91-11-79695648
E-mail: sales@rfppl.co.in

Original Article

International Journal of Food, Nutrition and Dietetics
Volume 10 Number 3, September – December 2022
DOI: http://dx.doi.org/10.21088/ijfnd.2322.0775.10322.1

Relationship Between Socio-Economic Characteristics with Attitude of Farmers Towards the Extension Services Provided by KVK

Arpita Sharma Kandpal[1], Aviral Bisht[2]

How to cite this article:
Arpita Sharma Kandpal, Aviral Bisht/Relationship Between Socio-Economic Characteristics with Attitude of Farmers Towards the Extension Services Provided by KVK/Int J Food Nutr Diet. 2022;10(3):79–82.

Abstract

Krishi Vigyan Kendras (KVK) are district level agricultural research centres that facilitate the rapid transfer of new technologies to agricultural fields. KVKs are well known for playing a significant role in rural development in terms of improving the social, economic, and cultural wellbeing of rural residents, among other things. Krishi Vigyan Kendra was initially founded to provide training to the many farming community stakeholders. As the years passed, this grassroots organisation underwent a significant transformation, beginning with the generation, testing, and verification of technology before ultimately transmitting it to the end users for the improvement of productivity in particular and for the overall socio-economic development of the rural people in general with its mandated programmes. The study was carried out in Uttarkashi districtand 96 respondents were selected using the PPS (Probability Proportional to Size) method. For the study descriptive research design was used. The results showed that nearly half of the respondents were in the middle age group, had a secondary education, the majority of them have medium level of farm experience, and had medium social participation. Results shows that farming experience and Social Participation had a positive significant relationship with the attitude of farmers towards KVK services. Regarding attitude, it was discovered that the majority of farmers had a neutral attitude toward the extension services provided by KVK Chinyalisaur.

Keywords: KVKs; Farmers; Relationship; Attitude; Socio-Economic Characteristics; Extension Services.

Author Affiliation: [1]Assistant Professor, [2]M.Sc Student, Department of Agricultural Communication, G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand 263145, India.

Corresponding Author: Arpita Sharma Kandpal, Assistant Professor, Department of Agricultural Communication, G.B. Pant University of Agriculture & Technology, Pantnagar, Uttarakhand 263145, India.

E-mail: sharmaarpita615@gmail.com

Received on: 10.12.2022

Accepted on: 31.10.2022

INTRODUCTION

Agriculture is currently expanding as an agribusiness for both rural and urban areas, going beyond merely being a farmer's job. Today's farmers are well-educated, perceptive, intelligent, and open to learning new things that could benefit their line of work. They are utilising the newest technologies to enhance the manufacturing and marketing of their food. Agriculture is prospering as an industry as a result, and it has a greater ability to enhance the socioeconomic situation of rural populations. KVK is an institutional project of ICAR also called as lighthouse for farmers in India with

its main objective to demonstrate the utilisation of science and technological input in agricultural research and education in the fields of farmers in rural areas. The development and demonstration of technology, as well as the training of farmers and extension agents, are the focus areas of KVKs. One of its responsibilities is to provide agricultural and related vocational training to young people in rural areas. India is moving away from "subsistence agriculture" and toward "agriculture for quality of life through financial stability." The other challenges, such as nutritional and food security, are becoming increasingly important everywhere.[1] There are currently 731 KVKs spread across all over the India, the main responsibilities of Krishi Vigyan Kendra is to increase the trainees' knowledge of the improved farm practises. This is important because knowledge is a cognitive component of an individual's mind and plays a significant role in both covert and overt behaviour. People who have a greater understanding of the technical aspects of the improved practises are also more likely to adopt them, possibly because knowledge is not inert.[2] Krishi Vigyan Kendras (KVKs) play a significant role in the evaluation, improvement, and display of technology. Technology assessment, refining, and demonstration must be successful for technology adoption to be successful.[3] As a result, the KVKs' function in the aforementioned procedures is crucial. They are actively promoting rural development by spreading technolog through frontline demonstrations (FLDs), trainings, and extension activities including farmer fairs and kisangosthies. ICAR and SAUs are transferring improved technologies to farmers' fields.

MATERIALS AND METHODS

The study was carried out in Uttarakhand's Uttarkashi district. KVK Chinyalisaur of the Uttarkashi district was purposively chosen because KVK Chinyalisaur received the prestigious Pandit Deen Dayal Upadhyay Krishi Vigyan Protsahan Puraskar from the Indian Council of Agricultural Research (ICAR) in 2019 for their out standing work in promoting agriculture in science and technology. For the study, two blocks i.e. Chinyalisaur and Dundawere chosen at random. Two villages were randomly chosen for the study from each block. The farmers are selected on the basis of probability propotrtionalto size method. A sample size of 96 respondents were chosen for the study in order to determine the attitude of farmers in availing the extension services provided by KVK. Farmers attitude was studied towards training programme, Front line demonstrations, On field trials, instructional services, diagnostic and other advisory services provided by the KVKs. Total 30 statements were taken for the present study and the statements were divided under several heads and scoring was done on a five point continuum with a score of 1 assigned to Strongly disagree, 2 to Disagree, 3 to Undecided, 4 to Agree and 5 to Strongly agree.

RESULTS AND DISCUSSION

An attitude is a state of readiness or a tendency to respond in a particular way. The intensity of positive or negative feelings for a certain psychological item can also be stated. Data from respondents was gathered and divided into the three categories according to the scale. The three categories of unfavourable, neutral and favourable attitude has been presented in Table 1.

According to the above data, most of the respondents (65.62%) had Neutral attitude towards the KVK services, followed by 18.76 percent of the respondents had Favourable attitude towards the KVK services. Only 15.62 percent of the respondents have Unfavourable attitude towards the KVK services. A total of 30 statements were taken and the statements were divided under several heads

Table 1: Distribution of respondents on the basis of their Attitude towards KVK services. (n=96)

S.no	Category	Frequency	Percentage
1.	Unfavourable attitude	15	15.62
2.	Neutral attitude	63	65.62
3.	Favourable attitude	18	18.76
	Total	96	100

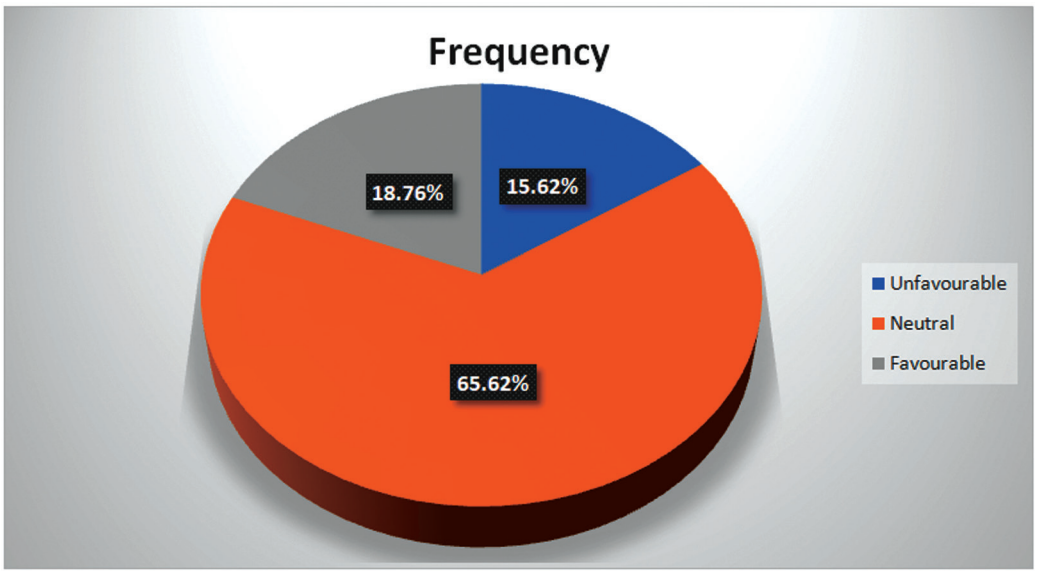

Fig. 1: Representation of respondents on the basis of attitude towards KVK services.

and the scoring was done on a five point continum with a score of 1 asssigned to Strongly disagree, 2 to Disagree, 3 to Undecided, 4 to Agree and 5 to Strongly agree.

Relationship between Socio-economic characteristics with attitude of farmers towards the extension services provided by KVK.

The coefficient of correlation was calculated to find out the relationship between selected socio-economic, communication and psychological characteristics of the farmers towards the extension services provided by KVK. The significance of coefficient of correlation was tested using t-test.

Data regarding relationship between socio-economic, communication and psychological characteristics comprising age, education, family size, farming experience, land holding, annual income, social participation, risk orientation and media exposure with farmers attitude towards extension services provided by KVK have been

Table 2: Correlation between independent and dependent variables.

S.no	Variables	Attitude of Farmers	
		r_{value}	t_{cal}
1.	Age	0.080	0.778
2.	Education	-0.163	-1.635
3.	Family size	-0.056	-0.544
4.	Farming experience	0.213*	2.162
5.	Land holding	0.060	0.618
6.	Annual income	0.021	0.203
7.	Risk orientation	0.003	0.030
8.	Social Participation	0.201*	2.130
9.	Media exposure	0.082	0.798

Significance at 0.05 level of probability, t value = 1.98

presented in Table 2.

The variables Age, Land holding, Annual income, Risk orientation, Media exposure hadnon significant positive relationship with the attitude of farmers towards KVK services at 5 percent level of significance hence null hypotheses proposed for these variable with the attitude of farmers towards KVK services were accepted.

Farming experience and Social Participation had a positive significant relationship with the attitude of farmers towards KVK services at 5 percent level of significance hence null hypotheses proposed for these variable with the attitude of farmers towards KVK services were rejected. Education and Family size had a non significant, negative relationship with the attitude of farmers towards KVK services at 5 percent level of significance hence null hypotheses proposed for these variable with the attitude of farmers towards KVK services were accepted.

CONCLUSION

It can be concluded that thepresent study was an attempt to identify the socio-economic, communicational and psychological characteristics of farmers using KVK services, as well as their attitudes toward those services, the associations between the characteristics and farmers attitude towards the services provided by KVK. The findings reveals that there is a neutral attitude of the farmers towards the KVK services, and the attitude depends on variable farming experience and social participation.

REFERENCES

1. Acharya, S.K., Ghosh, A., Mahato, M., Haque, M., Mazumder, D., Ghoshal, S. and Biswas, Amitava. 2020. Socio-ecological correlates of attitude towards KVK functioning: A multivariate analytical approach. Curr. J. of App. Sci. Tech. 39(37):23-31.
2. Bhatt, J.H. and Katole, S.B. 2017. Impact analysis of activities of KrishiVigyan KendraGujrat. Jour. of Ext. Edu. 28(2):267-270.
3. Singh, K., Peshin, R. and Saini, S.K. 2010. Evaluation of the agricultural vocational training programmes conducted by the KrishiVigyanKendras in India. Jour. of Agri. and Rur. Dev. 111(2): 65-77.

Original Article

International Journal of Food, Nutrition and Dietetics
Volume 10 Number 3, September – December 2022
DOI: http://dx.doi.org/10.21088/ijfnd.2322.0775.10322.2

The Beliefs that Hindering the use of Food and the Scientific Criterion: A Mixed Method Study

Indresh Kumar

How to cite this article:
Indresh Kumar/The Beliefs that Hindering the use of Food and the Scientific Criterion: A Mixed Method Study/Int J Food Nutr Diet. 2022;10(3):85–93.

Abstract

The nutritional status of our country remains worrisome, due to the fever availability of nutritious food and inaccessible access to the community. In such a situation, not using the easily available food due to misconceptions and wrong beliefs is making the situation worse. In this study, the Inhibitors that hinder the use of food items in rural areas of Uttar Pradesh have been studied through a mixed method research design. The study explores the belief for misconceptions hindering the use of food items in the rural community of Uttar Pradesh state and the criterion has been done based on published research articles. The results of the study showed that several assumptions were hindering the use of food ingredients present in the selected area, which did not prove correct with the criterion thought published scientific literature. In the study area, there were a total of 3 assumptions whose claimants were more than 50% of claimants, and 10 assumptions were claimed by more than 20% of claimants. The existing beliefs about pumpkin, meat, bottle gourd, millet, green vegetable, and citrus fruits were not supported by any research article. There is a need to promote the use of all types of food items by removing the existing barriers in the selected area.

Keywords: Misconception; Food myth; Food beliefs; Food assumption, Food items; Food stuff; Food knowledge; Religious beliefs; Rural food.

INTRODUCTION

Everyone needs to think about what they put on the plate and which ingredients should be avoided.[1] It is not enough to fill the stomach with food, but the food should be such that the various nutrients are available in sufficient quantity, the knowledge of these different types of nutritious substances is not appropriate in the rural population in India.[2] Not having enough accurate information about food can be responsible for misconceptions that can hinder the use of much nutrient rich food, while we are already grappling with the problem of low availability of food.[3]

It is generally seen that the initial cause of various diseases can be found in their diet. It is a well known fact that the level of nature of people completely depends on the food and the nutrients obtained from the food.[4] If the food is full of nutrients, the level of health will be equally good. If seen from this point of view, nutritional imbalance is the primary cause of most diseases. Because the adjustment of different food items in the diet seems to be correct by the people only from the point of view of the stomach.[5] But there is a huge

Author Affiliation: Programme Coordinator, Reginal Center of Excellence for Nutrition Rehabilitation, Department of Pediatrics, AIIMS, Bhopal 462020, Madhya Pradesh, India.

Corresponding Author: Indresh Kumar, Programme Coordinator, Reginal Center of Excellence for Nutrition Rehabilitation, Department of Pediatrics, AIIMS, Bhopal 462020, Madhya Pradesh, India.

E-mail: kumar.indresh@hotmail.com

Received on: 22.08.2022 **Accepted on:** 30.09.2022

imbalance in the nutrients obtained from different substances in the food. Nutrients obtained from different food items seem to be somewhat fine from the quantitative point of view but qualitatively it seems to be a very low level because most of the nutrients are being taken from food grains which are not qualitatively superior.[6] For example, in all classes, protein is being consumed more than the required standard level, but due to the majority of it being obtained from food grains, it is not as good as the best protein obtained from foods like eggs, milk, meat, fish and cheese, etc. The same fact is more or less visible concerning other nutrients.[7]

Misconceptions impede better use of available food, due to which health deteriorates, and falls behind in this competitive environment.[8] Some beliefs were as follows, the woman should feed their family first, women should avoid certain foods during pregnancy & lactation, girls need less food than boys, and the sick person needs less food than a healthy person and less food frequency during pregnancy.[9] There were also beliefs they are deprived of nutritious food, for example, some women avoid oranges, guavas, and other fruits during suffering from a cold, whereas vitamin 'C' is found in abundance in these fruits, which is very helpful in overcoming these infections.[10]

The objective of this study was to find out the food beliefs present in the research population and to test the beliefs with the existing research based literature in which that decision can be reached against the existing beliefs.

METHODOLOGY

The local of the study was selected conveniently from the Kanpur and Kannauj districts of Uttar Pradesh state while the selection of the respondent was done by random sampling method. A total of 252 homemakers were interviewed after describing the research proposal and written concerns. The tool used for data collection was constructed based on indications obtained from a previous study; the actual data collection was started only after testing its validity and reliability by the appropriate method. Only such claims have been included in this study, which have been claimed by at least 10 percent of the respondents. The claims made by the respondent were discussed based on research articles already available on the electronic database like Pubmed, Springer Link, Research Gate, Scopus, Web of Science, and GoogleScholar.

