Eco. Env. & Cons. 31 (July Suppl. Issue): 2025; pp. (S320-S325) Copyright@ EM International ISSN 0971-765X

DOI No.: http://doi.org/10.53550/EEC.2025.v31i04s.049

Website: www.envirobiotechjournals.com

Study of Aeromycoflora at Indoor and Outdoor Site of Primary Health Centre Durg City, Chhattisgarh, India

Mansi V. Sahu and Ranjana Shrivastava*

*Govt. Dr. W.W. Patankar Girls PG College, Durg, Chhattisgarh, India

(Received 22 February, 2025; Accepted 8 April, 2025)

ABSTRACT

Airborne organisms and their spores, dust particles and pollen grains like micro substances are present in environment in the form of bioaerosols. Among all, most abundantly found bioparticles in air are fungal spores, on account of their dimensions in the form of bioaerosol. Hospitals are very prone to the fungal contaminations and are also contaminated with increasing numbers of severely ill patients. Primary health care (PHC) addresses most of the person's health needs throughout their lifetime. In the present study, indoor and outdoor aeromycoflora of Primary health centre (PHC) Potiyakala, Durg city was carried out from March 2022 to February 2023. During the study total 57 fungal species from 25 genera were isolated using Gravity plate method containing potato dextrose agar (PDA) media. A majority of fungi found from division of Anamorphic fungi and division of Ascomycota. Seasonal variation and different environmental conditions play an important role for the occurrence and diversity of fungal spores. Identification of fungal spore done by morphological and microscopic feature from available literatures. The fungi with the highest occurrence and prevalence were Aspergillus species, Cladosporium species, Curvularia species, Fusarium species And, Acremonium species, Penicillium species, Mucor species with lowest occurrence. Other than that we found some mycelia sterilia.

Key word: Aeromycoflora, Indoor environment, Outdoor environment, Bioaerosol and PHC.

Introduction

The study involves the impact of airborne Mycoflora in human, animal and other organism. Aerobiology is the study of bioparticles suspended in the air. It's a branch of microbiology which deals with bioparticles and allergic responses in humans and all livings. Aerobiology has been defined as science concerned with airborne microbes, pollen grains, dust, spores, smoke and other substances as well as their occurrence, characteristics, relation to human welfare and control. Environment has a spread of suspended fungal spores refers as aeromycoflora. Fungal spore causes pathogenicity in plants as well

as numerous allergic responses in human. All the fungal spores are not pathogenic or allergic but when inhaled they show adverse effect on human respiratory track and causes allergic responses. Thus, aerobiology is a multidisciplinary branch of science which deals with dispersion, deposition and dissemination of micro-organism and bioparticles through the atmosphere and their impact on plants, animals and human beings (Bhonde, 2018). Urban pollution would seem to be a cause of the increase of both allergic rhinitis and asthma (Jadhav and Kunjam, 2009) The allergic response due to fungal spores are similar as other biotic environmental pollutants. They can grow with least moisture content

^{*}Principal

^{*}Corresponding author's email: msgopima28@gmail.com

and any temperature, but 20 to 250 °C is the best temperature for fungal development. Some of the common allergic diseases caused due to Aeromycoflora are Allergic rhinitis, asthma and conjunctivitis. Air is the carrier of these microorganisms and aero mycological study verify the presence and quantify the fungal populations in the respective environment. Aero-mycological studies are of great importance because of their pathogenic properties, they cause respiratory track diseases in humans. The outdoor environment is major source of aeromycoflora instead of indoor environment. Indoor environment include area like houses, shopping malls, hotels, hospitals etc. Hospitals are very prone to the fungal contaminations and are also contaminated with increasing numbers of severely ill patients.

Materials and Methods

Study Area

In the investigation on the aeromycoflora of indoor and outdoor site of Primary Health Centre Potiyakala was selected as study area, an effort was made to examine the fungal spores present in environment where individuals are highly exposed to allergens that may cause allergic diseases.

Method of sampling

Aeromycoflora are suspended fungal spores present in the form of aerosol in our environment. There are so many specific techniques for catching fungal spores from the environment but in the present study, we use the Gravity Plate Method for sampling Aeromycoflora. Media coated slide or media containing petri plate exposed in environment for constant and required time at one metre above from ground level. Gravity sampling is non quantitative for atmospheric concentrations of aeroallergens and is affected by particle size and shape and by air movement. This method was first time used by Gregory (1952).

In the present study, the Gravity Plate Method was used for sampling of aeromycoflora. PDA media was poured into Petri plates, plates were exposed in selected indoor and outdoor sites of selected primary health centres (Potiyakala). Exposure of media contained petri plates for standard time interval 5-10 minute at one-meter hight opposite to gravity. The investigation was supervised for one

year march 2022 to February 2023. PDA media is standard for observing fungal growth. Petri plates were exposed to air in triplicate form at both indoor and outdoor site of primary health centre Potiyakala, Durg, Chhattisgarh. The aeromycoflora carried petri plate kept in incubator at 28 °C for 4-5 days in incubator.

Method of identification

The fungal colonies were isolated and identified. Photography done with photomicroscope. Identification of Aeromycoflora was done based on microscopic study and by following the literature of Funder, (1953); Ellis and Ellis, (1985); Barnet and Hunter, (1987) and Tilak, (1989). Percentage frequency and percentage distribution calculation done by following formula of (Prasad *et al.*, 2016).

Results

Aero-mycoflora at indoor site of Primary Health Centre (Potiyakala)

In the present investigation total 249 fungal colonies were observed among 20 genera and 51 fungal species. Over 20 fungal genera 12 number of colonies of 02 genera and 02 species of class Zygomycotina were noted; similarly 46 fungal colonies of 10 genera and 15 species of class Ascomycotina were observed. While 10 number of colonies of 01 genera and 01 species of class Basidiomycotina was noted. 178 fungal colonies of 07 genera and 33 species of class Anamorphic fungi were observed and 03 colonies of mycelia sterilia were noted at indoor site of Primary Health Centre of Potiyakala Durg, Chhattisgarh (Table 1, Fig. 1).

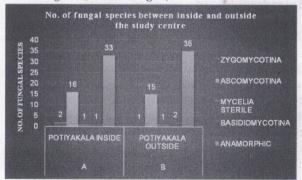


Fig. 1. Class-wise number of fungal species observed in both Indoor and outdoor Site of Primary health centre (Potiyakala) of Durg, city investigated during year 2022-23

The aeromycoflora of class Anamorphic fungi Cladosporium cladosporida were recorded as a highest found and aeromycoflora of class Ascomycotina within Emmonsia pasteuriana, Pseudo Aureobasidium Arachidicola, Trichophyton rubrum, Trichophyton

violaceum were recored as a lowest found. Aeromycoflora of class Anamorphic fungi within Alternaria solini, Fusarium incarnatum, Fusarium verticilloides, Periconiabyssoides were recorded as a lowest found. Mycelia steriliawas recorded in out-

Table 1. Class Wise Diistribution of Aeromycoflora in Indoor and Outdoor Site (Potiyakala) of Durg City Investigated During the Year 2022-2023

SNo	Number of colonies in the study si			y site Potiyakala
3.110.	Name of the Aeromyconora	Inside Potiyakala	Outside Potiyakala	Total no. of fungal colonies
CT AC	S ZYGOMYCOTINA	Tonyakaia	Tollyakala	Tungar colonies
	Interest Company of the Company of t			
1	Cunnighamella saisamornae	6	10	6
2	Mucor	6	13	19
OT LO	TOTAL	12	13	25
1,000	S ASCOMYCOTINA			
3	Botrytis cinera	2	-	2
4	Candida albicans	15	10	25
5	Cladophiodophora bantianna	2	1	3
6	Emmonsia pasteuriana	1	2	3
7	Engyodontium Rectidentatum	1. S. 1	2	2
8	Microsporum audouini	6	2	8
9	Microsporum canis	2	5	7
10	Microsporum gypseum	2	5	7
11	Neoscytalidium dimidiatum	3	3	6
12	Ovatospora brasiliensis	3	2	5
13	Pseudo Aureobasidium Arachidicola	1	3	4
14	Scedosporium prolificance	2	6	8
15	Trichophyton mentagnophyte	3	4	7
16	Trichophyton rubrum	1	3	4
17	Trichophyton tonsurance	2	3	5
18	Trichophyton violaceum	1	2	3
	TOTAL	46	53	99
CLAS	S BASIDIOMYCOTINA			
19	Phanerodontia Chrysosporium		3	3
20	Trametes ljubarskyi	10	2	12
	TOTAL	10	5	15
ANAN	MORPHIC FUNGI			
21	Acremonium sp.	3	4	7
22	Alternaria alternata	15	21	36
23	Alternaria brassicae		9	9
24	Alternaria citri	4	12	16
25	Alternaria solini	1	7	8
26	Aspergillus flavous	4	12	16
27	Aspergillus fumigatus	9	5	14
28	Aspergillus galacus	4	3	7
29	Aspergillus nigar	13	16	29
30	Aspergillus ochraceus	5	2	7
31	Aspergillus oryzae	5	5	10
32	Aspergillus parasiticus	2	-	2
33	Aspergillus steynii	4	8	12
34	Aspergillus terrus	5	3	8
35	Aspergillus versicolor	3	4	7

Table 1. Class Wise Diistribution of Aeromycoflora in Indoor and Outdoor Site (Potiyakala) of Durg City Investigated During the Year 2022-2023

S.No.	Name of the Aeromycoflora	Number of colonies in the study site Potiyakala		
511101		Inside Potiyakala	Outside Potiyakala	Total no. of fungal colonies
36	Cladosporium cladosporida	22	19	41
37	Cladosporium herbarum	8	6	14
38	Cladosporium oxysporum	6	25	31
39	Cladosporium tenuissium	5	19	24
40	Curvularia alcornii	3	4	7
41	Curvularia lunata	2	17	19
42	Fusarium delphinoides	8	2	10
43	Fusarium equisiti	3	4	7
44	Fusarium incarnatum	1	12	13
45	Fusarium oxysporum	9	5	. 14
46	Fusarium solini	3	2	5
47	Fusarium verticilloides	1	2	3
48	Penicillium chrysogenum	8	6	14
49	Penicillium citrium	6	7	13
50	Penicillium notatum	4	6	10
51	Penicillium rubens	2	2	4
52	Penicillum petrophilum	-	3	3
53	Periconia byssoides	1	4	5
54	Trichoderma harzianum	7	4	11
55	Trichoderma longibrachiatum	2	10	12
56	Trichoderma viridie	5.00 P. 1	1	1
	TOTAL	178	271	449
MYCE	CLIA STERILE			
57		3	5	8

(-) No Fungal Observation

door site of Primary Health centre Potiyakala, Durg, Chhattisgarh were recorded (Table 1).

Aero-mycoflora at outdoor site of Primary Health Centre (Potiyakala)

In the present investigation of aeromycoflora in primary health centre Potiyakala total 352 fungal colo-

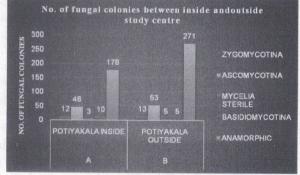


Fig. 2. Class-wise number of fungal colonies observed in both Indoor and outdoor Site of Primary health centre (Potiyakala) of Durg, city investigated during year 2022-23

nies were observed over 23 genera and 54 fungal species. Over 23 genera 18 fungal colonies of 02 genera and 02 species of class Zygomycotina were noted. 53 fungal colonies of 10 genera and 15 species of class Ascomycotina were recorded. 05 fungal colonies of 02 genera and 02 species of class Basidiomycotina were recorded. 271 fungal colonies of 09 genera and 35 species of class Anamorphic

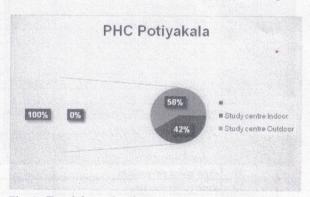


Fig. 3. Total fungal colonies distribution of Primary health centre (Potiyakala), Durg city.

fungi were recorded and 05 fungal colonies of mycelia sterilia are recorded (Table 2, Fig. 2).

The aeromycoflora of Class Anamorphic fungi within *Cladosporium oxysporum* were recorded as a highest found and the aeromycoflora of class Asomycotina within *Cladophiodophora bantianna*, aeromycoflora of class anamorphic fungi within *Trichoderma viridie* were recorded as a lowest found. *Mycelia sterilia* was recorded in outdoor site of Primary Health centre Potiyakala, Durg, Chhattisgarh (Table 2).

The present study found that anamorphic fungi exhibited the highest abundance in both indoor and outdoor environments, with a greater concentration observed in the outdoor environment. The lowest abundance of aeromycoflora, in terms of total fungal species, was recorded for *Mycelia sterilia*, while the class Basidiomycotina showed the lowest number of total fungal colonies (Fig. 1, 2).

Discussion

The present study indicates that the environment plays a significant role in influencing the growth rate of Aeromycoflora. The results clearly show that outdoor environments have a higher density of Aeromycoflora compared to Indoor environment (Fig. 3). Additionally, each specific environment has its own factors that can impact the growth and abundance of Aeromycoflora.

Conclusion

Airborne fungal spores were monitored at the study area, the Primary Health Centre (Potiyakala) in Durg City, Chhattisgarh, at both indoor and outdoor locations over a one-year period (2022-2023). The findings clearly indicate that the abundance of aeromycoflora was higher in the outdoor environment compared to the indoor environment. The health centre underwent regular fumigation, which likely contributed to a lower concentration of airborne fungi indoors compared to the outdoor environment. Previous research on the aeromycoflora of indoor and outdoor environments aligns with the current investigation, highlighting the significant role the environment plays in the growth and distribution of fungal flora. Health centres, due to the daily influx of severely ill patients, are particularly prone to the development of airborne fungi indoors as well. The recent study on aeromycoflora will help

to understand the allergic patient in terms of skin allergies, eyesight infection as well as respiratory track infection such as aspergillosis, asthma, hypersensitivity, and pneumonitis.

Acknowledgement

The author acknowledges the Chief medical and health officer Durg Chhattisgarh, who gave the permission to collect air sample from Primary health centre (Potiyakala) Durg, city.

Conflicts of interest

During the research author declare that they have no conflicts of interest. No funding source was used to carry out the research work.