RESULTS AND DISCUSSION

Knowledge related to food and nutrition:

Lack of appropriate or proper nutrition knowledge promotes food myths because traditional food beliefs are not refereed based on logic.[11] Food myths are nutritional beliefs that people take as gospel but that are ill supported by or even at odds with the best available scientific evidence. Nutritional knowledge is a powerful weapon in the fight against false information and the promotion of healthy eating choices.[12] Hence, it

Table 1: Nutrition knowledge of adults

Food required for	Relevant answer		Irrelevant answer		Don't know	
	N	%	n	%	n	%
Provide energy	85	41.87	75	36.06	43	41.35
Prevent illness	64	30.77	91	43.75	53	25.48
Prevent anemia	61	29.33	84	40.38	63	30.29
Growth & maintenance	52	25.62	88	42.31	63	25.00
Build teeth/bones	44	21.15	88	42.31	76	36.54
Healthy eyes	40	19.23	97	46.63	71	34.13
Prevent obesity	32	15.38	110	52.88	66	31.73
Average	54	26.19	90	43.48	62	32.07

was concluded that, despite the levels of nutritional knowledge, there are still several food myths that need to be debunked, through the proper channels, to promote healthy, balanced, and adequate eating behaviors.

Participants were lacking in nutrition related knowledge; 41.87% gave the correct response when asked about the energy giving foods 32 respondents gave the right answer about foods needed for growth & maintenance. Overall, only 26.19% of the respondents gave relevant answers, 43.48% irrelevant answers, and 32.07% of respondents did not know anything about the above subjects.

Better utilization of all available food items

Table 2: Popular beliefs that are hindering the use of food (n=252)

S. no.	Name of food stuff	Inhibitors	Claimants	
			In nos	In %
1.	Non-vegetarian (Except eggs)	Non-vegetarian food is not good for the health	209	82.94
2.	Pumpkin	Only men can cut the pumpkin; pumpkin vegetables cannot be made if there is no man available for engraving.	169	67.06
3.	Citrus fruits	Consumption of citrus fruitsis harmful in cold	136	53.97
4.	Green vegetables	Eating green vegetables during pregnancy will increase the chances of a pregnant woman getting a cold.	121	48.02
5.	Dry pea	Using dry peas produces gas, upset stomach, and digestive problems arise	111	44.05
6.	Bengal gram dal	Upset stomach and digestive problems arise	106	42.06
7.	Brinjal	Eating brinjal increases the pain in joints, which is why many people do not like brinjal.	86	34.13
8.	Meat	Eating meat causes more anger	81	32.14
9.	Ladies finger	Increases the joints pain	68	26.98
10.	Banana	Eating bananas during pregnancy caused cold	63	25.00
11.	Black gram dal	Increases the joints pain	60	23.81
12.	Bottle guard	Eating bottle gourd seeds causes birth to a girl child.	55	21.83
13.	Millets (bajra)	Feeding bajra to children can make their color darker.	51	20.04
14.	Green vegetables	Only fresh vegetables are	48	19.05
15.	Green vegetables	Green vegetables are easily digested	36	14.29

is necessary for a healthy diet, but due to some misbeliefs and myths that are hindering the use of food variety. Respondents, 24% reported that eating dry peas or Bengal gram dal causes acidity, so they were not wanted to cook. 67.06% of people claimed that Pumpkins could be cut only by men; if no men were available in the HH, then there was a problem with carving the pumpkin. The above table shows that several types of food inhibitors were prevalent in the populations.

(1) Non-vegetarian food is not good for

health:

In a selected population, 82.94% of the respondents believed that non-vegetarian food is harmful to health. By the way, there are many reasons behind the less use of non-vegetarian food in the large population of India like religious restrictions, compassion towards animals, and misconceptions about non-vegetarian food. According to Kumar and Gautam, the villagers of Uttar Pradesh sell meat for 97% of the total production because they have compassion for the animals they nurture and do not want to see them as food.[6]

Reviewed research articles showing that including chicken mutton and fish has several health benefits because this type of food is rich in protein and vitamins.[13] Non-vegetarian food strengthens muscles and helps them grow faster. It also helps to maintain body stamina and hemoglobin. Vitamin B 12 and iron found in meat, and fish are in abundance and It is very important for the formation of red blood cells and nerve fibers. If bodies do not produce enough red blood cells it can lead to iron deficiency known as anemia.[14] According to medical science, a diet constituting seafood like fish and eggs sharpens our intellect and promotes the smooth functioning of our brain.

The protein content in it is quite more than what is required by the body. Non-vegetarian food has a higher amount of protein content, and much intake of meat makes digestion difficult. Consuming much non-vegetarian food may lead to acidity and constipation which in turn might cause other digestion related complications as well.[15] Overall researchshows that the intake of non-vegetarian food in prescribed amounts is beneficial for health.[16]

(2) Only men can cut the pumpkin:

It was a belief that only men can cut pumpkins, due to which if there are only women in the house, then it is not used to make pumpkin curry.[16,17] There was no scientific basis for this, but 67.06% of the respondents believed in this tradition. Pumpkin is an affordable and available all season vegetable for rural areas of Uttar Pradesh. Many types of research show that the potassium, fiber, and vitamin C in pumpkin can all help you keep your blood pressure low.[18] Eating pumpkin every day is a great way to promote good gut health and a strong heart. After being rich in nutrients, hindering barriers to pumpkin use is a matter of concern.

(3) Consumption of citrus fruits is harmful in cold:

The present research shows that 53.97% of respondents claimed that citrus fruits are not good during the cold and winter. In winter most rural people were avoiding the use of citrus fruits like lemon, orange, and other citrus fruits.

But several types of research show that the consumption of fruits and vegetables containing vitamin C is very beneficial for health.[19] It is believed that they should not be consumed in the problem of cold and flu. It is wrong to believe so. There is an immunity booster, which is useful in these problems.[19,22] There is no harm in consuming them for cold and flu. Because oranges are rich in vitamin C, we believe falsely that eating them can help cure a cold. Let us be clear: after the onset of cold symptoms, eating oranges or drinking orange juice is not an effective treatment.[20,21]

(4) Eating green vegetables during pregnancy will increase the chances of a pregnant woman getting a cold:

48.02% of the population believed that eating green vegetables during pregnancy can cause a cold in the mother, she used to avoid eating vegetables with high water content. Green vegetables have an important role during pregnancy, so misconceptions about them can be a hindrance to the use of green vegetables.

Greens and sprouts are generally great foods to add to the diet as they contain large amounts of fiber and nutrients.[23] Most of the studies suggested adding all these vegetables to the diet and walking through the pregnancy journey with a happy mind and healthy body supplied with the vitamins and nutrients they need for healthy growth. According to *Kumar et al., (2022)*, Dark greens also supply a significant amount of folate, a B vitamin that promotes heart health and helps protect against some kinds of birth defects.[24,25] However, some greens or sprouts may contain bacteria, such as Salmonella or E. coli, which can cause infection but there is never a danger in eating green vegetables by washing them well, they are rich in nutrients.[26]

(5) Using dry peas produces gas, upset stomach, and digestive problems arise:

The 44.05% of the population of the study area experienced and believed that eating peas causes stomach problems, which is why they avoided the use of peas. Peas contain high amounts of complex sugar called raffinose, which the body has trouble breaking down.[27] Peas are also rich in fiber, and a high intake of fiber can increase gassiness.[28] Peas are available in abundance in Uttar Pradesh and its price also works with all parties, it is a cheap source of protein. Therefore, after soaking the peas once, the problem can be reduced by throwing away

their water.[29,30]

(6) Use of Bengal gram upset stomach and digestive problems arise:

Bengal Gram, also better known as dark brown peas or chana, is widely regarded as an important pulse, owing to its nutritional properties.[31] It contains a good amount of iron, sodium, and selenium in addition to small doses of manganese, copper, and zinc. A handful of Bengal gram is a very good source of fiber and folic acid. The 42.06% of the population (Table 2) of the study area experienced and believed that eating Bengal gram causes stomach problems, which is why they avoided the use.

According to Bodagh and Maleki (2018), Chana also has certain medicinal properties.[31] Always soak some grams overnight and then have them in the morning along with a dollop of honey.[32,33] The water can be macerated and consumed as a healthy tonic. Sprouted Bengal gram also serves as a great source of vitamins and B-complex.[34]

(7) Eating brinjal increases the pain in joints:

Brinjal has a wide array of health benefits like getting strong bones and offsets the onset of osteoporosis.[35,1] It helps to deal with symptoms of anemia, increases cognitive function, improves cardiovascular health, and, even, protects the digestive system. Furthermore, brinjal also helps you to lose weight, reduces stress levels, helps to protect infants from birth defects, and also fights some strains of cancer.[36] In the study area, 34.13% of the population reported that eating brinjal caused increased pain in joints.

Despite all the health benefits that brinjal provides, consumption of this vegetable in large quantities can have some harmful effects on the body.[37,3] Nasunin, present in brinjal is a phytochemical which can bind with iron and remove it from the cells. The oxalates in this vegetable can cause stones in the kidney.[38,39]

(8) Eating meat causes more anger:

According to research presented at a recent symposium at McGill, seeing meat appears to make human beings significantly less aggressive.[40] Protein consumption (from foods like fish, beef, chicken, turkey, tofu, beans, eggs, and unsweetened yogurt) has been linked to higher levels of dopamine and norepinephrine, which are brain chemicals that play a role in your mood, motivation, and concentration.[41,42,43] In the present study 32.14% of the population in study areas showed that eating meat causes more anger.

(9) Lady's finger Increases the joints pain:

In the present study, it was found against the lady's finger, after eating it, joint pain is not confirmed by any research paper. 26.98% of the population believed that eating okra causes joint pain (Table 2). There are no studies that report any major side effects of ladyfinger. However, some people might be allergic to a lady'sfinger. According to *Tschon et al., 2021*, the lady's fingercontains solanine, which is a toxic compound that may trigger joint pain, arthritis, and prolonged inflammation in some people.[44] Potatoes, tomatoes, eggplant, blueberries, and artichokes also contain solanine. Excessive use of any fingercan cause side effects, but mixed amounts are beneficial for health.[6]

(10) Eating bananas during pregnancy caused cold:

Researchers suggested that bananas should be on the top of your list and can be eaten throughout pregnancy.[45] They are rich in carbohydrates and will give you the much needed energy during this time. Bananas are super healthy for those ladies who suffer from anemia, as it gives a good boost to the hemoglobin levels.[46] But 25.00% of the participants (table 2) of the study population claimed that pregnant women should not eat bananas because they can cause cold problems in pregnant women. When pregnant women in our country are suffering from underweight and anemia, in a situation, bananas can prove to be a portion of good food, if there is a need for proper use.

Banana is healthy and energizing but should be avoided at night during winter only if the person is suffering from cough and cold or other respiratory ailments as it irritates when it comes in contact with mucus or phlegm.[47-49]

(11) Black Gram Dal Increases joints pain:

Black gram can improve digestion as it is filled with fibers that help with the bulking up and movement of your stool.[51,52] It can therefore be used to combat both, constipation and diarrhea.[50] It boosts your energy by helping provide more oxygenated blood to your organs. It increases your bone mineral density, making bones stronger and healthier as you grow older. In the present research, 23.81% of the participants of the study population claimed that eating black gram dal increases the problem of joint pain.

One of the main issues of consuming high amounts of black grams is that it increases the amount of uric acid in blood.[53] As a result, it can stimulate the calcification stones in the kidney. Even though it is known to prevent the same, very

high quantities of a black gram can induce the very thing you want it to prevent. It is proved by all the studies that use in excessive quantity can be harmful but use in prescribed quantity is beneficial.[17]

(12) Eating bottle gourd seeds causes birth to a girl child:

Bottle gourd is not liked by all for its bland and sour taste, but it is a very healthy vegetable. It offers several health benefits, especially for pregnant women. Pregnant women need to strengthen their immune system as their nutrients get used up very fast in the path towards the delivery of their baby, and eating bottle gourd can fulfill that need.

There was only a myth about bottle gourd; it in no way proved scientifically that eating gourd seeds increases the chances of giving birth to a girl child. In the present study, 21.83% of the participants believed that eating gourd seeds would increase the chances of having a girl. According to Kumar and *Gautam (2020)*, women who are planning to become pregnant avoid eating bottle gourd, which will help them to reduce the chances of having a girl child.[10,17]

(13) Feeding bajra to children can make their color darker:

Millets are gluten free, rich in fiber grain that is a nutritious, highly digestible grain that is both nutritious and easy to prepare.[54] This grain is considered one of the least allergenic foods available today.[55] It very closely resembles barley in terms of size and shape but is high in fiber, which makes it easy to digest. Millets are also considered superfoods because it is additionally rich in Vitamin B, Protein, Potassium, Iron, Magnesium, and Phosphorus.[56]

In the present study, 19.84% of the participants believed that the leftovers born from eating millet increased the chances of darkening when the studied article proved that millet is beneficial for healthy skin. According to research, Bajra is extremely rich in several nutrients such as protein, vitamin B6, zinc, iron, and folate. These nutrients altogether are responsible for healthy hair and skin.[57,8]

(14) Only fresh vegetables are best:

19.05 % of the participants in the current study believed that only fresh vegetables were rich in nutrients. In today's time, vegetables and fruits are available in many forms, fresh, canned, and dried.[58] All fruits and vegetables are such that after being processed, they are sent to the market. In such a situation, need to know how beneficial their consumption is for you. Fruits and vegetables that come canned or dried in the market are equally beneficial for health.[59,60] Provided that no harmful chemical substances have been used in their processing. There are many areas of India where many vegetables like cabbage are dried and used.[61] They also contain nutrients beneficial for health.

(15) Green vegetables are easily digested:

In the present study, 14.29% of the participants believed that green vegetables go quickly. Green leafy vegetables and greens are rich in fiber. After consuming them, the stomach takes more time to digest them.[62] Due to the presence of fiber in abundance, the stomach has to work harder to metabolize them. Chew them properly then they can be easily digested.[63] In such a situation, it would be completely wrong to say that green vegetables are easily digested.[64]

According to *Kumar et al. (2022)*, There were religious feelings and some food myth was responsible for less consumption of meat and eggs, their consumption could be increased by resolving food myth related issues.[10] Only 12.06% of the fish was consumed in HHs out of the total produced, 2.21% was shared with other HHs, and the remaining 80.88% was sold. Most people were vegetarian, and have sold 100% of the total meat production.[17] At a time when pregnant women, adolescent girls, and survivors are suffering from nutritional deficiency, confusion about such nutritious food items can add to the problem, today there is a need to remove all the hinders and make proper use of them.[65,66]

CONCLUSION

For the improvement in the nutrition status of vulnerable groups, the emphasis has to be on full utilization of the available food items and the existing obstructions have to be removed. In this article, the misconceptions present in the rural population of Uttar Pradesh state, the scenario have been discussed by studying the available research article and it was found that many misconceptions and wrong beliefs about food are affecting the nutrition of the community. Some misconceptions were as follows (highest claimants to lowest): non-vegetarian food is not good for the health (82.94%), only men can cut the pumpkin (67.06%) pumpkin vegetables cannot be made if there is no man available for engraving, consumption of citrus fruits is harmful in cold (53.97%), eating green vegetables during pregnancy will increase the chances of a pregnant woman getting a cold (48.02%), using dry

peas and Bengal gram dal produces gas (42.05%), upset stomach, and digestive problems arise. Most of the myths were beliefs, which were not proved to be true based on the research paper studied and to be used in a prescribed quantity. The use of all types of food items in a combination proves beneficial.