References

- Bhonde, M. C. 2018. Aeromycoflora of two recidential places at Nagpur (MS) India. *International Journal of Current Engineering and Scientific Research (IJCESR)*. 5(1): 412-414.
- Darunde Punam, B.M. 2021. Aeromycology of Industrial Area, Wadi, Nagpur. *International Advanced Research Journal in Science, Engineering and Technology.* 8(8): 46-50.
- Ellis, M. B. and Ellis, J. P. 1985. *Microfungi on land plants*. Great Britain: Guildford and king'slynn.
- Funder, S. 1953. Practical mycology: manual for identification of fungi. Oslo-Norway: Broggers Boktr. Forlag.
- Jadhav, S. K. 1996. Studies of aeromycoflora over rice field at Baloda bazar Raipur (M.P.). Ph. D. thesis, Pt. Ravishankar shukla university Raipur.
- Jadhav, S. K. and Kunjam, S. 2009. Ecological studies on aeromycoflora of tribal area of chhattisgarh. *Indian Journal Aerobiology*. 22(1,2): 21-28.
- Khan, S. 2016. Survey of aeromycoflora and related allergic diseases of Raipur, Chhattisgarh. Ph. D. thesis, Pt. Ravishankar shukla university Raipur.
- Kulkarni, P. 2011. Aeromycological profile of the public parks of Bhilai township, Chhattisgarh, India. *Indian Journal of Science and Technology*. 4(5): 558-560.
- Luka, R. S., Sharma, K. and Tiwari, P. 2014. Aeromycoflora of Jackman memorial hospital, Bilaspur (C.G.). Scholars Academic Journal of Pharmacy. 3(1): 06-08.
- Mohture, V.M.K.A. 2020. Biodiversity of Aeromycoflora in indoor environment of Nagbhid (M.S.) India. *International Advanced Research Journal in Science, Engineering and Technology*. 7(11): 58-61.
- Nobel, W.C. and Clayton, Y.M. 1963. Fungi in the air of hospital wards. *Journal og General Microbiology*. 32: 397,402
- Pathak, A.K. 2012. An extramural aeromycological inves-

- tigation of Dental college hospital associated environment. *International Journal of Environmental Sciences*. 2(4): 1952-1961.
- Prasad, H., Tiwari, P. and Ekka, M.K. 2015. Study of Outdoor Aeromycoflora of Sai Temple, Amapara, Raipur district (C.G.), India. IOSR Journal of Environmental Science, Toxicology and Food Technology. 1(4): 08-13.
- Prasad, H., Tiwari, P., Patra, S. and Ekka, M.K. 2016. Study of intramural aeromycoflora of zoological museum of Govt. Nagarjun (PG) college of science Raipur (C.G.), India. *Indian Journal Apllied and Pure Biology*. 31(2): 143-150.
- Shahare, N.H. and Chichkhede, P. 2017, November). Study of aeromycoflora in college and university libraries in Amravati city Maharashtra, India. IOSR Journal of Environmental Science, Toxicology and Food Technology. 11 (1): 37-40.
- Shukla, S. and Shukla, R.V. 2011. Air borne fungal spores in the atmosphere of industrial town, Korba, Chhattisgarh, India. *Microbiology Journal*. 1(1): 33-39.
- Singh, A., Tiwari, R., Singh, P., Verma, V.S., Sharma, M.,

- Alexander, A. and Ajazuddin, 2014. Diversity of aeromycoflora of diffrent environmental hights. *Asian Journal of Pharmacy and Technology*. 4(4): 195-199.
- Soni Indu, P.S. 2022. A comparative study of aeromycoflora based on seasonal variation of pt. Sundar lal sharma library, pt.rsu, raipur, [c.g.], India. International Research Journal of Management Sociology & Humanity (IRJMSH). 257-264.
- Soni, I. 2016. Study of indoor Aeromycoflora of Pt. sundar lal sharma library in Pt Ravishankar shukla university Raipur (C.G.). Ph. D. thesis, Pt. Ravishankar Shukla University Raipur, C.G.).
- Tilak, S. T. 1982. Aerobiology. Aurangabad: Vaijayanti Prakashan.
- Tiwari, K. L., Jadhav, S. K. and Kunjam, S. R. (December 2006. Aeromycoflora of slum area of Raipur (C.G.), India. *Advances in Plant Science*. 19 (II): 387-390.
- Verma, S., Thakur, B., Karkun, D. and Shrivastava, R. 2013. Studies of aeromycoflora of district and session court of Durg, Chhattisgarh. *Journal Bio Innovation* 2(4): 146-151.

ORIGINAL PAPER



Particulate toxic elements' oxidative potential and gastrointestinal bioaccessibility features in the vicinities of coal-fired mineral processing industries, India

Archi Mishra · Shamsh Pervez · Yasmeen Fatima Pervez · Madhuri Verma · Princy Dugga · Sushant Ranjan Verma · Indrapal Karbhal · Kallol K. Ghosh · Manas Kanti Deb · Manmohan L. Satnami · Kamlesh Shrivas

Received: 25 October 2024 / Accepted: 2 February 2025 © The Author(s), under exclusive licence to Springer Nature B.V. 2025

Abstract Particulate matter (PM) poses significant health risks due to its ability to generate reactive oxygen species (ROS) and transport toxic metal(loid)s into the human body. In this study, an in vitro physiologically based extraction test (PBET) method, allowing the simulation of the gastric phase (GPh) and intestinal phase (IPh) of human digestion, was applied to evaluate bioaccessibility of eleven potentially toxic elements (Al, As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, and Zn) in airborne particulate matter (APM) samples collected from an urban-residential area in Chhattisgarh, India. Additionally, oxidative potential (OP) was assessed using the dithiothreitol (DTT) assay for a comprehensive understanding of PM toxicity. The bioaccessibility of metal(loid)s varied

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10653-025-02388-x.

A. Mishra · S. Pervez (⋈) · M. Verma · S. R. Verma · I. Karbhal · K. K. Ghosh · M. K. Deb · M. L. Satnami · K. Shrivas
School of Studies in Chemistry, Pt. Ravishankar Shukla
University, Raipur, Chhattisgarh 492010, India

e-mail: shamshpervez@gmail.com

Published online: 10 February 2025

Y. F. Pervez Government Dr. Waman Wasudev Patankar Girls PG College, Durg, Chhattisgarh, India

P. Dugga Government Danteshwari P.G. Mahila College, Jagdalpur, Chhattisgarh, India bility upto ~75%, attributed to its lower pH enhancing metal dissolution. Elevated DTT responses were recorded for PM₁₀ and PM_{2.5}, driven primarily by Fe, Zn, and Pb, underlining their pivotal role in oxidative stress generation. Correlation analyses demonstrated strong associations between bioaccessible fractions and OP, especially in the GPh. The findings advance understanding by linking bioaccessibility with ROS generation and highlight the importance of particle size and solubility in assessing the health risks posed by PM. These insights provide a foundation for improved risk assessments and mitigation strategies targeting emissions from high-temperature processing industries, and vehicular activities, on a global scale.

significantly across phases, with gastric phase solu-

Keywords In vitro bioaccessibility · DTT assay · Oxidative potential · Particulate matter · Reactive oxygen species

Introduction

Particulate matter (PM) is a critical environmental and public health concern due to its ability to transport toxic metals and metalloids into the human body. These elements, often released during industrial processes, vehicular emissions, and coal combustion, pose significant risks ranging from respiratory ailments to cardiovascular and neurological disorders (Lin & Yu, 2019; Gao et al., 2020; Kumar et al.,



2022; Briffa et al., 2020, Swietlik et al., 2022). The impact of PM exposure extends beyond the respiratory system, as inhaled particles are transferred via mucociliary clearance into the gastrointestinal tract (GIT), where they interact with gastric and intestinal fluids (Alpofead et al., 2017; Falta et al., 2008; Salim et al., 2014). Understanding the bioaccessibility of PM-bound metal(loid)s is vital for assessing their potential health risks, as only the bioaccessible fraction, the portion soluble in bodily fluids, is available for absorption and systemic distribution (Denys et al., 2006).

Previous studies have primarily focused on total concentrations of metals in PM to evaluate their health implications. However, these approaches overlook the fact that total concentrations do not account for the varying solubility of metals under physiological conditions (Boros et al., 2017; Mishra et al., 2021, 2023; Turner & Price, 2008). Bioaccessibility tests, such as the physiologically based extraction test (PBET), simulate gastric and intestinal environments to determine the fraction of metal(loid)s that can dissolve in the digestive system. This offers a more accurate representation of the potential exposure risks associated with PM-bound toxic elements (Han et al., 2020; Turner, 2011).

Simultaneously, the oxidative potential (OP) of PM, a measure of its ability to generate reactive oxygen species (ROS), has emerged as a key indicator of its toxicological impact. ROS, including hydroxyl radicals, superoxides, and hydrogen peroxide, are known to cause oxidative stress, damaging cellular components such as lipids, proteins, and DNA. The dithiothreitol (DTT) assay is a widely used method for quantifying OP, as it measures the rate at which PM depletes DTT, a surrogate for biological reducing agents (Charrier & Anastasio, 2012; Delfino et al., 2005; Dellinger et al., 2001; Li et al., 2009; Squadrito et al., 2001).

In this study, the water-soluble fraction of PM was used for the DTT assay to evaluate oxidative potential. Water-soluble components are directly available for redox reactions in aqueous environments, such as respiratory tract fluids, making them highly relevant for assessing immediate oxidative stress potential (Clemente et al., 2023; Guascito et al., 2023).

Industrial regions worldwide, particularly those with coal-fired power plants, mining operations, and

heavy industries, are known for their significant particulate matter emissions (Asif et al., 2022; Filonchyk & Peterson, 2023; Guttikunda et al., 2019). These activities contribute to variations in the analysis of OP and bioaccessibility of PM-bound toxic elements, influenced by seasonal and local pollution sources.

Despite the recognized importance of such regions, detailed analyses of the oxidative potential and bioaccessibility of toxic metal(loid)s in PM near coal-fired and mineral-processing industries remain scarce. Investigating these variations and their link to oxidative potential is essential for advancing PM toxicity research and shaping effective air quality management strategies.

This study aims to address these gaps by investigating (1) the speciation and gastrointestinal bioaccessibility of potentially toxic elements associated with PM in high-temperature processing industrial region, (2) the oxidative potential of these elements using the DTT assay, and (3) the correlation between the bioaccessible fractions of metal(loid)s and oxidative potential in PM₁₀ and PM_{2.5}. By linking bioaccessibility with oxidative potential, the findings provide a comprehensive framework for evaluating the health risks of PM exposure in industrialized environments worldwide.

Methodology

Sampling site and sampling method

A set of 78 samples of each particulate matter (PM₁₀ and PM_{2.5}) were collected from an urban-residential area in the Raipur district, Chhattisgarh during January to December 2019. These samples were obtained through 26 sampling events, each of which was replicated three times, resulting in the collection of 78 samples in total. The detailed procedure of sample collection has been described elsewhere (Mishra et al., 2023). PM₁₀ and PM_{2.5} samples were collected on quartz fibre filters (47 mm diameter) using a fine particulate sampler (APM 550, Envirotech) with 16.6 L/ min flow rate for 24 h. Subsequently, the collected samples were stored in a refrigerator (~4 °C) (Watson et al., 2017).



Environ Geochem Health (2025) 47:72 Page 3 of 14 72

In vitro metal(loid)s bioaccessibility test

bioaccessibility of PM_{2.5} (fine particulate mode) and PM_{10-2.5} (coarse particulate matter) metal(loid)s in the GPh and IPh (gastrointestinal phase) were evaluated by in vitro PBET method (Ruby et al., 1996; Turner, 2011; Mukhtar et al., 2013; Mishra et al., 2021). To estimate the bioaccessibility of PM_{2.5} and PM₁₀ metal(loid)s in GPh, simulated gastric fluids were applied. The gastric juice was prepared by adding 1 L deionized water (18.2 M Ω ·cm), 2.50 g pepsin (Sigma-Aldrich), 1.00 g sodium citrate (Sigma-Aldrich), 1.00 g DL malic acid disodium salt (Sigma-Aldrich, 98%), 840 µL lactic acid (ACS reagent, 85%), and 1 mL of acetic acid (Sigma-Aldrich). The pH (2) of the solution was adjusted by using HCl (Sigma-Aldrich). Quartz filters containing PM_{2.5} or PM₁₀ were cut into quarters and mixed with 15 mL of the gastric solution. The mixture was placed in a shaker in water bath at 37 °C for 1 h. After extraction, the samples were allowed to reach room temperature and subsequently centrifuged at 5000 rpm for 10 min for separation of sample solution from insoluble species and remaining filter substrate. A sample aliquot of the stomach phase was extracted and stored for examination. The residual sample mixture was further leached for the IPh by adjusting the pH to 7.0 with solid sodium bicarbonate (ACS, 99%). For the IPh, 175 mg bile salts (Sigma-Aldrich) and 50 mg pancreatin (Sigma-Aldrich) in 10 mL deionized water were added to the remaining solution. The mixture was incubated at 37 °C for 4 h and then centrifuged and filtered as described above for analysis. Extractants of GPh and IPh were then kept at 4 °C in a refrigerator until examination by furnace atomic absorption spectroscopy (FAAS). The bioaccessible concentrations of metal(loid)s were determined by double beam Atomic Absorption Spectrophotometer (AAS) (iCE 3000 Model, Thermo Fisher Scientific, UK) equipped with a graphite furnace and hydride generation. Bioaccessible metal(loid)s concentrations of PM_{10-2.5} were found by subtracting PM_{2.5} from PM₁₀ metal(loid) s concentration and considered as coarse particulate mode (PM_{10-2.5}). Further, percent bioaccessibility was calculated by dividing the gastric or intestinal concentrations by the total metal(loid)s concentrations and multiplying by 100 (Kabir et al., 2022).

Oxidative potential test

The ability of PM to produce ROS and subsequently cause oxidative stress in biological systems has been described using the term "oxidative potential" (OP) (Fang et al., 2019). DTT assay (adopted from Cho et al., 2005) was used for the assessment of the OP of PM (PM $_{10}$ and PM $_{2.5}$) and associated potentially toxic elements. For the DTT assay, the water-soluble fraction of the respective PM was obtained using a sequential extraction method. Details of this method can be found in our previous work (Mishra et al., 2023).

The water-soluble fraction was then added to 15 ml 100 µM DTT (Sigma-Aldrich) in 0.1 M of potassium phosphate buffer (Sigma-Aldrich). The mixture was incubated at 37 °C, and the reacting mixture was taken for monitoring DTT consumption after being filtered through 0.45 µm pore syringe filters and quenched by 1 ml trichloroacetic acid (TCA) (10% v/v) (Sigma-Aldrich) every 5 min. After then, reaction mixture was mixed with 2 mL of 0.4 M Tris HCl (Sigma-Aldrich), pH 8.9 containing 25 mL of 10 mM DTNB (5,5'-dithiobis-(2-nitrobenzoic acid) (Sigma-Aldrich). The concentration of formed 5-mercapto-2-nitrobenzoic acid was measured by its optical density absorption at 412 nm using a UV Vis spectrophotometer (evolution 220, thermo fisher). All reaction measurements were conducted in the low-light exposure environment. The DTT consumption rate (nmol/min*m³) corresponded to the slope of a straight line obtained by several data points (0, 5, 10, 15, 20, 25, 30 min). The DTT consumption rates of PM_{2.5} and PM₁₀ were calculated by the difference between the samples and filter blanks. For the assessment of elemental components OP, amount of total water- soluble concentrations of all the metal(loid) s was added to the DTT solution at time zero. DTT procedure, including steps and reagents used in this study, are illustrated in Fig. 1.