REFERENCES

1. Conlon MA, Bird AR. The impact of diet and lifestyle on gut microbiota and human health. Nutrients. 2014 Dec 24;7(1):17-44. doi: 10.3390/nu7010017.
2. Cena H, Calder PC. Defining a Healthy Diet: Evidence for The Role of Contemporary Dietary Patterns in Health and Disease. Nutrients. 2020 Jan 27;12(2):334. doi: 10.3390/nu12020334.
3. Hoogenboom BJ, Morris J, Morris C, Schaefer K. Nutritional knowledge and eating behaviors of female, collegiate swimmers. N Am J Sports PhysTher. 2019 Aug;4(3):139-48.
4. Govender L, Pillay K, Siwela M, Modi A, Mabhaudhi T. Food and Nutrition Insecurity in Selected Rural Communities of KwaZulu-Natal, South Africa-Linking Human Nutrition and Agriculture. Int J Environ Res Public Health. 2016 Dec 27;14(1):17. doi: 10.3390/ijerph14010017.
5. P S. Socioeconomic determinants of nutritional status among 'Baiga' tribal children In Balaghat district of Madhya Pradesh: A qualitative study. PLoS One. 2019 Nov 21;14(11):e0225119. doi: 10.1371/journal.pone.0225119.
6. Indresh Kumar, Priya Yadav, Madhulika Gautam, et al./Impact of Heat on Naturally Present Digestive Enzymes in Food/ Int J Food Nutr Diet. 2022;10(2):57–63.
7. Stoll S. Common Misconceptions in the Nutritional Management of Athletes. Am J Lifestyle Med. 2018 Apr 21;12(5):387-390. doi: 10.1177/1559827618766484.
8. Florença SG, Ferreira M, Lacerda I, Maia A. Food Myths or Food Facts? Study about Perceptions and Knowledge in a Portuguese Sample. Foods. 2021 Nov 9;10(11):2746. doi: 10.3390/foods10112746.
9. Lesser LI, Mazza MC, Lucan SC. Nutrition myths and healthy dietary advice in clinical practice. Am Fam Physician. 2015 May 1;91(9):634-8.
10. Kumar, I and Gautam, M.Enhance the Nutritive Value of Diet through Dietary Diversity in the Rural area of Uttar Pradesh: an intervention-based study. Indian Res. J. Ext. Edu. 2022; 22 (2), pp. 29-33 https://doi.org/10.54986/irjee/2022/apr_jun/29-33.
11. Wansink B, Shimizu M, Brumberg A. Dispelling myths about a new healthful food can be more motivating than promoting nutritional benefits: the case of Tofu. Eat Behav. 2014 Apr;15(2):318-20. doi: 10.1016/j.eatbeh.2014.03.016. Epub 2014 Apr 4.
12. Verbanac D, Maleš Ž, Barišić K. Nutrition - facts and myths. Acta Pharm. 2019 Dec 1;69(4):497-510. doi: 10.2478/acph-2019-0051.
13. Gómez-Pinilla F. Brain foods: the effects of nutrients on brain function. Nat Rev Neurosci. 2008 Jul;9(7):568-78. doi: 10.1038/nrn2421.
14. Kokubun K, Nemoto K, Yamakawa Y. Fish Intake May Affect Brain Structure and Improve Cognitive Ability in Healthy People. Front Aging Neurosci. 2020 Mar 20;12:76. doi: 10.3389/fnagi.2020.00076.
15. Bradbury J. Docosahexaenoic acid (DHA): an ancient nutrient for the modern human brain. Nutrients. 2011 May;3(5):529-54. doi: 10.3390/nu3050529. Epub 2011 May 10.
16. Justo G, de Oliveira EM, Jurberg C. Functional foods and cancer on Pinterest and PubMed: myths and science. Future Sci OA. 2018 Aug 9;4(9):FSO328. doi: 10.4155/fsoa-2018-0023.
17. Indresh Kumar, Madhulika Gautam/ Determinants of Dietary Diversity Score for the Rural Households of Uttar Pradesh State/Int J Food Nutr Diet. 2022;10(1):9–16.
18. Chianese R, Coccurello R, Viggiano A, Scafuro M, Fiore M, Coppola G, Operto FF, Fasano S, Laye S, Pierantoni R, Meccariello R. Impact of Dietary Fats on Brain Functions. CurrNeuropharmacol. 2018;16(7):1059-1085. doi: 10.2174/1570159X15666171017102547.
19. Lv X, Zhao S, Ning Z, Zeng H, Shu Y, Tao O, Xiao C, Lu C, Liu Y. Citrus fruits as a treasure trove of active natural metabolites that potentially provide benefits for human health. Chem Cent J. 2015 Dec 24;9:68. doi: 10.1186/s13065-015-0145-9.
20. Forastiere F, Pistelli R, Sestini P, Fortes C, Renzoni E, Rusconi F, Dell'Orco V, Ciccone G, Bisanti L. Consumption of fresh fruit rich in vitamin C and wheezing symptoms in children. SIDRIA Collaborative Group, Italy (Italian Studies on Respiratory Disorders in Children and the Environment). Thorax. 2000 Apr;55(4):283-8. doi: 10.1136/thorax.55.4.283.
21. Abdel-Salam OM, Youness ER, Mohammed NA, Morsy SM, Omara EA, Sleem AA. Citric acid effects on brain and liver oxidative stress in lipopolysaccharide-treated mice. J Med Food. 2014 May;17(5):588-98. doi: 10.1089/jmf.2013.0065. Epub 2014 Jan 16.
22. Miles EA, Calder PC. Effects of Citrus Fruit Juices and Their Bioactive Components on Inflammation and Immunity: A Narrative Review. Front Immunol. 2021 Jun 24;12:712608.

doi: 10.3389/fimmu.2021.712608.

23. Klimek-Szczykutowicz M, Szopa A, Ekiert H. Citrus limon (Lemon) Phenomenon-A Review of the Chemistry, Pharmacological Properties, Applications in the Modern Pharmaceutical, Food, and Cosmetics Industries, and Biotechnological Studies. Plants (Basel). 2020 Jan 17;9(1):119. doi: 10.3390/plants9010119.
24. Kominiarek MA, Rajan P. Nutrition Recommendations in Pregnancy and Lactation. Med Clin North Am. 2016 Nov;100(6):1199-1215. doi: 10.1016/j.mcna.2016.06.004.
25. Kumar, I; Gautam, M. Correlation between Individual Dietary Diversity Score and Nutrients Adequacy Ratio in the Rural Community. SPR. 2021;1(4):258–263. https://doi.org/10.52152/spr/2021.143.
26. Ricci E, Chiaffarino F, Cipriani S, Malvezzi M, Parazzini F. Diet in pregnancy and risk of small for gestational age birth: results from a retrospective case-control study in Italy. Matern Child Nutr. 2010 Oct;6(4):297-305. doi: 10.1111/j.1740-8709.2009.00218.x.
27. Kumar I, and Gautam M, Excessive intake of micronutrients in rural population of Uttar Pradesh state, SPR, 2022, Volume 2, issue 2, Page No.: 515-519. DOI: https://doi.org/10.52152/spr/2021.174.
28. Cozma-Petruț A, Loghin F, Miere D, Dumitrașcu DL. Diet in irritable bowel syndrome: What to recommend, not what to forbid to patients! World J Gastroenterol. 2017 Jun 7;23(21):3771-3783. doi: 10.3748/wjg.v23.i21.3771.
29. Mäkinen KK. Gastrointestinal Disturbances Associated with the Consumption of Sugar Alcohols with Special Consideration of Xylitol: Scientific Review and Instructions for Dentists and Other Health-Care Professionals. Int J Dent. 2016;2016:5967907. doi: 10.1155/2016/5967907. Epub 2016 Oct 20.
30. Hasler WL. Gas and Bloating. Gastroenterol Hepatol (N Y). 2006 Sep;2(9):654-662.
31. NikkhahBodagh M, Maleki I, Hekmatdoost A. Ginger in gastrointestinal disorders: A systematic review of clinical trials. Food SciNutr. 2018 Nov 5;7(1):96-108. doi: 10.1002/fsn3.807.
32. Kalaitzakis E. Gastrointestinal dysfunction in liver cirrhosis. World J Gastroenterol. 2014 Oct 28;20(40):14686-95. doi: 10.3748/wjg.v20.i40.14686.
33. Villapol S. Gastrointestinal symptoms associated with COVID-19: impact on the gut microbiome. Transl Res. 2020 Dec;226:57-69. doi: 10.1016/j.trsl.2020.08.004. Epub 2020 Aug 20.
34. Lete I, Allué J. The Effectiveness of Ginger in the Prevention of Nausea and Vomiting during Pregnancy and Chemotherapy. Integr Med Insights. 2016 Mar 31;11:11-7. doi: 10.4137/IMI.S36273.
35. Dumic I, Nordin T, Jecmenica M, StojkovicLalosevic M, Milosavljevic T, Milovanovic T. Gastrointestinal Tract Disorders in Older Age. Can J Gastroenterol Hepatol. 2019 Jan 17;2019:6757524. doi: 10.1155/2019/6757524.
36. Tedeschi SK, Frits M, Cui J, Zhang ZZ, Mahmoud T, Iannaccone C, Lin TC, Yoshida K, Weinblatt ME, Shadick NA, Solomon DH. Diet and Rheumatoid Arthritis Symptoms: Survey Results From a Rheumatoid Arthritis Registry. Arthritis Care Res (Hoboken). 2017 Dec;69(12):1920-1925. doi: 10.1002/acr.23225.
37. Khanna S, Jaiswal KS, Gupta B. Managing Rheumatoid Arthritis with Dietary Interventions. Front Nutr. 2017 Nov 8;4:52. doi: 10.3389/fnut.2017.00052. PMID: 29167795; PMCID: PMC5682732.
38. Nezamoleslami S, Ghiasvand R, Feizi A, Salesi M, Pourmasoumi M. The relationship between dietary patterns and rheumatoid arthritis: a case-control study. NutrMetab (Lond). 2020 Sep 17;17:75. doi: 10.1186/s12986-020-00502-7.
39. BasuA , Schell J , Scofield RH . Dietary fruits and arthritis. Food Funct. 2018 Jan 24;9(1):70-77. doi: 10.1039/c7fo01435j.
40. Modlinska K, Pisula W. Selected Psychological Aspects of Meat Consumption-A Short Review. Nutrients. 2018 Sep 14;10(9):1301. doi: 10.3390/nu10091301.
41. Appelhans BM, Whited MC, Schneider KL, Oleski J, Pagoto SL. Response style and vulnerability to anger-induced eating in obese adults. Eat Behav. 2011 Jan;12(1):9-14. doi: 10.1016/j.eatbeh.2010.08.009. Epub 2010 Sep 17.
42. BattagliaRichi E, Baumer B, Conrad B, Darioli R, Schmid A, Keller U. Health Risks Associated with Meat Consumption: A Review of Epidemiological Studies. Int J VitamNutr Res. 2015;85(1-2):70-8. doi: 10.1024/0300-9831/a000224.
43. Amiot CE, El Hajj Boutros G, Sukhanova K, Karelis AD. Testing a novel multicomponent intervention to reduce meat consumption in young men. PLoS One. 2018 Oct 11;13(10):e0204590. doi: 10.1371/journal.pone.0204590.
44. Tschon M, Contartese D, Pagani S, Borsari V, Fini M. Gender and Sex Are Key Determinants in Osteoarthritis Not Only Confounding Variables. A Systematic Review of Clinical Data. J Clin Med. 2021 Jul 19;10(14):3178. doi: 10.3390/jcm10143178.
45. Chakrabarti S, Chakrabarti A. Food taboos in

pregnancy and early lactation among women living in a rural area of West Bengal. J Family Med Prim Care. 2019 Jan;8(1):86-90. doi: 10.4103/jfmpc.jfmpc_53_17.

46. Santiago SE, Park GH, Huffman KJ. Consumption habits of pregnant women and implications for developmental biology: a survey of predominantly Hispanic women in California. Nutr J. 2013 Jul 1;12:91. doi: 10.1186/1475-2891-12-91.
47. Lunkenheimer HG, Burger O, Akhauri S, Chaudhuri I, Dibbell L, Hashmi FA, Johnson T, Little EE, Mondal S, Mor N, Saldanha N, Schooley J, Legare CH. Tradition, taste and taboo: the gastroecology of maternal perinatal diet. BMJ NutrPrev Health. 2021 Jul 5;4(2):385-396. doi: 10.1136/bmjnph-2021-000252.
48. Tela FG, Gebremariam LW, Beyene SA. Food taboos and related misperceptions during pregnancy in Mekelle city, Tigray, Northern Ethiopia. PLoS One. 2020 Oct 13;15(10):e0239451. doi: 10.1371/journal.pone.0239451.
49. Riang'a RM, Broerse J, Nangulu AK. Food beliefs and practices among the Kalenjin pregnant women in rural UasinGishu County, Kenya. J EthnobiolEthnomed. 2017 May 25;13(1):29. doi: 10.1186/s13002-017-0157-8.
50. Rajagopal V, Pushpan CK, Antony H. Comparative effect of horse gram and black gram on inflammatory mediators and antioxidant status. J Food Drug Anal. 2017 Oct;25(4):845-853. doi: 10.1016/j.jfda.2016.08.010. Epub 2016 Nov 11.
51. JW, Yang M, Park S. Efficacy of Turmeric Extracts and Curcumin for Alleviating the Symptoms of Joint Arthritis: A Systematic Review and Meta-Analysis of Randomized Clinical Trials. J Med Food. 2016 Aug;19(8):717-29. doi: 10.1089/jmf.2016.3705.
52. Gupta RC, Lall R, Srivastava A, Sinha A. Hyaluronic Acid: Molecular Mechanisms and Therapeutic Trajectory. Front Vet Sci. 2019 Jun 25;6:192. doi: 10.3389/fvets.2019.00192.
53. Ragab G, Elshahaly M, Bardin T. Gout: An old disease in new perspective - A review. J Adv Res. 2017 Sep;8(5):495-511. doi: 10.1016/j.jare.2017.04.008. Epub 2017 May 10.
54. Mudau M, Mashau ME, Ramashia SE. Nutritional Quality, Antioxidant, Microstructural and Sensory Properties of Spontaneously Fermented Gluten-Free Finger Millet Biscuits. Foods. 2022 Apr 27;11(9):1265. doi: 10.3390/foods11091265.
55. Gowda NAN, Siliveru K, Prasad PVV, Bhatt Y, Netravati BP, Gurikar C. Modern Processing of Indian Millets: A Perspective on Changes in Nutritional Properties. Foods. 2022 Feb 9;11(4):499. doi: 10.3390/foods11040499.
56. Sharma M, Kishore A, Roy D, Joshi K. A comparison of the Indian diet with the EAT-Lancet reference diet. BMC Public Health. 2020 May 29;20(1):812. doi: 10.1186/s12889-020-08951-8. PMID: 32471408; PMCID: PMC7260780.
57. Hassan ZM, Sebola NA, Mabelebele M. The nutritional use of millet grain for food and feed: a review. Agric Food Secur. 2021;10(1):16. doi: 10.1186/s40066-020-00282-6. Epub 2021 Mar 29.
58. Brouwer-Brolsma EM, Brandl B, Buso MEC, Skurk T, Manach C. Food intake biomarkers for green leafy vegetables, bulb vegetables, and stem vegetables: a review. Genes Nutr. 2020 Apr 9;15(1):7. doi: 10.1186/s12263-020-00667-z.
59. Slavin JL, Lloyd B. Health benefits of fruits and vegetables. AdvNutr. 2012 Jul 1;3(4):506-16. doi: 10.3945/an.112.002154.
60. Pem D, Jeewon R. Fruit and Vegetable Intake: Benefits and Progress of Nutrition Education Interventions-Narrative Review Article. Iran J Public Health. 2015 Oct;44(10):1309-21.
61. Lattimer JM, Haub MD. Effects of dietary fiber and its components on metabolic health. Nutrients. 2010 Dec;2(12):1266-89. doi: 10.3390/nu2121266. Epub 2010 Dec 15.
62. Minich DM. A Review of the Science of Colorful, Plant-Based Food and Practical Strategies for "Eating the Rainbow". J NutrMetab. 2019 Jun 2;2019:2125070. doi: 10.1155/2019/2125070. Erratum in: J NutrMetab. 2020 Nov 28;2020:5631762.
63. Melse-Boonstra A. Bioavailability of Micronutrients From Nutrient-Dense Whole Foods: Zooming in on Dairy, Vegetables, and Fruits. Front Nutr. 2020 Jul 24;7:101. doi: 10.3389/fnut.2020.00101.
64. Drulyte D, Orlien V. The Effect of Processing on Digestion of Legume Proteins. Foods. 2019 Jun 24;8(6):224. doi: 10.3390/foods8060224.
65. Livovsky DM, Pribic T, Azpiroz F. Food, Eating, and the Gastrointestinal Tract. Nutrients. 2020 Apr 2;12(4):986. doi: 10.3390/nu12040986.