Quality control and statistical analysis

The analytically pure reagents and double distilled water were used for all experiments. A linear regression of four points of DTT concentration vs. time was used to calculate the rates of DTT loss. The replicate measurements were used to calculate the average and standard deviation of the resulting final rates of DTT



72 Page 4 of 14 Environ Geochem Health (2025) 47:72

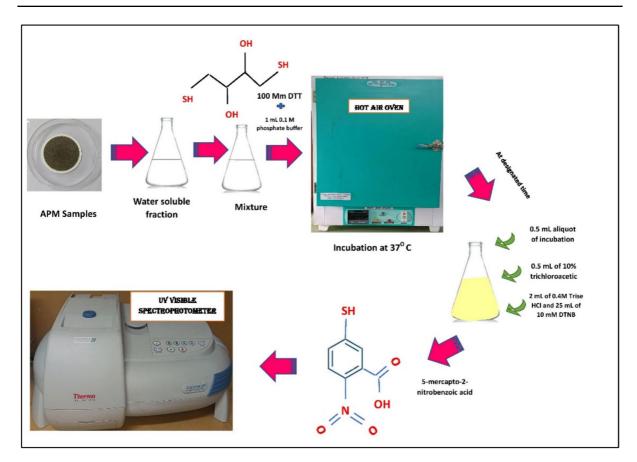


Fig. 1 Experimental procedure of DTT (Dithiothreitol) assay, adopted from Cho et al., 2005

loss. Excel 2019 and Origin 5.0 were utilized for statistical analysis and graph plotting (Chirizzi et al., 2017; Kabir et al., 2022). The square of the Pearson correlation coefficient (R²) was used to evaluate and quantify the relationships between various variables. In addition, the detection limits (LOD) for the different elements analyzed using atomic absorption spectroscopy (AAS) are provided in the supplementary file (Table S4).

Results and discussion

Bioaccessibility of $PM_{2.5}$ and $PM_{10-2.5}$ bound metal(loid)s in the gastrointestinal system

The Bioaccessible concentrations (mean, standard deviation (\pm)) in GPh and IPh of eleven metal(loid) s, along with total concentrations of each metal(loid) s (mean, standard deviation (\pm)) for coarse and fine

particulate modes are presented in Table S1 and Table S2, respectively (supporting information). Additional details regarding the particulate mass concentrations, metal(loid)s concentrations as well as other physiochemical properties of APM are available in a previous publication (Mishra et al., 2023).

As shown in Fig. 2, the percentage gastric bioaccessibility of potentially toxic elements (PTEs) in coarse particulate mode ranged from 12.72 to 74.55% following the order of Mn>As>Cr>Zn>Cd>C u>Pb>Ni>Co>Fe>Al. Corresponding bioaccessible concentrations in the GPh revealed that Mn had the highest value $(0.204\pm0.144~\mu g/m^3)$, reflecting its significant percentage bioaccessibility and higher relative abundance in these samples. In contrast, Fe and Al exhibited low bioaccessibility percentages (12.29% and 14.48%, respectively), even though their absolute bioaccessible concentrations $(0.170\pm0.167~\mu g/m^3$ for Fe, $0.093\pm0.109~\mu g/m^3$ for Al) were higher than several other metal(loid)s. This



Environ Geochem Health (2025) 47:72 Page 5 of 14 72

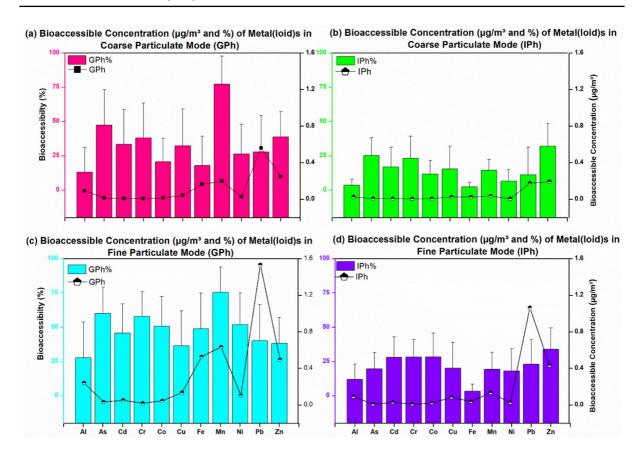


Fig. 2 Annually averaged bioaccessible concentrations and percentage bioaccessibility of toxic metal(loid)s in coarse ($PM_{10-2.5}$) and fine ($PM_{2.5}$) particulate modes, for both gastric (GPh) and intestinal (IPh) phases

suggests that elements with high total abundance may not necessarily show a proportional increase in bioaccessible concentrations.

In the IPh, the bioaccessibility trend was observed as $Zn>As>Cr>Cd>Cu>Mn>Co>Pb>Ni>Al>Fe, ranging from 2.47 to 31.94%. Zn demonstrated the highest intestinal bioaccessible concentration <math>(0.194\pm0.148~\mu g/m^3)$, consistent with its highest percentage bioaccessibility. Elements like Fe and Al again showed low bioaccessibility percentages (1.66-4.05%, respectively), despite their measurable bioaccessible concentrations $(0.023\pm0.026~\mu g/m^3)$ for Fe and $0.026\pm0.027~\mu g/m^3$ for Al).

For the fine mode, decreasing gastric bioaccessibility was observed: Mn>As>Cr>Ni>Co>Fe>C d>Pb>Zn>Cu>Al ranging from 27.39 – 75.34%. Mn exhibited the highest gastric bioaccessible concentration $(0.853\pm0.622~\mu g/m^3)$, reinforcing its significant role in both coarse and fine particulate modes. In the IPh, the bioaccessibility of metal(loid)s

ranged from 3.44 - 33.85% and decreased in the order of $Zn > Co > Cr > Cd > Pb > Cu > As > Mn > Ni > Al > Fe. Zn again showed the highest bioaccessible concentration <math>(0.446 \pm 0.333 \, \mu g/m^3)$.

The bioaccessibility of metal(loid)s in GPh was relatively higher than in IPh, with the difference being approximately 40% greater in the GPh. These outcomes are consistent with earlier research explaining that elements are more bioaccessible in the GPh significantly due to its lower pH (Kabir et al., 2022). The pH value is 7 for the IPh but 2 for the GPh. In highly acidic conditions, metal(loid)s are likely to be present as ions exhibit relatively high levels of activity (Pelfreňe et al., 2011). In the higher pH, neutral carbonate-rich environment of the intestine, metals readily form pepsin precipitates (Dong et al., 2020).

Mn displayed the highest bioaccessible concentrations in both coarse and fine modes, reaching approximately 91% in coarse mode $(0.204\pm0.144~\mu\text{g/m}^3)$ and 94% in fine mode $(0.853\pm0.622~\mu\text{g/m}^3)$. This



indicates significant bioavailability and potential health risks, likely linked to anthropogenic sources such as industrial emissions and fossil fuel combustion (Alberta Environment, 2004). Other metal(loid) s such as Al, Cd, Co, Fe, and Ni in coarse mode, and Al in fine mode, also showed measurable bioaccessibility, highlighting their importance in assessing human health risks. The temporal variation of gastric and intestinal bioaccessible concentrations in coarse and fine particulate modes was estimated by comparing the winter and summer mean values of PM sampled at an urban-residential area (n=16 for winter and n = 14 for summer for each metal(loid)s) during January- December 2019, as depicted in Figs. 3 and 4. Gastric and intestinal bioaccessibility of all metal(loid)s was higher in winter than in summer.