Original Article

International Journal of Food, Nutrition and Dietetics
Volume 10 Number 3, September – December 2022
DOI: http://dx.doi.org/10.21088/ijfnd.2322.0775.10322.3

Evaluation of in Vitro Antioxidant & Antidiabetic Effects of Garden Cress Seed (Lepidium Sativum)

Minaxi R Prajapati[1], K B Kamaliya[2]

How to cite this article:
Minaxi R Prajapati, K B Kamaliya/Evaluation of in Vitro Antioxidant & Antidiabetic Effects of Garden Cress Seed (Lepidium Sativum)/Int J Food Nutr Diet. 2022;10(3):95–99.

Abstract

Foods rich in antioxidants have gained much attention due to their health promoting activities. These foods are also referred as a neutraceuticals as they prevent many of degenerative diseases like diabetes mellitus, cancer, blood pressure and heart diseases. Garden cress seed have been used in India since ancient time. It possesses numerous health benefits such as antianaemic effect, Antimicrobial Activity, Antidiabetic and Anti-oxidant effect. In the present study, Garden cress seed was evaluated for its in vitro antioxidant and antidiabetic activities. Antioxidants activities of Garden cress seed was studies by DPPH and ABTS method. Whole seed showed 22.63% DPPH radical inhibition and 13.78% ABTS radical inhibition. Antidiabetic activity was studies by using Non enzymatic Glycosylation of hemoglobin (NEGH) and α amylase inhibition activity. Non enzymatic Glycosylation of hemoglobin inhibition was 71.42% and α amylase inhibition was 66.53%. Results suggest potential health benefiting activities of Garden cress seed. These benefits must be utilized by incorporating seed in daily diet.

Keywords: Antioxidants; Antidiabetic; Degenerative diseases; Inhibition.

INTRODUCTION

There is growing scientific evidence associating diets rich in antioxidant compounds which occur particularly in plant foods with a lower risk of developing cardiovascular disease, certain kinds of cancer and age related degenerative processes.[8] Particular attention has been paid to their role as "free radical scavengers" and has provoked numerous studies into phenolic compounds in many plants such as fruits, vegetables, nuts and plant seed. Fruits, vegetables and nuts are popular for their health beneficial effects. Among the lists of functional foods which possess various neutraceuticals properties, Garden cress seed is one of the plant seed with high nutritional value and functional properties.[13]

Garden cress seed belongs to Brassicaceae family and its scientific name is Lepidium sativum. Common names of Garden cress seed includes Common Cress (English), Halim (Bengali), Aseliyo (Gujrati), Chansur (Hindi), Allibija, Kapila (Kannada), Alian (Kashmiri) Asali (Malayalam), Ahaliva, Haliv (Marathi), Allivirai (Tamil) and Adityalu, Aadalu (Telugu).[3] In spite of great medicinal value, seed has not received much attention. Only few studies are available which describe chemical composition of seed.[13,4] In traditional medicinal system, Garden cress seed have been widely used in treating various health issues such as hypertension, diabetes and kidney diseases and in prevention of cancer, cardiovascular

Author Affiliation: [1]Assistant Professor, [2]Principal, Department of Polytechnic in Food Science and Home Economics, Anand Agricultural University, Anand, Gujarat 388110, India.

Corresponding Author: Minaxi R Prajapati, Assistant Professor, Department of Polytechnic in Food Science and Home Economics, Anand Agricultural University, Anand, Gujarat 388110, India.

E-mail: mk85@aau.in

Received on: 26.07.2022 **Accepted on:** 28.08.2022

diseases and mild glycemia in diabetic patients.[7]

Research revealed that Garden cress seed possesses strong anticancer effect on breast cancer cell.[11] Traditionally Garden cress seed are used in fracture healing long back. A study conducted on 6 adult rabbits reveled that compared to control group there was significant increase in fracture healing among experiment group who were fed Garden cress seed mixed food.[1] An animal study conducted on rats proven its effect on reducing blood cholesterol.[2] The results of this study suggest that Garden cress seed can also be used in treating hypercholesterolemia. Garden cress seed have positive effect on bronchial asthma also. A study conducted on 30 males and female reveled that feeding of one gram of ground seed powder for 4 weeks significantly improve different pulmonary functions without causing any adverse effect.[9] As Garden cress seed possess numerous health promoting compounds, it must be further studied and can be added in various food products.

Objectives

- To investigate the in vitro Antioxidant activity of Garden cress seed (Lepidium sativum).
- To investigate the in vitro Antidiabetic activity of Garden cress seed (Lepidium sativum).

METHODOLOGY

For the study Garden cress seed procured from local market and cleaned manually. Cleaned seed than ground in to fine powder with mortal pastel. Powdered sample stored in refrigerator till further analysis. Seed was cleaned manually, finely grind with mortal pastel and stored in refrigerator till further analysis.

Sample extraction for analyzing antioxidant activity: Methanol: Distilled water (80:20) was used as a solvent for the extraction of Garden cress seed. 300mg of ground powder was taken in 50ml conical flask. Then 5ml of solvent was added. The mixture then was shaken for 30 minutes using a mechanical shaker (NOVA) at 30rpm. After shaking, the content of flask was centrifuged (REMI) at 3000 rpm for 10 minutes and supernants were collected in sugar tubes. Again 5 ml of the same solvent was added to flask and process was repeated. Both supernants were combined; filtered and volume was adjust to 16.3 ml. the obtained extract was stored at –20°C and used to analyzed for their total antioxidant capacity two methods i.e. ABTS and DPPH.

Sample extraction for analyzing antidiabetic activity:

One gram of seed powder soaked in 10ml of methanol for 48 hours at 37°C with occasional shaking. The extract was filtered through a cotton plug followed by Whatman No. 1 filter paper. The filtrate was then evaporated up to 5 ml and stored at 4°C until use.

Evaluation of antioxidant and antidiabetic effect

DPPH Radical Scavenging Activity

For analyzing DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging capacity of Garden cress seed extract 0.2 ml of cereal extract was taken and volume was made up to 1 ml with methanol. Then 3 ml of DPPH reagent (1 mM in methanol) were added. The content was mixed properly. It was incubated at 37°C for 20 minutes. After incubation the absorbance was measured 517 nm in a UV visible double beam spectrophotometer (Hitachi 22OS, Japan). For control, 3 ml of DPPH was added to 1.0 ml of methanol. For standard, known concentration of trolox (10-40 µg) was taken and volume was made up to 1 ml with methanol. Pure methanol was used as a blank and percent inhibition was calculated using the following formula: % inhibition = (Abs of control – Abs of sample)/Abs of control x 100.[5]

Total Phenolic Compounds Estimation

For estimating total phenolic compounds, 0.05 ml aliquote from each extraction was taken in a test tube and volume was made up to 1 ml with distilled water. To this, 1 ml each of folin ciocalteau reagent diluted with water (1:2) and 35 % Na_2CO_3 were added. The contents were incubated for 30 min at room temperature. 2 ml of distilled water was added and intensity of blue colour was recorded at 620 nm in UV visible double beam spectrophotometer (Hitachi 220S, Japan). Gallic acid of known concentration (5-20 mg) was used as standard.

TEAC Measurement by ABTS Method

The TEAC (Trolox equivalent antioxidant capacity) of cereal extract was measured using the modified 2,2'-azinobis (3-ethylbenzothiazoline-6-sulfonic acid diammonium salt (ABTS) radical decolonization assay. This method was given by *Re et al (1999)*. 7mmol/L ABTS stock solution was reacted with 2.45mmol/L potassium persulphate

to prepare ABTS radical cation (ABTS+) and incubated in the dark at room temperature for 12–16 h. The ABTS+ solution was diluted with 5mM PBS (Potassium phosphate buffered saline, pH 7.4) to an absorbance of 0.7 at 734 nm before use. For assay, 20 µl of cereal extract was taken, volume was made up to 1 ml with ethanol and 3 ml of ABTS was added to it. The contents were vortexed for 10 seconds. The discoloration caused by reduction of the cation by antioxidant from the sample measured at 734 nm in a UV visible spectrophotometer (Hitachi 200S, Japan). 1.0 ml of ethanol was added to 3 ml of ABTS and used as a control. For Standard, known concentration of trolox (5-20 µg) was taken and the volume was made up to 3 ml with ethanol and thereafter all test tubes were treated in the same way as sample. Percent inhibition was calculated using the following formula: % inhibition = (Abs of control – Abs of sample)/Abs of control x 100[10]

In-Vitro antidiabetic activity

Non–enzymatic glycosylation of hemoglobin assay

Antidiabetic activity of Garden cress seed were investigated by estimating degree of Non–enzymatic glycosylation of hemoglobin and was measured in colorimetrically at 520nm. For the assay, 2% glucose, 0.06% hemoglobin and 0.02% sodium azid solutions were prepared in 0.01 M phosphate buffer (pH 7.4). 1ml of each of the above mentioned solution was mixed and in that 1ml of extracted sample was added to above mixture. This mixture was incubated in dark at room temperature for 72 hours. The degree of glycosylation of hemoglobin was measured colorimetrically at 520nm. Trolox was used as a standard. All the tests were performed in triplicate.[12]

Inhibition of salivary amylase enzyme

For this assay, 1ml of extract or standard of different concentration (2,1, 0.5 mg/mL) was taken in test tubes. In each test tube 20μL of α-amylase was added and incubated for 10 minutes at 37°C. After the incubation, 200 μL of starch solution (1%) was added in each test tube. Again this mixture was incubated for 1 hour at 37°C. After re-incubation, 200μL of iodine solution and 10mL of distilled water was added. Finally, absorbance of the mixture was read at 565nm. Sample, substrate and α-amylase blank were prepared by following above method.[6]

RESULTS

Looking to the analytical procedures, entire study can be divided into two parts viz. analysis of antioxidants and analysis of antidiabetic activities.

Antioxidant and Antidiabetic Activity of Garden cress seed

S. no.	Antioxidant Activity				Antidiabetic Activity			
	DPPH (% inh)	ABTS (% inh)	TPC (mg%)	FRAP (RP%)	HbA_1 (% inh)		α-amylase (% inh)	
					Std*1	GCS	Std*2	GCS
1	22.63	11.23	780.55	46.45	72.83	71.42	71.23	66.66
2	26.12	14.33	801.89	48.81	76.34	65.38	70.00	67.69
3	25.32	12.42	791.31	42.51	77.55	75.67	69.11	68.65
4	19.22	17.22	776.54	51.96	78.84	67.85	72.00	65.57
5	22.29	13.33	798.21	50.43	77.31	69.49	67.69	64.40
6	20.21	14.12	782.23	48.23	75.63	71.38	71.43	66.21
Mean	22.63	13.78	788.46	48.07	76.42	70.20	70.24	66.53
SEM	1.11	0.83	4.19	1.35	0.85	1.44	0.67	0.62
CV	12.02	14.81	1.30	6.89	2.71	5.02	2.32	2.27

% inh = % inhibition

RP% = Reduction Power

HbA_1 = Glycosylated by Non Enzymatic Glycosylation of Hemoglobin

Std*1 = Standard 1 i.e. Trolox

Std*2 = Standard 2 i.e. Metformin

In vitro Antioxidant activity

ABTS & DPPH radical scavenging activity

Although the DPPH• free radical is ubiquitously used to estimate the potential free radical-scavenging activity of natural products, the ABTS•+ free radical is commonly used when issues of solubility or interference arise and the use of DPPH• based assays becomes inappropriate. The percent of inhibition of GC extracts was 13.78±0.83 and 22.63±1.11 for ABTS and DPPH radical respectively.

Total Phenolic Compounds

The role of phenolics as natural antioxidants has attracted considerable interest due to their pharmacological functions. The mean value of total phenolic content of seed extract was 788.46±4.19 mg%.

In vitro Antidiabetic activity

To study Antidiabetic effect of Garden cress seed % inhibition of Non Enzymatic Glycosylation of Hemoglobin and α-amylase these two tests were performed. Mean value of Non Enzymatic Glycosylation of Hemoglobin is 70.20 ± 1.44 (% inhibition) where as standard shown 76.42±0.85 (% inhibition). In case of % inhibition of α-amylase Garden cress seed shown 66.53± 0.62 and standard shown 70.24± 0.67.

All experiments were carried out in triplicate (n = 3) for each analysis and their means ± Standard deviation were reported. Differences between variable were tested for significance by using a one way analysis of variance procedure, Ducan, using level of significance $P \leq 0.05$ using SPSS.

DISCUSSION

Garden cress seed possess many neutraceutical properties and to prove it few researches have been carried out in vitro as well as in vivo. Based on present study also it can be concluded that garden cress seed possess antidiabetic and antioxidant activities. Most of the previous studies including this, have proven that garden cress seed can be utilized in treating diabetitic, hyperglycemia, fracture healing and to get various phytochemicals. Though only few in vivo studies have been carried out, looking to the health benefits further researches should be carried out to prove its positive effect on human.

CONCLUSION

The results of present study concluded that Garden cress seed possess significant antioxidant activity. The potential pharmacological activity of seed might be due to the presence of phytochemicals and soluble fiber.

REFERENCES

1. Abdullah H., Abdullah J. (2007). The effects of Lepidium sativum seed on Fracture – Induced Healing in Rabbits. Med Gen Med., 9(2), 23-29.
2. Amawi K., Aljamal A. (2012). Effects of Lepidium sativum on Lipid profiles and Blood Glucose in Rats. J Phys & Pharm Adv., 2(8), 277-281.
3. Anonymous. Ayurvedic Pharmacopaeia of India, Part-1, 1st ed, The drug controller of India, Government of India, Ministry of health and family welfare development of Indian system of medicine and homeopathy, New Delhi civil lines, Delhi. 2001; 1:26.
4. Bhakare HA, Kulkarni, Khotpal RR. (1993). Lipid composition of some seed of Central India., Journal of Food Science and Technology. 30:54-55.
5. Bran- Williams M. Cuvelier and Berset C. (1995). Use of free radical method to evaluate antioxidant activity. Lebensmittel Wissenschaft and Technology., 28: 25-30.
6. Hossan S.J., El-Sayed M., Aoshima H. (2009). Antioxidative and anti a-amylase activities of four wild plants consumed by nomads in Egypt., Orient Pharm Exp Med: 217-224.
7. Kirtkar KM, Basu BD.(2005). Indian medicinal plants., I:174.
8. Onyeneho SN, Hettiarachchy NS. (1992). J Agric Food Chem., 40: 1496–1500.
9. Paranjape, AN., Mehta, AA. (2006). Iranian Journal of Pharmacology & Therapeutics., 5(1): 55-59.
10. Re N., Pellegrini A., Proteggente A., Pannala M., Yang and Rice Evans. (1999). Antioxidnat activity applying an improved ABTS radical cation decolorization assay. Free Radical Biology., 26:1231-1237.
11. Sawsan Hassan Mahassni and Roaa Mahdi Al-Reemi. (2013). Cytotoxic effect of an aqueous extract of Lepidium SativumL.seed on human breast cancer cells, Indian Journal of Traditional Knowlwdge., 2(4): 605-614.
12. Suganya G, Sampath Kumar P. Dheeba B, Sivakumar R. (2014). In vitro Antidiabetic, Antioxidnat and Anti-Inflamatory Activity of Clitoria Ternatea L. International Journal of Pharmacy and Pharmaceutical Sciences., 6(7): 342-347.
13. Sumangala S. Gokavi, Nagappa G., Malleshi,

Mingruo Guo. (2004). Chemical Composition of Garden Cress (Lepidium sativum) Seeds and Its Fractions and use of Bran as a Functional Ingredient, Journal of Plant Foods for Human Nutrition., 59: 105–111.

SUBSCRIPTION FORM

I want to renew/subscribe international class journal "**International Journal of Food, Nutrition and Dietetics**" of Red Flower Publication Pvt. Ltd.

Subscription Rates:
• Institutional: **INR 6500 / USD 507.31**

Name and complete address (in capitals):_____

_____

Payment detail:
Online payment link: http://rfppl.co.in/payment.php?mid=15

Cheque/DD: Please send the US dollar check from outside India and INR check from India made payable to 'Red Flower Publication Private Limited'. Drawn on Delhi branch.

Wire transfer/NEFT/RTGS:
Complete Bank Account No. 604320110000467
Beneficiary Name: Red Flower Publication Pvt. Ltd.
Bank & Branch Name: Bank of India; Mayur Vihar
MICR Code: 110013045
Branch Code: 6043
IFSC Code: BKID0006043 (used for RTGS and NEFT transactions)
Swift Code: BKIDINBBDOS

Term and condition for supply of journals
1. Advance payment required by Demand Draft payable to **Red Flower Publication Pvt. Ltd**. payable at **Delhi.**
2. Cancellation not allowed except for duplicate payment.
3. Agents allowed 12.5% discount.
4. Claim must be made within six months from issue date.

Mail all orders to
Subscription and Marketing Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi - 110 091(India).
Phone: 91-11-79695648
Cell: +91-9821671871
E-mail: sales@rfppl.co.in

Original Article

International Journal of Food, Nutrition and Dietetics
Volume 10 Number 3, September – December 2022
DOI: http://dx.doi.org/10.21088/ijfnd.2322.0775.10322.4

Importance of Right Nutrition for the Astronauts of Deep Space

Swapan Banerjee

How to cite this article:
Swapan Banerjee/Importance of Right Nutrition for the Astronauts of Deep Space/Int J Food Nutr Diet. 2022;10(3):101–110.

Abstract

Essential food requirements for space food systems include food safety, palatability, safety, stability, variety, usability, and reliability. The space station administration always gives astronauts access to nutritious food like fruits, vegetables, and certain processed foods as a regular diet. The gravitational impacts are significantly reduced in a microgravity environment in deep space. As a result of microgravity, the eating implements like wise float away. The beverage packaging for the international space station is made of laminated foil and plastic. The article mainly talked about the food system engineering facilities and the classifications of space food according to their processing. The article also highlighted the standard menu in a space shuttle for American, Russian, and Chinese astronauts according to a pre-planned diet. There are various uses of food under the food processing system in the space shuttle, such as preparation and selection of food, planning, and serving of food, etc. Similarly, it is essential for extended shelflife food for Indian astronauts. Proper nutrition and food safety are critical for all astronauts to cope with deep space environments.

Keywords: Space food; Space food system; Astronauts' diet; Deep space food; Space nutrition.

INTRODUCTION

In space science, nutrition and dietetics have progressed significantly regarding total quality assessments (food safety), food systems, calorie assessments, nutrient selections, and deficiencies. In an article, Douglas, Zwart, and Smith explained that the toxicity of nutrients, the underestimation of calories, and improper preservation were significant issues. Still, these factors have recently been found to develop significantly. Palatability, safety, stability, variety, usability,and reliability are essential food criteria in space food systems.In the aspect of a daily diet, the space station authority always provides astronauts with fresh food such as vegetables, fruits, salads, and some processed food. They used to face challenges with fresh food due to the short shelf life of some of the food. Still, thermo stabilization, irradiation based sterilization, and other processes can help for the best nutrition.[1]

Author Affiliation: Scholar, Department of Nutrition, Seacom Skills University, Birbhum 731236, West Bengal, India.

Corresponding Author: Swapan Banerjee, Scholar, Department of Nutrition, Seacom Skills University, Birbhum 731236, West Bengal, India.

E-mail: sbanerjee.researcher.21@gmail.com

Received on: 10.01.2022

Accepted on: 31.10.2022

Effect of microgravity:

The effects of gravity are considerably lessened in a microgravity setting. The evidence shows that it happens when a spaceship orbits the earth with all its cargo in free fall. Due to a process known as cohesion, comparable to the adhesion of a drop of water to paper, liquids bind meals together and stick to themselves in enormous bubbles when released from their containers. Special straws are employed for removing drinks released for drinks

within the space shuttle. The needs for related food systems, as well as the development of space food packaging and food selection, have all been greatly influenced by the impacts of microgravity. The eating utensils also float away due to microgravity when not used; the knife, fork, spoon, and scissors are fastened to magnets on the food plate.[2]

History of food consumption in the international space station

Foil and plastic laminate is used to create the international space station (ISS) beverage packaging. A study described an adapter connecting the galley or kitchen area to the box. With a pair of scissors, the top of the box is removed, and the food within is consumed with a fork or spoon. The Foods Systems Engineering Facility conducts research and development on food transported into space at NASA Johnson Space Center in the United States of America. Foods are evaluated for their nutritional content, flavor, storage and unpackaging characteristics, and freeze drying efficiency. Food samples are offered to astronauts for tasting. They employ a straight for ward form to score things on look, color, odor, flavor, and texture. Five months before the flight, astronauts choose their food. They are going to pick 30 days flight menus for the ISS. Utensils and containers must be held in place because everything wanders in a microgravity environment. The crew will keep the food in the galley of the international space station.[2]

MATERIALS AND METHOD

The article is a short communication reviewing the available information in the open access literature on Google Scholar and National Center for Biotechnology Information (NCBI) databases. The data was also searched on the National Aeronautics and Space Administration (NASA) website and published reports from 1995 onwards. The keywords included 'Space food system,' 'Space food,' 'Astronauts' diet,' 'Deep space food,'and 'Space nutrition' for information related to deep space food processing, safety, and nutrition received by astronauts.

RESULTS AND DISCUSSION

The article mainly talked about the food system engineering facilities and the classifications of space food according to their processing. The article also highlighted the standard menu in a space shuttle for Russian and Chinese according to pre-planned and American Astronauts as per special planning A, B, and C. There are various uses of food under the food processing system in the space shuttle provided below serially.[2]

Preparation of food: Rehydratable meals are used by hikers to reduce their weight carrying. Any weight heading into space increases the amount of fuel used during take-off. Foods that have been rehydrated also take up much less room on the space shuttle (ss).

Selection of food: About five months before taking off, astronauts choose their food for space. A unique taste panel has been set up for the astronauts to sample various dishes. Before traveling into space, they can use this to determine whether they enjoy the cuisine.

Planning and serving of food: When eating in space, astronauts utilize specialized trays to keep their utensils in place. There are chambers on the ISS food tray for holding unique bowl like containers. These packaging units resemble the single serving frozen food plates sold in supermarkets.

Fruits and vegetables: The most perishable items like carrots and celery should be eaten during the first 2 days of the space shuttle. Many latest tools and techniques are adopted to keep fresh fruit and vegetables usually taken in the space shuttle. Certain fruits and vegetables can have an extended shelf life of up to 60 days.

Effect of mold: On space flight missions lasting more than seven days, commercial tortillas experience spoilage issues. The requirement to create a shelf stable tortilla at room temperature has grown as mission length has increased. The amount of water that is available has to be decreased, and the pH has to be lowered to stop bacterial growth from creating a tortilla that would be shelf stable for space travel.

Waste materials: To minimize waste and mess, nuts, shelled nuts, and fruit liquids are included in the meal lists for the space shuttle and international space station. Water, a by product of the space shuttle fuel cells' electrical power, makes up most of the waste. To lessen the amount of rubbish entering orbit, trash compactors are already on flight and designed for the space station.

Dehydration of food: Dehydrated foods and beverages make up a sizable portion of the space shuttle's daily dishes. Most water in nutrition is removed through freeze drying and other drying processes. This meal type adds variety to the menu for space travel and offers a more substantial diet. The fuel cells produce water as a by product, which makes water readily available for space shuttle

preparation. In the table 1. various food available for the space shuttle and international space station has been discussed with their basic descriptions and examples. These are ways by which food is usually preserved and processed for the consumption of astronauts who are also concerned with a non-boring diet. However, there have been drastic changes over the last two decades in food technology that are helping give quality food, taste, and flavors to eliminate the astronauts' boredom.

Table 1: Various space food and their preparation for regular consumption.

Types of food	Description	Examples
Fresh Food	Not artificially preserved and processed	Banana, apple
Refrigerated Food	To prevent microbial spoilage, need to chill the temperature	Cream cheese
Rehydratable Food	Dehydration (also known as freeze-drying) process. Food and drinks are prepared in this way.	Oatmeal as a hot cereal
Natural Form Food	Ready-to-eat (RTE) food is usually packed in easypackets.	All cookie nuts
Irradiated Food	The food is packed quickly after cooking in the foil packets.The ionizing radiation process is used for sterilization.	Smoke turkey
Frozen Food	The food is quickly chilled to stop building the large ice crystals.	Chicken pot pie, quiches
Thermostabilized Food	Hot process food can retain at standard temperature and is usually thermostabilized in a can.	Pudding in a cup, packed tuna fish.
Intermediate Moisture Food	Foods with intermediate moisture are kept fresh by removing a portion of the water while saving enough to preserve the product's soft texture. There is no need to prepare food to eat it.	Apricot, pear

A standard menu is presented, usually scheduled as a diet in a space shuttle for the American astronauts in table 2. A 2 days menu out of 7 days has been provided below in models A, B, and C, the three meals in the SS. After America, Russia, and China have significant roles in deep space work. Their usual consumable and preferred food have also been discussedat the table 3. Chinese like to consume their traditional food apart from processed space food listed below, according to *Tang et al*.[3]

Table 2: Standard menu ina space shuttle for American Astronauts (2 days).[3]

Days	(A)	(B)	(C)
Day-1	• Dried peaches (359) • Cornflakes (357) • Orange-pineapple drink (113) • Cocoa beans (220)	• Ham sand witch (257) • Cheese spread (295) • Tortilla x 2 (474) • Pineapple slices (50) • Cashews (553) • Strawberry drink (53)	• Chicken a la king (71) • Turkey Tetrazzini (150) • Cauliflower with/cheese (79) • Brownie (466) • Grape drink (67)

Day-2	• Scrambled eggs (182/2 pcs) • Dried pears (359) • Vanilla instant Breakfast (171) • Orange juice (45) • Beef Patties (247)	• Apple/grape Jelly (53) • Tortilla x2 (474) • Fruit cocktail (46) • Peach/apricot drink (70) • Trail mix (462)	• Macaroni and cheese (164) • Peach ambrosia (39) • Green beans with/ Mushrooms (59) • Frankfurters (290) • Tropical punch (35)

Table 3: Standard menu in a space shuttle for Russian and Chinese Astronauts (2 days a week). [3]

Day	Meal (1)	Meal (2)	Meal (3)
Russia	• Dried Peaches/Apricots (359) • Orange-Pineapple Drink (113) • Tvorog with tomatoes (138) • Other side dishes	• Chicken rice, lamb with vegetables (250) • Canned drinks (41) • Fried rice, shrimp/macaroni (262) • Other side dishes	• Beef with barley (56) • Canned Drink (42) • Fried rice withsturgeon (298) • Other side dishes
China	• Lotus seeds porridge (89) • Green tea (1) • Dried pears (262) • Beef patties (247) • Other traditional food	• Eight treasure rice (74) • Beef in soya sauce/beef balls (202) • Kung pao chicken (129) • Sichuan pork (271) • Other Traditional food	• Hot Pot (62) • Sweet and sour pork (270) • Ma Po tofu (119) • Ink fish balls (107) • Fried rice (163) • Other traditional food

Indian space food system focuses the proper nutrition.

In India, the Defence Food Research Laboratory (DFRL) has already started to prepare dried and packaged food. Laboratory testing has confirmed variously processed and dehydrated food varieties' good shelf life (nil micro-bacterial effect). A digital magazine that packaging, preservation, additives, and on-time supply are considered more seriously to reduces poilage for the best nutrition of astronauts. Even in challenging situations, the latest liquid dispensing and waste disposal systems, rehydrating food systems, and heaters are considered the best food management tools.[4]

CONCLUSIONS

Proper nutrition is essential for deep space astronauts because their job is quite challenging. The entire food system and safety process have significantly progressed compared to the 20th century. The leading countries' space food systems are paying great attention to technology based food engineering for space food planning, preparation, serving, preservation, and wastage systems. The ultimate benefits should come for the deep space workers to cope with the microgravity and other physical cum psychological aspects.

REFERENCES

1. Douglas, G. L., Zwart, S. R., & Smith, S. M. Space food for thought: Challenges and considerations for food and nutrition exploration missions. Journal of Nutrition.2020;150: 2242–2244. https://doi.org/10.1093/jn/nxaa188.
2. Angelo A. Casaburri, C. A. G. Space Food, and Nutrition. National Aeronautics and Space Administration. 1999; 62:1-49. (Accessed: 28 August 2022).
3. Tang, H., Rising, H. H., Majji, M., & Brown, R. D. Long-Term Space Nutrition: A Scoping Review. Nutrients.2021;14:194. https://doi.org/10.3390/nu14010194.
4. Anantha Krishnan M, 2020. "Malayala Manorama. https://www.onmanorama.com/news/india/2020/08/27/gaganyaan-manned-flight-food-warming-dfrl-mysuru.html. (Accessed: 30 August 2022).

Instructions to Authors

Submission to the journal must comply with the Guidelines for Authors. Non-compliant submission will be returned to the author for correction.

To access the online submission system and for the most up-to-date version of the Guide for Authors please visit:

http://www.rfppl.co.in

Technical problems or general questions on publishing with **IJFND** are supported by Red Flower Publication Pvt. Ltd.'s Author Support team (http://rfppl.co.in/article_submission_system.php?mid=5#)

Alternatively, please contact the Journal's Editorial Office for further assistance.

Editorial Manager
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II
Mayur Vihar Phase-I
Delhi - 110 091(India).
Mobile: 9821671871, Phone: 91-11-79695648
E-mail: author@rfppl.co.in

Original Article

International Journal of Food, Nutrition and Dietetics
Volume 10 Number 3, September – December 2022
DOI: http://dx.doi.org/10.21088/ijfnd.2322.0775.10322.5

Dragon Fruit: An Exotic Super Future Fruit of India

Neelesh Kumar Maurya

How to cite this article:
Neelesh Kumar Maurya/Dragon fruit: An exotic super future fruit of India/Int J Food Nutr Diet. 2022;10(3):107–111.