Moreover, higher metal(loid)s content in the PM corresponded to greater bioaccessibility, especially in GPh. This suggested the presence of sources

responsible for the high concentration of metal(loid) s in the PM at the study area, primarily attributed to high temperature-based coal-fired industries and the substantial loadings of vehicular exhausts throughout the year, particularly in the winter season (Liu et al., 2019; Mishra et al., 2023). This confirmed the gastrointestinal bioaccessible results, indicating that $PM_{2.5}$ and PM_{10} in urban areas of Chhattisgarh were predominantly influenced by coal combustion for urban heating during winter, driven by the urban population (Ghosh, 2016; Guttikunda et al., 2019; Singh, 2006).

Oxidative potential of PM₁₀ and PM_{2.5}

The DTT activity was assessed by determining the consumption rate of DTT at different time intervals (0, 5, 10, 15, 20, 30 min). Figure 1 gives an overview of the DTT assay methodology used to estimate the OP of the PM. The results of OP (nmol/min*m³)

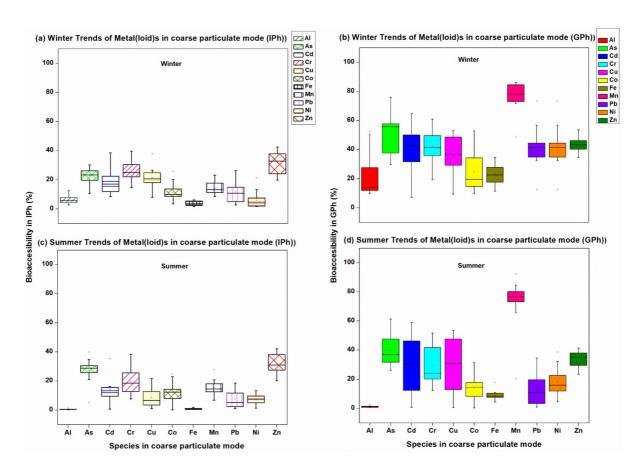


Fig. 3 Seasonally averaged values of Bioaccessibility of selected toxic mental(loid)s of coarse particulate (mode- $PM_{10-2.5}$) in gastric (GPh) (a) and intestinal (IPh) phase (b) for winter and summer season



Environ Geochem Health (2025) 47:72 Page 7 of 14 72

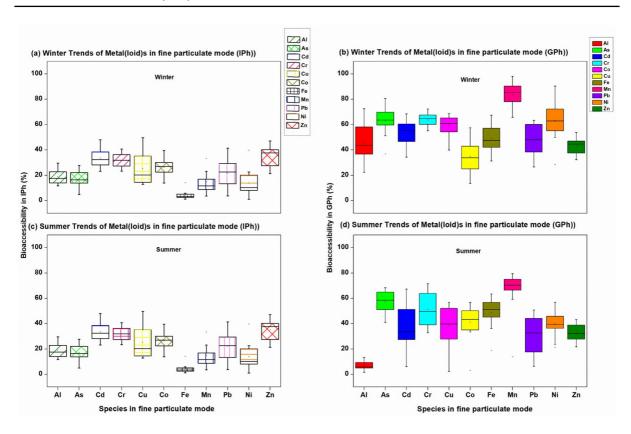


Fig. 4 Seasonally averaged values of Bioaccessibility of selected toxic mental(loid)s of fine particulate (mode- $PM_{2.5}$) in gastric (GPh) (a) and intestinal phase (IPh) (b) for winter and summer season

measurements (month-wise) for PM_{2.5} and PM₁₀ compared to the elemental components (As, Al, Cr, Cu, Cd, Mn. Ni, Pd, Ni, and Zn) are depicted in Fig. 5. The DTT consumption rate (nmol/min*m³) for PM_{2.5} mass ranged from 0.66 - 4.12 with an average value of 2.46 ± 1.20 . For elemental contents of PM_{2.5} it ranged between 0.42 to 2.90 with an average value of 1.72 ± 0.87 . In the case of PM₁₀ mass, the DTT value was 3.33 ± 1.28 (ranging between 1.33 and 4.99) and elemental contents ranged between 0.47 and 4.14 with an average of 2.45 ± 1.13 . It was observed that approximately 70–75% DDT loss occurred from the metal(loid)s in both PM_{2.5} and PM₁₀, respectively. The remaining DTT consumption might be due to the presence of quinones, water-insoluble metals, or other redox-active components, which were not examined in this study.

The OP value was found to be higher in PM_{10} than in $PM_{2.5}$, attributing to a greater concentration of redox-active elements per unit mass in PM_{10} compared to $PM_{2.5}$. This variation may be attributed

to distinct local sources, including industrial activities with notable element emissions and the abrasion from tire wear on highly trafficked roads. Furthermore, the results indicated that metal(loid)s can be responsible for the oxidation of DTT, and constituting a large portion of DTT loss from APM, where the DTT-active metal concentrations are markedly higher than the quinone concentrations. It is believed that water-soluble metals catalyze the Haber-Weiss reaction pathway, which reduces hydrogen peroxide to the redox active hydroxyl radical (Gao et a., 2005; Valko et al., 2016). Since ROS activity and transition metals are related, understanding their emissions sources is vital. Table 1 summarizes the comparison of the present study with earlier reported OP values (nmol/ min*m³) of PM. DTT activities for OP varied significantly across the different study areas, suggesting that a diverse mix of sources and consequent PM contents could lead to the significant variation in OP values. For instance, lower PM25 OP activity was found in Bologna, Italy, and in Los Angeles as compared to the



72 Page 8 of 14 Environ Geochem Health (2025) 47:72

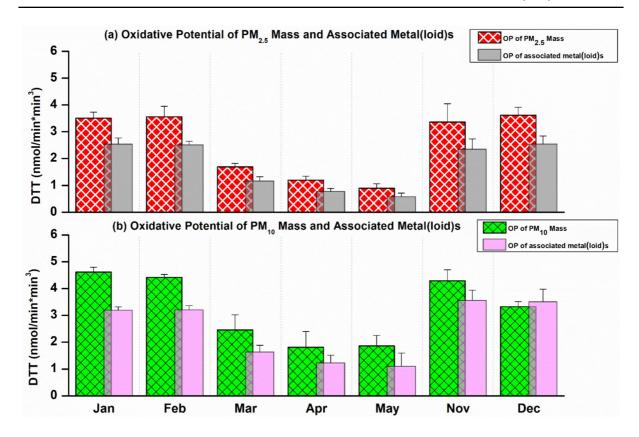


Fig. 5 Temporal variation of oxidative potential (OP) value measured with DTT Assay for PM_{2.5} and PM₁₀ sample

Table 1 Comparison of the present study with earlier reported oxidative potential values (nmol/min*m³) of particulate matter

Locations	Sampling period	Size fraction	OP value	References
Chhattisgarh, India	2019	PM ₁₀	3.33 ± 1.28	Present study
		$PM_{2.5}$	1.72 ± 0.87	
Delhi, India	2019	$PM_{2.5}$	1.57 ± 0.7	Puthussary et al., 2020
Mumbai, India	2017	$PM_{2.5}$	0.04-0.51	Anand et al., 2022
Lecce, Italy	2013-16	PM_{10}	0.46	Chirizzi et al., 2017
Central Los Angeles and Anaheim, California, USA	2012–14	PM _{2.5}	0.028 ± 0.005	Shirmohammadi al., 2016
Los Angeles	2001-02	$PM_{2.5}$	0.013	Li et al., 2003
Los Angeles	2007	$PM_{2.5}$	0.022	Hu et al., 2008
Los Angeles	2007	$PM_{2.5}$	0.007 ± 0.003	Verma et al., 2009
Central Mediterranean Site, Italy	2014–15	$PM_{2.5}$	0.29 ± 0.03	Perrone et al., 2019
Bologna, Italy	2011–14	$PM_{2.5}$	0.2–1.7	Visentin et al., 2016

present study (Hu et al., 2008; Li et al., 2003; Visentin et al., 2016). Similarly, the $PM_{2.5}$ OP in Mumbai, India was substantially lower, while the $PM_{2.5}$ OP activity in Delhi, India was comparable to that

in Chhattisgarh, India (current study) (Anand et al., 2022; Puthussery et al., 2020). These observed variations could be attributed to various PM mass ranges as well as different levels of ROS-generating species