Abstract

Hylocereusundatus is the most widely cultivated vine cactus in the Cactaceae family, with native populations in Mexico and America. It is commonly known as "dragon fruit" or "pitaya" in the United States. In Malaysia, it is also known as "Buahnaga," which means dragon fruit. Aside from their appealing color, Hylocereusundatus fruits are prized around the world for their high content of polyphenolic components and antioxidant activity. Scientists have found that a wide range of phytochemicals, such as betalains, polyphenolic compounds, and carotenoids, protect against oxidant stress in the body and keep the right balance between antioxidants and oxidants to improve human health.The goal of this review's conclusion is to impart an understanding of Hylocereusundatus and its functional phytochemicals, as well as implications for its potential health benefits in the context of future research and application. More environmentally friendly antioxidant and antibacterial agents were proposed, which are important in the sectors of healthcare, food processing, nutraceuticals, and cosmeceuticals. To grow the global market for dragon fruit, experts will collaborate to enhance the importance of this fruit to worldwide cultivars. In the 1990s, dragon fruit became trendy in India. Agriculturists favored it for its low input costs and high profitability.

Keywords: Antioxidant; Betalains; Dragon fruit; Pitaya; Polyphenol.

INTRODUCTION

It is a fruit native to tropical regions that has a distinct appearance, a crisp consistency, and a palatable taste. Its appearance was based on that of a dragon that breathes fire. It has a lot of different antioxidants. Cacti belong to the Cactoideae subfamily of the Cactaceae family of plants, and the Hylocereus genus is part of that subfamily (*Sonawane et al., 2017; Day et al., 2022*).[1,2] Due to the extraordinary skills of the Crassulacean Acid Metabolism, the members of the family Cactaceae exhibit an extraordinarily high water use efficiency despite having minimum water requirements (CAM) (*Jalgaonkar et al., 2022; Batista-Silva et al., 2020; Alzim et al., 2022*).[3-5] Cactus plants with fruit known as the Red Dragon Fruit or Red Pitaya Fruit is the Hylocereusundatus, which is the species of vine cactus that is cultivated the most frequently. Because of the bracts or scales that cover the surface of the fruit, it is sometimes referred to as the Red Pitaya or the Strawberry Pear Cactus Fruit. The common name for this fruit is pitaya, which translates to "the scaly fruit". In addition, CAM plants are able to produce more biomass in response to increased amounts of carbon dioxide (CO2) in the environment.[3,4] *Arivalagan et al., 2022; Al-Mekhlafi et al., 2021* described the dragonn fruit also known as a night blooming flower, due to the

Author Affiliation: Assistant Professor, Department of Home Science, PK University, Shivpuri, Madhya Pradesh 222001.

Corresponding Author: Neelesh Kumar Maurya, Assistant Professor, Department of Home Science , PK University, Shivpuri, Madhya Pradesh 222001.

E-mail: neeleshkumar.maurya@gmail.com

Received on: 09.10.2022

Accepted on: 10.12.2022

fact that it only blooms at night and has enormous, fragrant blossoms that often only last for one night. This attribute gives the flower its name. Over the course of the past few decades, this fruit has been cultivated on a large scale for commercial purposes in the countries of Malaysia, Vietnam, Thailand, Taiwan, Nicaragua, Colombia, Australia, and the United States.[6-7] *Le and colleagues, 2021 Babar et al., 2021; Badam et al., 2018*, observed that majority of the world's supply of dragon fruit comes from the Indian states of Karnataka, Kerala, Tamil Nadu, Maharashtra, Gujarat, Odisha, and Andhra Pradesh, as well as the Andaman and Nicobar Islands. The production of this peculiar fruit is relatively new in the state of West Bengal. It may be grown in any kind of soil, as long as there is sufficient drainage and a high concentration of fertiliser in the soil where it is grown. It cannot be cultivated on terrain that is too wet. The growth of dragon fruit thrives best in warm, humid environments.[8-11]

Planting

The dragon fruit is a semi-epiphytic plant, which means that it prefers a dry tropical or subtropical climate with an average temperature of 21–29°C. However, it is able to withstand temperatures as high as 38–40°C and can even survive brief bouts of cold temperatures.[12-14] This crop requires continuous exposure to sunlight and between 600 and 1300 millimetres of precipitation annually, with distinct wet and dry seasons (*McMahon, 2003*).[14] In subtropical and tropical regions, fruit harvests can be grown throughout the entire year. Plants that produce dragon fruit require favorable climatic conditions, including, but not restricted to, a tropical climate a tropical or subtropical photoperiodic climate, enough rainfall, moist sandy soil, and other similar characteristics. In addition, each of these components is necessary for flowering and fruit formation (*Hossain 2021*). [15] *Barbar, 2021, Badma., 2021 and Jadhav., 2019* studied that the cultivation of dragon fruit is possible in almost any type of soil; however, sandier soils that receive adequate irrigation are recommended. It is recommended that the pH of the soil should be between 5.5 and 6.5 to have a productive crop. Bed frames ought to have a height of at least 40 to 50 centimeters. Even though they thrive best in a tropical climate with an annual rainfall of 40–60 centimeters, one of the most significant benefits of these plant species is that they can thrive in temperatures that are quite high and in really poor soil is generally agreed that temperatures in the 20°C to 30°C range are optimal for the growth of crops. It is recommended that mounds of fertilizer be spread across the area. Before planting dragon fruit plants, 20 kilograms of organic fertilizer, 0.5 kilos of superphosphate, and 1 kilogram of NPK16-16-8 should be applied every 50 relocations.[10-12]

Jiang, et al 2020., described that there are two distinct strategies for cultivating dragon fruit. The first method is to grow the plant from its seeds, and the second method is to take a cutting from an actual plant. Since seeds require three years to mature before producing a plant that is large enough to be useful, farmers frequently favor the method of cutting rather than sowing seeds. Before being planted in the field, the seedling should be 20 centimeters in length, removed from the mother plant, and then kept in the shade for five to seven days. The climate of Bangladesh is classified as subtropical monsoon, characterized by significant yearly variations in temperature and humidity level, as well as high temperatures.

Dragon Fruit varieties (Le Bellec, 2016)

- *Hylocereusundatus:* This type, sometimes known as Pitahaya, has white flesh with pink skin. The fruit measures 6-12 cm in length and 4-9 cm in thickness, and it contains delicious black seeds.
- *Hylocereus Polybius:* Also known as Scarlet Pitaya, this species is distinguished by its red meat and pink skin. It is native to Mexico, but it is currently grown in many nations across the world.
- *Hylocereuscostaricencis:* This species is distinguished by its violet red flesh and pink skin. Because it is native to Costa Rica, it is also known as Costa Rican Pitaya. The fruit is magenta in color, with pear shaped seeds.
- *Hylocereus (Selenicerus) megalanthus:* This South American variation is distinguished by its white flesh and yellow skin.[17]

Dragon fruit plant morphology

The Dragon fruit plant, also called as Hylocereus spp., is a fast growing evergreen cactus that may reach heights of up to 2.5 metres in length and features leafless, thin branches that resemble vines. It is either a terrestrial or an epiphytic cactus, and its stems are succulent and three winged. The colour of the stems is green (*Hossain 2015*). [15] The stem is pliable and vining like, and it branches out multiple times. Each segment consists of three undulating wings and anywhere from one to three spines, or it may not have any spines at all (*Jalgaonkar 2022*).[4] Aerial roots of the plant have several functions: they take in water, they grow on the underside of the stems, and they support the stems so that they remain upright. The flowers of the dragon plant are normally white, and its fruits have a bell like form and measure between 25 and 30 centimetres in length and 15 to 17 centimeters in diameter (*Merten, 2003*). [18] The fruit is gorgeous, with bright red skin studded with green scales and white or

crimson flesh that contains a bevy of microscopic black seeds. The skin of the fruit is studded with green scales. It is necessary to provide the vine with support in order to prevent it from falling.

Nutritional Value of Dragon Fruit

The nutritional value of dragon fruit varies according to species, provenance, and harvesting season .The nutritional composition and phytochemical qualities of red Dragon fruit differ greatly as a result of the developing environmental circumstances. Dragon fruit has higher levels of minerals such as potassium, phosphorus, sodium, and magnesium than mangosteen, mango, and pineapple as well as all kinds of vitamins. Flowering and fruit setting times have a major impact on fruit quality, particularly total soluble solids content Mature Dragon fruits have greater TSS, which is especially noticeable in fall fruits compared to summer fruits (*Arivalagan 2021*). Dragon fruit contains minerals, glucose, fructose, dietary fibre, and vitamins.

An interesting fact about this fruit is that the Chinese believe it was created by the fire of a dragon during a battle. Undermining the myth surrounding this fruit, there is something that makes it extremely healthy for us. Here is a list of 15 health benefits of eating dragon fruit.[23]

Component	Units(FW)	H. polyrhizus from Malaysia (Ramli and Rahmat 2014)[21]	H. polyrhizus from Australia(Ramli and Rahmat 2014)21	H. polyrhizus from Malaysia (Ruzainah et al. 2009)[22]	H.undatus from Brazil (Jerônimo et al. 2015)
Moisture	$g100g^{-1}$	85.05	89.98	82.5–83.00	86.03
Ash	$g100g^{-1}$	0.54	1.19	nd	nd
Carbohydrate	$g100g^{-1}$	12.97	8.42	nd	10.79
Total sugar	$g100g^{-1}$	nd	nd	nd	5.92
Protein	$g100g^{-1}$	1.45	0.41	0.159–0.229	2.27
Fat	$g100g^{-1}$	nd	nd	0.21–0.61	0.16
Total dietary fibre	$g100g^{-1}$	2.65	nd	nd	nd
Crude fibre	$g100g^{-1}$	nd	nd	0.70–0.90	1.15
Energy	$kcal100g^{-1}$	62.95	35.36	nd	53.68
Iron	$mg100g^{-1}$	0.30	0.03	nd	nd
Magnesium	$mg100g^{-1}$	26.40	13.70	nd	nd
Potassium	$mg100g^{-1}$	158.29	437.35	nd	3.09
Sodium	$mg100g^{-1}$	35.63	14.30	nd	0.14
Zinc	$mg100g^{-1}$	0.40	0.09	nd	nd
Calcium	$mg100g^{-1}$	6.72	1.55	nd	nd
Phosphorus	$mg100g^{-1}$	nd	nd	nd	0.003
Vitamin A	$mg100g^{-1}$	0.085	0.89	nd	nd
Vitamin C	$mg100g^{-1}$	0.024	0.03	8.00–9.00	0.84

Dragon Fruit Health Advantages (Le Bellec, 2006, Kiranmai, M., 2022,)[17,23]

1. Minimizes the incidence of diabetes

This fruit contains a lot of fibre, which helps people with diabetes keep their blood sugar levels stable and avoid spikes. Regular consumption of this fruit can help diabetics balance their blood sugar levels and avoid further medical consequences.[17]

2. Reduces Cancer Risks

This fruit contains anti-cancer properties that may reduce the risk of colon cancer. Its high vitamin C content helps to boost the immune system. Vitamin C is a potent antioxidant that protects against chronic diseases such as diabetes, Alzheimer's, Parkinson's, and cancer.[23]

3. Aids in Immune System Boosting

This fruit is high in vitamin C, which helps to boost immunity and keep you healthy. More Vitamin C means that your body is capable of fighting deadly infections that you may be prone to. All you need to do to stay healthy is consume 1 cup (200 grammes) of this fruit every day.

4. Beneficial to Digestion

This fruit contains a high concentration of oligosaccharides (a carbohydrate) that promotes the growth of beneficial bacteria such as flora, which aids in digestion. It is high in fibre, which promotes digestive health and lowers the risk of cancer and cardiovascular disease.[23]

5. Heart Healthy

The red pulp of dragon fruit contains betalains, which reduces bad cholesterol (LDL cholesterol). The tiny dark black seeds inside the fruit are high in omega-3 and omega-9 fatty acids, which are good for the heart and lower the risk of cardiovascular disease.[17]

6. Fights Skin Aging

Stress, pollution, and other factors such as poor diet can all contribute to accelerated ageing. It is, however, high in antioxidants, which can be used to treat sunburn, dry skin, and acne. Its vitamin C content can help with skin radiance. You can make dragon fruit juice and drink it once a day to get glowing skin.[23]

7. Hair Benefits

Do you require thick, black, and shiny hair? Try dragon fruit powder mixed with a glass of milk (250ml) once a day, and you'll be fine. The high nutrient content of this fruit extract powder reduces hair damage caused by artificial hair colouring and improves hair texture, leaving it soft and shiny. All you have to do is consume this once a day to see results.[17]

8. Healthy Bones

Good bone health can help with a variety of things, including avoiding injuries and joint pain. This superfruit contains 18% magnesium, which helps to build stronger bones and maintain good bone health. All you have to do is drink one glass of dragon fruit smoothie every day.[23]

9. Beneficial for the Eyes

This fruit contains beta-carotene (the pigment that gives the fruit its colour), which helps to prevent eye problems like cataracts and macular degeneration. Every day, consume one cup (220 grammes) of dragon fruit.[23]

10. Beneficial During Pregnancy

This fruit contains vitamin B, folate, and iron, making it an excellent choice for pregnant women. B vitamins and folate help to prevent birth defects and boost energy levels during pregnancy. Its calcium content is responsible for the development of the fetus's bones. Its magnesium content aids in the prevention of postmenopausal complications in women.[17]

The market for Dragon Fruit in India

Der et al., 2022 and *Nor et al., 2020*, studied crispy skin and scaly spikes that are seen on the fruits of the American dragon fruit (Hylocereusundatus) which give the fruit its name. In addition to these names, it is sometimes referred to as the strawberry pear, the noblewoman, and the queen of the night. In the 1990s, India experienced a surge in demand for dragon fruits.[2,4] *Jadhav et al., 2019* described that the high profitability of the venture and the low cost of the necessary inputs, it quickly gained favor among farmers. The plant is appropriate for use in processing businesses, has a yield that lasts for 20 years, and is abundant in nutraceuticals. The cultivation of dragon fruit is common in India since it requires little care and produces a large amount of fruit.[12]

As a result, the cultivation of dragon fruit has seen a significant increase in the states of Maharashtra, Karnataka, Andhra Pradesh, and the Andaman and Nicobar Islands, in addition to other states in the northeast. According to the Indian Council of Agricultural Research, National Institute of Abiotic Stress Management in Baramati, Maharashtra, the total area devoted to the cultivation of dragon fruit in India is somewhere between 3,000 and 4,000 hectares. The nation's yearly production of fruit totals 12,000 MT on average. The fruit is eligible for export to the United States, Europe, and the Persian Gulf. In June of 2021, a farmer from Maharashtra provided Dubai, United Arab Emirates, with its first shipment of dragon fruit. In order to adequately compensate farmers, PEDA is seeking to expand the export of dragon fruit to other nations in Europe. In the program of "Mann Ki Baat" that aired on All

India Radio in July 2020, the Prime Minister lauded the farmers of Kutch for ensuring that India would have sufficient supplies of fruit. When the fruit is exported to the United Kingdom and Bahrain, PM's desire will finally be accomplished. The first shipments of dragon fruit, grown by farmers in Gujarat and West Bengal, have now made their way to London, the UK and Bahrain, helping to improve the overall export of exotic fruits. In India, people commonly refer to it as Kamalam (dragon fruit). It was obtained from farmers in the Kutch region, and it was transported through APEDA-approved packhouses in Bharuch and Kolkata.[24]

Review Article

International Journal of Food, Nutrition and Dietetics
Volume 10 Number 3, September – December 2022
DOI: http://dx.doi.org/10.21088/ijfnd.2322.0775.10322.6

Impact of Dietary Counseling Based Interventions for Improvement in Glycaemic Control in Diabetes Mellitus Patients: A Systematic Review

Neha Jaiswal[1], Charu Katare[2]

How to cite this article:
Neha Jaiswal, Charu Katare/Impact of Dietary Counseling-Based Interventions for Improvement in Glycaemic Control in Diabetes Mellitus Patients: A Systematic Review/Int J Food Nutr Diet. 2022;10(3):112–117.