Environ Geochem Health (2025) 47:72 Page 9 of 14 72

at different locations. The association of residual oil combustion tracers with ROS activity at various locations and size ranges serves as clear evidence of the impact of industrial activities and fuel oil combustion on PM-induced redox activity (Saffari et al., 2013a, 2013b, 2013c). For example, Nickel was connected to PM_{2.5} ROS activity in Milan, Lahore, and Beirut (Daher et al., 2012, 2014; Shafer et al., 2010). Furthermore, the strong associations of vehicular tracers at various locations (such as Fe in, Thessaloniki, and Denver and Cu in Long Beach, Beirut, and Milan) with ROS activity demonstrated the influence of traffic sources, including their contribution to road dust (e.g., tailpipe exhaust, recondensed lubricating motor oil, and tire-pavement interaction emissions) (Zhang et al., 2008; Daher et al., 2012; Saffari et al., 2013a, 2013b, 2013c; Saffari et al., 2013a, 2013b, 2013c; Daher et a., 2014).

Statistical correlation study of oxidative potential with PM mass and metal(loid)s concentrations

The correlation (R^2) between DTT consumption rates and PM concentrations was 0.60 for $PM_{2.5}$ and 0.56 for PM_{10} , indicating that oxidative potential is influenced by the particulate load. The slightly stronger correlation for $PM_{2.5}$ suggests its greater role in ROS generation, likely due to its higher surface area and capacity to carry reactive species.

The impact of potentially toxic metal(loid)s concentrations on human exposure and the wide scale of the OP generated by PM led to execute the correlations between DTT consumption rate and metal(loid) s concentrations. Correlation coefficient (R^2) analysis was performed between elemental contents DTT activity value and PTEs concentrations for PM₁₀ and PM_{2.5} samples independently (Table 2). The actual OP values of elemental contents can be found in Table S3 (supplementary information) and metal(loid)s concentrations are referenced from Mishra et al., (2023).

Most notably, and in showed strong correlations ($R^2 > 0.5$) were observed between DTT activity and concentrations of Al, As, Co, Zn, Cu, Cd, Fe, Mn, and Pb in PM₁₀. For PM_{2.5}, Zn, Cu, Fe, Pb, and Mn exhibited strong correlations ($R^2 > 0.5$) with DTT activity. This correlation suggested that metal(loid) s present in the study area were dominant in DTT response. Specifically, redox-active transition metals,

Table 2 Correlation coefficients (R^2) between OP (DTT) of PM_{10} and $PM_{2.5}$ elemental components (nmol/min*m³) and elemental concentrations (μ g/m³)

	OP (DTT)	
Elements	$\overline{PM_{10}}$	PM _{2.5}
Al	0.75^	0.47*
As	0.73^	0.46*
Co	0.55**	0.40*
Zn	0.79^	0.60**
Cu	0.68**	0.72^
Cr	0.49*	0.32*
Cd	0.59**	0.24*
Fe	0.60**	0.60**
Pb	0.73^	0.63**
Ni	0.24*	0.21*
Mn	0.68**	0.67**
>0.70^	0.50-0.70**	0.10-0.50*

such as Mn, Fe, and Cu were correlated with elemental component's DTT activity ($R^2 > 0.6$), given their capacity to produce H_2O_2 (ROS) through Fenton chemistry (reactions: 1–4) (Netto et a., 1996; Charrier & Anastasio, 2012).

Compared to $PM_{2.5}$ metal(loid)s, elevated correlation ($R^2 > 0.7$) for PM_{10} metal(loid)s was observed, which was most likely due to higher metal(loid)s concentration in PM_{10} as compared in $PM_{2.5}$ (Mishra et al., 2023).

Fenton reaction

$$DTT_{reduced} + 2Me^{n+1} \Rightarrow 2Me^{n} + DTT_{oxidised} + 2H^{+}$$
(1)

$$Me^n + O_2 \Rightarrow Me^{n+1} + O_2^- \tag{2}$$

$$Me^{n} + O_{2}^{-} + 2H^{+} \Rightarrow H_{2}O_{2} + Me^{n+1}$$
 (3)

$$2H^+ + O_2^- \Rightarrow H_2O_2 + O_2 \tag{4}$$

where "Me" represents metal.

Similarly, a good correlation (R ²>0.8) was observed by Ntziachristos et al. (2007) between DTT response from APM and metals (Fe, Cu, Mn, and Zn). Hu et al., 2008 and Geller et al., 2006 also found a correlation between DTT loss and their



metals content. However, metal(loid)s can significantly oxidize DTT where the APM are having higher concentrations of the DTT-active metals (Lin & Yu, 2019).

It should be noted that the emission sources of the metal(loid)s may impact the OP activity. Given the consistent and frequent links that were observed between OP activity and water-soluble metal(loid)s will be helpful to further understand the mechanism through which particular species and sources affect the OP of PM at each location.

Correlations between bioaccessible metal(loid) s concentrations in GPh and IPh (for both, PM₁₀ and PM_{2.5}) with OP were also studied (Table 3). For both PM₁₀ and PM_{2.5}, Fe, Zn, and Pb exhibit high correlations, highlighting their strong role in driving oxidative stress, especially in the gastric phase. Mn shows strong contributions, but only in PM₁₀'s GPh and PM_{2.5}'s GPh. The GPh consistently shows stronger correlations across most metals than the IPh. This suggests that metals are more reactive under gastric conditions, likely due to the acidic pH enhancing their solubility and reactivity. PM_{2.5} generally shows higher correlations for Fe and Mn in the GPh, indicating these smaller particles may carry more bioavailable reactive metals. Ni and Mn (in IPh) are the least impactful elements

Table 3 Correlation coefficients (R²) between OP (*DTT*) (nmol/min*m³) and bioaccessible metal(loid)s (GPh- Gastric phase, IPh- Intestinal phase) concentrations (µg/m³)

	OP (DTT)				
Elements	PM ₁₀		PM _{2.5}		
	GPh	IPh	GPh	IPh	
Al	0.46*	0.59**	0.48*	0.61**	
As	0.61**	0.40*	0.43*	0.21*	
Co	0.28*	0.31*	0.41*	0.39*	
Zn	0.75^	0.52**	0.69**	0.53**	
Cu	0.39*	0.33*	0.26*	0.33*	
Cr	0.42*	0.42*	0.37*	0.26*	
Cd	0.50**	0.53**	0.29*	0.29*	
Fe	0.70^	0.61**	0.81^	0.67**	
Pb	0.78^	0.42*	0.54**	0.38*	
Ni	0.20*	0.08	0.25*	0.09	
Mn	0.68**	0.10	0.77^	0.01	
>0.70^	0.50-0.70**		0.10-0.50*	< 0.10	

for oxidative potential, consistently showing weak correlations.

The results indicate that oxidative potential, as measured by the DTT assay, is strongly influenced by specific metal(loid)s, particularly Fe, Zn, and Pb, under gastric conditions. The findings emphasize the importance of considering particle size, metal solubility, and environmental phases to comprehensively assess the health risks posed by particulate matter.