Abstract

Counseling efforts to improve self management are dominant components of any effective treatment plan. For people with diabetes mellitus to achieve optimal glycaemic control, motivation to perform self management like dietary and lifestyle related aspects is important. The researcher has determined whether or not counseling based interventions are clinically effective for improving glycaemic control of type 2 Diabetes Mellitus. The studies have been included research papers were based on dietary counseling based intervention. The current study has included 23 Randomized Control Trials (RTCs), while 16 were group based approaches while 7 were individual based approaches. All trials were effective in improving glycaemic control and reported statistically significant improvements in glycated hemoglobin test (HbA1c) levels through diet counseling based intervention. Regarding the counseling method, individualized counseling was more effective. Combining diet, exercise, and psychosocial intervention is more effective than dietary counseling alone. Studies have shown that a repetitive and long term dietary counseling intervention that offers follow up management was more effective than a short term counseling intervention.

Keywords: Counseling; Self-management; Glycemic; Diabetes mellitus; Diabetes; Glycated hemoglobin.

INTRODUCTION

Systematic reviews continue to gain prevalence in health care primarily because they summarize and appraise vast amounts of evidence for busy healthcare providers.[1] Thus, awareness of diabetes Mellitus (DM) and its complication has become an integral and essential part of DM care for the patients themselves, especially awareness of dietary management.[2] Consequently, dietary counseling efforts to improve self management of any effective treatment plan. There is an increasing amount of evidence that patient counseling is the most effective way to lessen the complications of diabetes and its management.[3]

The incidence of diabetes mellitus is increasing world wide. According to the International Diabetes Association, diabetes patients world wide account for 8.3% of the total population, and it is expected that this number will reach 592 million by 2035.[4] Diabetes is a chronic metabolic disease that causes complications such as cardiovascular disease, arteriosclerosis, hypertension, neuropathy, nephropathy, and diabetic retinopathy.[5] Type 2 diabetes usually occurs after the age of 40 and

Author Affiliation: [1]Research Scholar, [2]Professor, Department of Home Science, Kamla Raja Girls Government Post Graduate College, Gwalior 474006, Madhya Pradesh, India.

Corresponding Author: Neha Jaiswal, Research Scholar, Department of Home Science, Kamla Raja Girls Government Post Graduate College, Gwalior 474006, Madhya Pradesh, India.

E-mail: nehajaiswal2101@gmail.com

Received on: 28.04.2022
Accepted on: 25.05.2022

accounts for about 90% of all diabetes patients. Unlike type 1 diabetes, there are often no clear clinical symptoms in the early stages.[6] The onset of type 2 diabetes is preceded by a decrease in insulin secretion, followed by a metabolic disorder due to an increase in insulin resistance. In many cases, type 2 diabetes mellitus can be improved if weight is reduced through diet and exercise at an early stage.[7]

Patient counseling and counseling is a process that improves patients' ability to cope with their disease and make informed decisions regarding management, diet, and medication. It helps motivate patients to change any harmful dietary and life style habits.[8] The main objective of this study is to review the impact of diet counseling on patients with DM.[9] Despite several approaches to DM management being already available, healthcare professionals in India still struggle to achieve health targets without the adjunct therapy of diet coaching or counseling.[10]

METHODOLOGY

2.1. Search strategy

A review of randomized controlled trials (RCTs) to evaluate the effectiveness of dietary counseling based interventions for people with T2DM was conducted from February to March 2022. The article was searched using Springer-link, NCBI, PubMed, and Scopus databases. Studies published from 2012 to 2022 in the English language were included. The authors independently extracted data on participant and intervention characteristics. The main outcomes included glycaemic control (reduction in HbA1c level).

2.2. Inclusion criteria

This systematic review included RCTs and ensured all studies in adults aged 18 and over with T2DM in different healthcare settings were included. Studies, where participants were diagnosed with type 1 diabetes mellitus, gestational diabetes, and a mixture of T2DM with T1DM or other chronic conditions, were excluded. Furthermore, web-based or peer support, or telephone counseling were excluded to reduce confounding bias. Only studies that covered diet and dietary based counseling in groups or individual levels.

2.3. Data extraction and validity

Abstracts were independently screened by the authors to determine eligibility for inclusion in the review. After the author's retrieved eligible articles, each author was responsible for extracting half of the articles. A data extraction form was adapted from the literaturefor this purpose. Following data extraction, the two authors exchanged articles, read them, and reviewed the corresponding data extraction sheet performed by the other person to ensure data extraction accuracy.

Quality assessment was conducted by the authors to review the clarity of the study aims, the adequacy of details about the sample, the rating of the study design, the clarity of the methodology, and the reliability and validity of the measures and tools.

2.4. Data analysis

Due to the heterogeneity of populations, interventions, and measured outcomes, we could not conduct a meta-analysis. We, therefore, used a recently described method to identify specific intervention features likely to be associated successfully or unsuccessfully with the outcome of interest. Interventions were analyzed based on their success in producing a significant change (p-value ≤ 0.05) in outcomes, in the hypothesized direction. Outcome measures of interest were HbA1c levels, and diet outcomes. Diet was assessed with a desirable change in any of the following: total kilo calorie intake, dietary risk score, mean vegetable consumption, fruit consumption, consumption of five fruits and vegetables per day, fried food consumption, healthy eating plan adherence, fat-related dietary habits, dietary fat intake, dietary cholesterol intake, kilocalories from saturated fat, and percent kilocalories from fat. When a study used several instruments to measure an outcome (e.g., diet), at least 60% (an arbitrary cut-off) of the measures must have reported significant positive results to be considered a success for that outcome.

RESULTS AND DISCUSSION

A total of 738 non-duplicated publications were screened, 101 abstracts were assessed for eligibility, and 40 publications required full-text review before a decision could be made. 23 studies fulfilled the inclusion criteria, and the search processes are illustrated. The interventions varied considerably according to the number and duration of sessions; however, the content was mostly similar focusing on diabetes self-management.

We found that HbA1c levels were lower in the experimental group after dietary counseling based interventions compared with those in the control

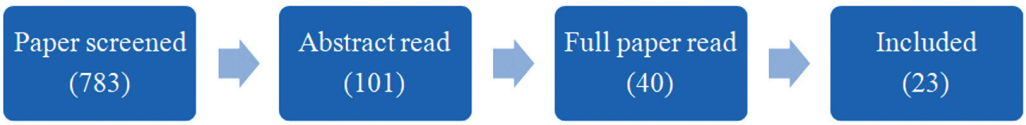

Fig. 1: Process of review of the research article

group.[11] Dietary counseling-based interventions are emphasized as important in diabetes guidelines and are effective in controlling blood sugar levels. Subgroup analysis was performed to analyze HbA1c levels according to the duration of dietary counseling. HbA1c levels assessed after 4–6, 7–9, and 10–12 months of dietary counseling interventions were lower in the experimental group than in the control group.[12] In contrast, HbA1c assessed after 3 months of a dietary counseling based intervention did not show a significant difference between the two groups.[13] In addition, HbA1C levels according to the duration of dietary counseling intervention, including the follow-up period, were lower in the experimental group at 4–6, 7–9, and 10–12 months. Studies have shown that a repetitive and long-term dietary counseling intervention that offers follow-up management was more effective than a short-term counseling intervention.[14] Moreover, considering that HbA1c reflects the blood sugar level at 3 months, it is thought that dietary counseling interventions for 4 months or longer are necessary. In particular, there is a need for continuous control of blood glucose levels in diabetes to prevent complications.[15] Maintaining HbA1c levels < 6.5% for 6 years is known to help prevent complications, including microvascular complications. Therefore, continuous follow-up interventions would be necessary for addition to dietary counseling interventions for 4 months or longer.[16] In particular, individual counseling interventions showed low heterogeneity between studies and large effect sizes.[17]

Experimental studies reported that HbA1c decreased by 1.0%–2.0% after individual nutritional counseling.[18] Considering these findings, individual counseling seems to be effective and should be given to diabetes patients. Different dietary counseling intervention contents were also analyzed.[19] Sub group analysis of a dietary centeredcounseling intervention, dietary and athletic counseling intervention, and dietary exercise and psychosocial intervention showed that the effect size of HbA1c was significantly reduced in the two intervention groups, except for the dietary centered counseling intervention.[21] This finding is consistent with the results of a 10-year follow-up study, which showed significantly decreased HbA1C after a dietary and athletic counseling intervention.[22] Similar findings were reported by another study where HbA1c significantly decreased after a dietary counseling and moderate exercise strategy that included a decrease of 500–750 kcal and 175 min of moderate-intensity exercise per week.[23] Therefore, combining diet, exercise, and psychosocial intervention is considered more effective than diet counseling alone.[24]

There are significant changes in blood sugar levels after diet counseling.[25] Intake of the high amounts of fiber, low glycemic foods, and functional foods helps to reduce the blood sugar levels randomly.[26] The contents and methods of interventions were diverse between studies, and it was difficult to divide them into different groups.[27] The studies included in this systematic analysis have included complex dietary counseling interventions, so there may be high heterogeneity.[28] Therefore, it is necessary to carefully interpret the research results.

The results of the investigation showed that intervention group participants were generally likely to follow dietary principles more carefully, and were more involved in their interactions with the counselor.[29] Many studyresults also indicated that subjects who received periodic, intensive diet counseling did not show symptoms of progression to diabetic complications, and also did not progress to insulin therapy for the management of their disease.[30]

CONCLUSION

As the incidence and prevalence of diabetes increase, intervention through dietary counseling is becoming more important for diabetes control. This systematic review examines the evidence for the efficacy of dietary counseling interventions on diabetes control. The study subjects were patients with T2DM, and the main outcome variable was HbA1c. All trials were effective in improving glycaemic control and reported statistically significant improvements in HbA1c levels. Regarding the counseling method, individualized counseling was more effective.

Moreover, considering that HbA1c reflects the blood sugar level at 3 months, it is thought that dietary counseling interventions for 4 months or longer are necessary Combining diets, exercise, and psychosocial intervention is more effective than dietary counseling alone.

Conflicts of Interest

The authors declare no conflict of interest.

REFERENCES

1. Kim J, Hur MH. The Effects of Dietary Education Interventions on Individuals with Type 2 Diabetes: A Systematic Review and Meta-Analysis. Int J Environ Res Public Health. 2021;18(16):8439. Published 2021 Aug 10. doi:10.3390/ijerph18168439.
2. Adachi M., Yamaoka K., Watanabe M., Nishikawa M., Kobayashi I., Hida E., Tango T. Effects of lifestyle education program for type 2 diabetes patients in clinics: A cluster randomized controlled trial. BMC Public Health. 2013;13:467. doi: 10.1186/1471-2458-13-467.
3. Cheng L., Sit J.W., Choi K.-C., Chair S.-Y., Li X., Wu Y., Long J., Tao M. Effectiveness of a patient-centered, empowerment-based intervention program among patients with poorly controlled type 2 diabetes: A randomized controlled trial. Int. J. Nurs. Stud. 2018;79:43–51. doi: 10.1016/j.ijnurstu.2017.10.021.
4. Christensen A.S., Viggers L., Hasselström K., Gregersen S. Effect of fruit restriction on glycemic control in patients with type 2 diabetes—A randomized trial. Nutr. J. 2013;12:29. doi: 10.1186/1475-2891-12-29.
5. Dong Y., Wang P., Dai Z., Liu K., Jin Y., Li A., Wang S., Zheng J. Increased self-care activities and glycemic control rate in relation to health education via Wechat among diabetes patients: A randomized clinical trial. Medicine. 2018;97:e13632. doi: 10.1097/MD.0000000000013632.
6. Kumar, I and Gautam, M.Enhance the Nutritive Value of Diet through Dietary Diversity in the Rural area of Uttar Pradesh: an intervention-based study. Indian Res. J. Ext. Edu. 2022; 22 (2), pp. 29-33 https://doi.org/10.54986/irjee/2022/apr_jun/29-33.
7. Eakin E.G., Reeves M.M., Winkler E., Healy G., Dunstan D., Owen N., Marshal A.M., Wilkie K.C. Six-Month Outcomes from Living Well with Diabetes: A Randomized Trial of a Telephone-Delivered Weight Loss and Physical Activity Intervention to Improve Glycemic Control. Ann. Behav. Med. 2013;46:193–203. doi: 10.1007/s12160-013-9498-2.
8. Ebrahimi H., Sadeghi M., Amanpour F., Vahedi H. Evaluation of empowerment model on indicators of metabolic control in patients with type 2 diabetes, a randomized clinical trial study. Prim. Care Diabetes. 2016;10:129–135. doi: 10.1016/j.pcd.2015.09.003.
9. Amendezo E., Timothy D.W., Karamuka V., Robinson B., Kavabushi P., Ntirenganya C., Uwiragiye J., Mukantagwabira D., Bisimwa J., Marie H.U., et al. Effects of a lifestyle education program on glycemic control among patients with diabetes at Kigali University Hospital, Rwanda: A randomized controlled trial. Diabetes Res. Clin. Pr. 2017;126:129–137. doi: 10.1016/j.diabres.2017.02.001.
10. Fan M.-H., Huang B.-T., Tang Y.-C., Han X.-H., Dong W.-W., Wang L.-X. Effect of individualized diabetes education for type 2 diabetes mellitus: A single-center randomized clinical trial. Afr. Health Sci. 2017;16:1157–1162. doi: 10.4314/ahs.v16i4.34.
11. Jayasuriya R., Pinidiyapathirage M., Jayawardena R., Kasturiratne A., De Zoysa P., Godamunne P., Gamage S., Wickremasinghe A. Translational research for Diabetes Self-Management in Sri Lanka: A randomized controlled trial. Prim. Care Diabetes. 2015;9:338–345. doi: 10.1016/j.pcd.2015.01.014.
12. Al Lenjawi B., Mohamed H., Amuna P., Zotor F., Ziki M.D.A. Nurse-led theory-based educational intervention improves glycemic and metabolic parameters in South Asian patients with type II diabetes: A randomized controlled trial. Diabetol. Int. 2016;8:95–103. doi: 10.1007/s13340-016-0286-7.
13. Kumar, I; Gautam, M. Correlation between Individual Dietary Diversity Score and Nutrients Adequacy Ratio in the Rural Community. SPR. 2021;1(4):258–263. https://doi.org/10.52152/spr/2021.143.
14. Kumar, I., Gautam, M., Srivastava, D., Yadav, R. Assess the Diet Diversity Score along with the availability of food variety for a rural household in the Banda and Kannauj districts of Uttar Pradesh. American International Journal of Research in Formal, Applied & Natural Sciences. 2019; 25 (1), pp. 14-18.
15. Mohamed H., Al-Lenjawi B., Amuna P., Zotor F., Elmahdi H. Culturally sensitive patient-centred educational programme for self-management of type 2 diabetes: A randomized controlled trial. Prim. Care Diabetes. 2013;7:199–206. doi: 10.1016/j.pcd.2013.05.002.
16. Muchiri J.W., Gericke G.J., Rheeder P. Effect of a nutrition education programme on clinical status and dietary behaviours of adults with type 2 diabetes in a resource-limited setting

in South Africa: A randomised controlled trial. Public Health Nutr. 2015;19:142–155. doi: 10.1017/S1368980015000956.

17. Moreira R.C., Mantovani M.D.F., Soriano J.V. Nursing Case Management and Glycemic Control among Brazilians with Type 2 Diabetes: Pragmatic Clinical Trial. Nurs. Res. 2015;64:272–281. doi: 10.1097/NNR.0000000000000104.
18. Moncrieft A.E., Llabre M.M., McCalla J.R., Gutt M., Mendez A.J., Gellman M.D., Goldberg R.B., Schneiderman N. Effects of a Multicomponent Life-Style Intervention on Weight, Glycemic Control, Depressive Symptoms, and Renal Function in Low-Income, Minority Patients with Type 2 Diabetes: Results of the Community Approach to Lifestyle Modification for Diabetes Randomized Controlled Trial. Psychosom. Med. 2016;78:851–860. doi: 10.1097/psy.0000000000000348.
19. Peimani M., Monjazebi F., Ghodssi-Ghassemabadi R., Nasli-Esfahani E. A peer support intervention in improving glycemic control in patients with type 2 diabetes. Patient Educ. Couns. 2018;101:460–466. doi: 10.1016/j.pec.2017.10.007.
20. Ramadas A., Chan C.K.Y., Oldenburg B., Hussein Z., Quek K.F. Randomised-controlled trial of a web-based dietary intervention for patients with type 2 diabetes: Changes in health cognitions and glycemic control. BMC Public Health. 2018;18:1–13. doi: 10.1186/s12889-018-5640-1.
21. Kumar I, Gautam M, Excessive intake of micronutrients in rural population of Uttar Pradesh state, SPR, 2022, Volume 2, issue 2, Page No.: 515 - 519. DOI: https://doi.org/10.52152/spr/2021.174.
22. Rock C.L., Flatt S.W., Pakiz B., Taylor K.S., Leone A.F., Brelje K., Heath D.D., Quintana E.L., Sherwood N.E. Weight Loss, Glycemic Control, and Cardiovascular Disease Risk Factors in Response to Differential Diet Composition in a Weight Loss Program in Type 2 Diabetes: A Randomized Controlled Trial. Diabetes Care. 2014;37:1573–1580. doi: 10.2337/dc13-2900.
23. Reale R., Tumminia A., Romeo L., La Spina N., Baratta R., Padova G., Tomaselli L., Frittitta L. Short-term efficacy of high intensity group and individual education in patients with type 2 diabetes: A randomized single-center trial. J. Endocrinol. Investig. 2018;42:403–409. doi: 10.1007/s40618-018-0929-6.
24. Shahid M., Mahar S.A., Shaikh S., Shaikh Z.U. Mobile phone intervention to improve diabetes care in rural areas of Pakistan: A randomized controlled trial. J. Coll. Physicians Surg. Pak. 2015;25:166–171.
25. De Souza C.F., Dalzochio M.B., Zucatti A.T.N., De Nale R., De Almeida M.T., Gross J.L., Leitao C. Efficacy of an education course delivered to community health workers in diabetes control: A randomized clinical trial. Endocrine. 2017;57:280–286. doi: 10.1007/s12020-017-1352-z.
26. Tamban C., Isip-Tan I.T., Jimeno C. Use of Short Message Services (SMS) for the Management of Type 2 Diabetes Mellitus: A Randomized Controlled Trial. J. ASEAN Fed. Endocr. Soc. 2013;28:143–149. doi: 10.15605/jafes.028.02.08.
27. Thom D.H., Ghorob A., Hessler D., De Vore D., Chen E., Bodenheimer T.A. Impact of Peer Health Coaching on Glycemic Control in Low-Income Patients with Diabetes: A Randomized Controlled Trial. Ann. Fam. Med. 2013;11:137–144. doi: 10.1370/afm.1443.
28. Varney J.E., Weiland T., Inder W., Jelinek G.A. Effect of hospital-based telephone coaching on glycaemic control and adherence to management guidelines in type 2 diabetes, a randomised controlled trial. Intern. Med. J. 2014;44:890–897. doi: 10.1111/imj.12515.
29. Wild S.H., Hanley J., Lewis S.C., McKnight J.A., McCloughan L.B., Padfield P.L., Parker R.A., Paterson M., Pinnock H., Sheikh A., et al. Supported Telemonitoring and Glycemic Control in People with Type 2 Diabetes: The Telescot Diabetes Pragmatic Multicenter Randomized Controlled Trial. PLoS Med. 2016;13:e1002098. doi: 10.1371/journal.pmed.1002098.
30. Evert A.B., Boucher J.L., Cypress M., Dunbar S.A., Franz M.J., Mayer-Davis E.J., Neumiller J.J., Nwankwo R., Verdi C.L., Urbanski P., et al. Nutrition Therapy Recommendations for the Management of Adults with Diabetes. Diabetes Care. 2013;37:S120–S143. doi: 10.2337/dc14-S120.

Subject Index

Author Index

Guidelines for Authors

Manuscripts must be prepared in accordance with "Uniform requirements for Manuscripts submitted to Biomedical Journal" developed by international committee of medical Journal Editors

Types of Manuscripts and Limits

Original articles: Up to 3000 words excluding references and abstract and up to 10 references.

Review articles: Up to 2500 words excluding references and abstract and up to 10 references.

Case reports: Up to 1000 words excluding references and abstract and up to 10 references.

Online Submission of the Manuscripts

Articles can also be submitted online from http://rfppl.co.in/customer_index.php.

I) First Page File: Prepare the title page, covering letter, acknowledgement, etc. using a word processor program. All information which can reveal your identity should be here. use text/rtf/doc/PDF files. Do not zip the files.

2) Article file: The main text of the article, beginning from Abstract till References (including tables) should be in this file. Do not include any information (such as acknowledgement, your name in page headers, etc.) in this file. Use text/rtf/doc/PDF files. Do not zip the files. Limit the file size to 400 Kb. Do not incorporate images in the file. If file size is large, graphs can be submitted as images separately without incorporating them in the article file to reduce the size of the file.

3) Images: Submit good quality color images. Each image should be less than 100 Kb in size. Size of the image can be reduced by decreasing the actual height and width of the images (keep up to 400 pixels or 3 inches). All image formats (jpeg, tiff, gif, bmp, png, eps etc.) are acceptable; jpeg is most suitable.

Legends: Legends for the figures/images should be included at the end of the article file.

If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks from submission. Hard copies of the images (3 sets), for articles submitted online, should be sent to the journal office at the time of submission of a revised manuscript. Editorial office: Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091, India, Phone: 91-11-79695648, Cell: +91-9821671871. E-mail: author@rfppl.co.in. Submission page: http://rfppl.co.in/article_submission_system.php?mid=5.

Preparation of the Manuscript

The text of observational and experimental articles should be divided into sections with the headings: Introduction, Methods, Results, Discussion, References, Tables, Figures, Figure legends, and Acknowledgment. Do not make subheadings in these sections.

Title Page

The title page should carry

1) Type of manuscript (e.g. Original article, Review article, Case Report)

2) The title of the article should be concise and informative;

3) Running title or short title not more than 50 characters;

4) The name by which each contributor is known (Last name, First name and initials of middle name), with his or her highest academic degree(s) and institutional affiliation;

5) The name of the department(s) and institution(s) to which the work should be attributed;

6) The name, address, phone numbers, facsimile numbers and e-mail address of the contributor responsible for correspondence about the manuscript; should be mentoined.

7) The total number of pages, total number of photographs and word counts separately for abstract and for the text (excluding the references and abstract);

8) Source(s) of support in the form of grants, equipment, drugs, or all of these;

9) Acknowledgement, if any; and

l0) If the manuscript was presented as part at a meeting, the organization, place, and exact date on which it was read.

Abstract Page

The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Materials, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

Introduction

State the background of the study and purpose of the study and summarize the rationale for the study or observation.

Methods

The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and methods; all information obtained during the conduct of the study belongs in the Results section.

Reports of randomized clinical trials should be based on the CONSORT Statement (http:// www. consort-statement. org). When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma. net/e/policy/l 7-c_e.html).

Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

Discussion

Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, What this study adds to the available evidence, effects on patient care and health policy, possible mechanisms)? Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_ requirements.html) for more examples.

Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006; 35: 540–7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, *et al*. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003; 61: 347–55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone-iodine antisepsis. State of the art. Dermatology 1997; 195 Suppl 2: 3–9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000; 71: 1792–801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O,

Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. pp 7–27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979–2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7–18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

More information about other reference types is available at www.nlm.nih.gov/bsd/uniform_requirements.html, but observes some minor deviations (no full stop after journal title, no issue or date after volume, etc.).

Tables

Tables should be self-explanatory and should not duplicate textual material.

Tables with more than 10 columns and 25 rows are not acceptable.

Table numbers should be in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.

Explain in footnotes all non-standard abbreviations that are used in each table.

For footnotes use the following symbols, in this sequence: *, ¶, †, ‡‡,

Illustrations (Figures)

Graphics files are welcome if supplied as Tiff, EPS, or PowerPoint files of minimum 1200x1600 pixel size. The minimum line weight for line art is 0.5 point for optimal printing.

When possible, please place symbol legends below the figure instead of the side.

Original color figures can be printed in color at the editor's and publisher's discretion provided the author agrees to pay.

Type or print out legends (maximum 40 words, excluding the credit line) for illustrations using double spacing, with Arabic numerals corresponding to the illustrations.

Sending a revised manuscript

While submitting a revised manuscript, contributors are requested to include, along with single copy of the final revised manuscript, a photocopy of the revised manuscript with the changes underlined in red and copy of the comments with the point-to-point clarification to each comment. The manuscript number should be written on each of these documents. If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks of submission. Hard copies of images should be sent to the office of the journal. There is no need to send printed manuscript for articles submitted online.

Reprints

Journal provides no free printed, reprints, however a author copy is sent to the main author and additional copies are available on payment (ask to the journal office).

Copyrights

The whole of the literary matter in the journal is copyright and cannot be reproduced without the written permission.

Declaration

A declaration should be submitted stating that the manuscript represents valid work and that neither this manuscript nor one with substantially similar content under the present authorship has been published or is being considered for publication elsewhere and the authorship of this article will not be contested by any one whose name(s) is/are not listed here, and that the order of authorship as placed in the manuscript is final and accepted by the co-authors. Declarations should be signed by all the authors in the order in which they are mentioned in the original manuscript. Matters appearing in the Journal are covered by copyright but no objection will be made to their reproduction provided permission is obtained from the Editor prior to publication and due acknowledgment of the source is made.

Approval of Ethics Committee

We need the Ethics committee approval letter from an Institutional ethical committee (IEC) or an institutional review board (IRB) to publish your Research article or author should submit a statement that the study does not require ethics approval along with evidence. The evidence could either be consent from patients is available and there are no ethics issues in the paper or a letter from an IRB stating that the study in question does not require ethics approval.

Abbreviations

Standard abbreviations should be used and be spelt out when first used in the text. Abbreviations should not be used in the title or abstract.

Checklist

- Manuscript Title
- Covering letter: Signed by all contributors
- Previous publication/ presentations mentioned, Source of funding mentioned
- Conflicts of interest disclosed

Authors

- Middle name initials provided.
- Author for correspondence, with e-mail address provided.
- Number of contributors restricted as per the instructions.
- Identity not revealed in paper except title page (e.g. name of the institute in Methods, citing previous study as 'our study')

Presentation and Format

- Double spacing
- Margins 2.5 cm from all four sides
- Title page contains all the desired information. Running title provided (not more than 50 characters)
- Abstract page contains the full title of the manuscript
- Abstract provided: Structured abstract provided for an original article.
- Keywords provided (three or more)
- Introduction of 75-100 words
- Headings in title case (not ALL CAPITALS). References cited in square brackets
- References according to the journal's instructions

Language and grammar

- Uniformly American English
- Abbreviations spelt out in full for the first time. Numerals from 1 to l0 spelt out
- Numerals at the beginning of the sentence spelt out

Tables and figures

- No repetition of data in tables and graphs and in text.
- Actual numbers from which graphs drawn, provided.
- Figures necessary and of good quality (color)
- Table and figure numbers in Arabic letters (not Roman).
- Labels pasted on back of the photographs (no names written)
- Figure legends provided (not more than 40 words)
- Patients' privacy maintained, (if not permission taken)
- Credit note for borrowed figures/tables provided
- Manuscript provided on a CDROM (with double spacing)

Submitting the Manuscript

- Is the journal editor's contact information current?
- Is the cover letter included with the manuscript? Does the letter:

1. Include the author's postal address, e-mail address, telephone number, and fax number for future correspondence?
2. State that the manuscript is original, not previously published, and not under concurrent consideration elsewhere?
3. Inform the journal editor of the existence of any similar published manuscripts written by the author?
4. Mention any supplemental material you are submitting for the online version of your article. Contributors' Form (to be modified as applicable and one signed copy attached with the manuscript)

Red Flower Publication (P) Ltd.

Presents its Book Publications for sale

1. **Beyond Medicine: A to E for Medical Professionals) (2020)**
   Kalidas Chavan **INR390/USD31**
2. **Biostatistical Methods For Medical Research (2019)**
   Sanjeev Sarmukaddam **INR549/USD44**
3. **Breast Cancer: Biology, Prevention And Treatment (2015)**
   Dr. A. Ramesh Rao **INR 395/USD31**
4. **Chhotanagpur A Hinterland of Tribes (2020)**
   Ambrish Gautam **INR250/ USD20**
5. **Child Intelligence (2004)**
   Dr. Rajesh Shukla, Md, Dch. **INR100/ USD50**
6. **Clinical Applied Physiology and Solutions (2020)**
   Varun Malhotra **INR263/USD21**
7. **Comprehensive Medical Pharmacology (2019)**
   Dr. Ahmad Najmi **INR599/USD47**
8. **Critical Care Nursing in Emergency Toxicology (2019)**
   Vivekanshu Verma **INR460/USD34**
9. **Digital Payment (Blue Print For Shining India) (2020)**
   Dr. Bishnu Prasad Patro **INR329/USD26**
10. **Drugs in Anesthesia (2020)**
    R. Varaprasad **INR449/USD35**
11. **Drugs In Anesthesia and Critical Care (2020)**
    Dr. Bhavna Gupta **INR595/USD46**
12. **MCQs in Medical Physiology (2019)**
    Dr. Bharati Mehta **INR300/ USD29**
13. **MCQs in Microbiology, Biotechnology and Genetics (2020)**
    Biswajit Batabyal **INR285/USD22**
14. **MCQs In Minimal Access & Bariatric Surgery (2019)**
    Anshuman Kaushal **INR450/USD35**
15. **MCQs In Minimal Access and Bariatric Surgery (2nd Edition) (2020)**
    Anshuman Kaushal **INR545/USD42**
16. **Patient Care Management (2019)**
    A.K. Mohiuddin **INR999/USD78**
17. **Pediatrics Companion (2001)**
    Rajesh Shukla **INR 250/USD50**
18. **Pharmaceutics-1 (A Comprehensive Hand Book) (2021)**
    V. Sandhiya **INR525/ USD50**
19. **Poultry Eggs of India (2020)**
    Prafulla K. Mohanty **INR390/USD30**
20. **Practical Emergency Trauma Toxicology Cases Workbook (2019)**
    Dr. Vivekanshu Verma, Dr. Shiv Rattan Kochar, Dr. Devendra Richhariya **INR395/USD31**
21. **Practical Record Book of Forensic Medicine & Toxicology (2019)**
    Dr. Akhilesh K. Pathak **INR299/USD23**
22. **Recent Advances in Neonatology (2020)**
    Dr. T.M. Ananda Kesavan **INR 845/USD66**
23. **Shipping Economics (2018)**
    Dr. D. Amutha **INR347/USD45**
24. **Skeletal and Structural Organizations of Human Body (2019)**
    Dr. D.R. Singh **INR659/USD51**
25. **Statistics In Genetic Data Analysis (2020)**
    S.Venkatasubramanian **INR299/USD23**
26. **Synopsis of Anesthesia (2019)**
    Dr. Lalit Gupta **INR1195/USD75**

Order from

Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091(India)
Mobile: 8130750089, Phone: 91-11-79695648
E-mail: sales@rfppl.co.in