Conclusion

This study investigated the gastrointestinal bioaccessible fractions of coarse (PM_{10-2.5}) and fine particulate matter (PM_{2.5}) and assessed their oxidative potential using the DTT assay. The findings revealed that higher bioaccessibility in GPh compared to IPh was exhibited by metal(loid)s. Among the analyzed metal(loid)s, Mn showed the highest gastric bioaccessibility in both coarse and fine particulate mode, reflecting contributions from industrial processes (e.g., alloy manufacturing) and fossil fuel combustion in power plants, automobile and coke ovens in and around the study area. Seasonal variation showed increased gastric and intestinal bioaccessibility of metal(loid)s during winter, likely driven by industrial emissions, road traffic, and biomass burning.

This study highlights the importance of assessing metal(loid)s bioaccessibility in urban-residential areas surrounded by coal-fired industries and vehicular emissions. Such assessments offer valuable insights into the bioavailable contaminants that can be absorbed through the gastrointestinal tract. However, further research is needed to explore the relationships between bioaccessibility values and health outcomes using animal models on similar particulate samples.

The DTT assay results further confirm that key metal(loid)s such as Fe, Zn, and Pb drive ROS generation, underscoring their toxicological significance. Elemental content accounted for approximately 75% of the DTT loss in PM₁₀ (2.45 \pm 1.13 nmol/min*m³) and 70% in PM_{2.5} (1.72 \pm 0.87 nmol/min*m³). The remaining DTT loss may be attributed to the presence of other insoluble metals and organics, specifically PHs (like quinone) which were not examined in this study. Correlation analyses revealed strong associations (R² \geq 0.60) between bioaccessible fractions and



Environ Geochem Health (2025) 47:72 Page 11 of 14 72

OP, particularly in the GPh, highlighting the crucial role of acidic solubility.

These findings contribute novel insights by linking bioaccessible fractions of metal(loid)s with their oxidative potential, bridging a key knowledge gap in PM toxicity research. This study offers a robust framework for health risk assessments, emphasizing the need to consider both bioaccessibility and oxidative potential when evaluating the impact of industrial and vehicular emissions.

Long-term monitoring of DTT redox activity can serve as a practical tool for assessing the health impacts of emission mitigation strategies, particularly in areas with significant industrial activity, such as Chhattisgarh, India. However, limitations such as the complexity of interactions within the human body, the methods of extraction, and the varying conditions of the gastrointestinal environment should be considered. Additionally, the exclusion of certain organic compounds, such as polycyclic hydrocarbons (PHs), may limit the comprehensiveness of the findings. Future research should aim to address these factors and explore seasonal patterns of DTT redox activity, mechanisms of metal-induced oxidative stress, and the role of redox-active organic compounds. Investigating DTT activity in personal exposure samples is also crucial for understanding the health implications of real-world aerosol exposure, including its links to diseases, mortality, oxidative stress, and inflammation.

Acknowledgements This study is mainly supported by SERB, India project proposal (CRG/ 2022/003926). One of the authors, Archi Mishra is thankful to Pt. Ravishankar Shukla University, Raipur, C.G., India for providing university scholarship under the grant-in-aid, VR. No 797/Fin./Sch./2021.

Author contribution Archi Mishra: Data curation, formal analysis, investigation, methodology, writing- original draft, writing—review & editing visualization. Shamsh Pervez: Conceptualization, data curation, validation, investigation, writing—review & editing, visualization, supervision. Yasmeen Fatima Pervez: Validation, reviewing and editing madhuri verma: validation, reviewing and editing. Princy Dugga: Validation, reviewing and editing. Sushant Ranjan Verma: Reviewing and editing. Indrapal Karbhal: Validation, reviewing and editing. Manas Kanti Deb: Validation, reviewing and editing. Manmohan L. Satnami: Validation, reviewing and editing. Kamlesh Shrivas: Validation, reviewing and editing.

Data availability No datasets were generated or analysed during the current study.

Declarations

Conflict of interest The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- Alpofead, J. A. H., Davidson, C. M., & Littlejohn, D. (2017). A novel two-step sequential bioaccessibility test for potentially toxic elements in inhaled particulate matter transported into the gastrointestinal tract by mucociliary clearance. *Analytical and Bioanalytical Chemistry*, 409(12), 3165–3174. https://doi.org/10.1007/s00216-017-0257-2
- Anand, A., Yadav, S., & Phuleria, H. C. (2022). Chemical characteristics and oxidative potential of indoor and outdoor PM_{2.5} in densely populated urban slums. *Environmental Research*, 212, 113562. https://doi.org/10.1016/j.envres. 2022.113562
- Asif, Z., Chen, Z., Wang, H., et al. (2022). Update on air pollution control strategies for coal-fired power plants. *Clean Techn Environ Policy*, 24, 2329–2347. https://doi.org/10.1007/s10098-022-02328-8
- Boros, K., Fortin, D., Jayawardene, I., Chénier, M., Levesque, C., & Rasmussen, P. E. (2017). Comparison of gastric versus gastrointestinal PBET extractions for estimating oral bioaccessibility of metals in house dust. *International Journal of Environmental Research and Public Health*, 14(1), 92. https://doi.org/10.3390/ijerph14010092
- Briffa, J., Sinagra, E., & Blundell, R. (2020). Heavy metal pollution in the environment and their toxicological effects on humans. *Heliyon*, *6*(9), e04691. https://doi.org/10.1016/j.heliyon.2020.e04691
- Charrier, J. G., & Anastasio, C. (2012). On dithiothreitol (DTT) as a measure of oxidative potential for ambient particles: Evidence for the importance of soluble transition metals. *Atmospheric Chemistry and Physics*, *12*(5), 11317–11350. https://doi.org/10.5194/acpd-12-11317-2012
- Chirizzi, D., Cesari, D., Guascito, M. R., Dinoi, A., Giotta, L., Donateo, A., & Contini, D. (2017). Influence of Saharan dust outbreaks and carbon content on oxidative potential of water-soluble fractions of PM2. 5 and PM10. Atmospheric Environment, 163, 1–8. https://doi.org/10.1016/j. atmosenv.2017.05.021
- Cho, A. K., Sioutas, C., Miguel, A. H., Kumagai, Y., Schmitz, D. A., Singh, M., Eiguren-Fernandez, A., & Froines, J. R. (2005). Redox activity of airborne particulate matter at different sites in the Los Angeles Basin. *Environmental Research*, 99(1), 40–47. https://doi.org/10.1016/j.envres. 2005.01.003
- Clemente, Á., Gil-Moltó, J., Yubero, E., Juárez, N., Nicolás, J. F., Crespo, J., & Galindo, N. (2023). Sensitivity of PM10 oxidative potential to aerosol chemical composition at a Mediterranean urban site: Ascorbic acid versus dithiothreitol measurements. Air Quality, Atmosphere & Health, 16(6), 1165–1172. https://doi.org/10.1007/s11869-023-01332-1



72 Page 12 of 14 Environ Geochem Health (2025) 47:72

- Daher, N., Ruprecht, A., Invernizzi, G., De Marco, C., Miller-Schulze, J., Heo, J. B., Shafer, M. M., Shelton, B. R., Schauer, J. J., & Sioutas, C. (2012). Characterization, sources and redox activity of fine and coarse particulate matter in Milan, Italy. Atmospheric Environment, 49, 130–141. https://doi.org/10.1016/j.atmosenv. 2011.12.011
- Daher, N., Saliba, N. A., Shihadeh, A. L., Jaafar, M., Baalbaki, R., Shafer, M. M., Schauer, J. J., & Sioutas, C. (2014). Oxidative potential and chemical speciation of size-resolved particulate matter (PM) at near-freeway and urban background sites in the greater Beirut area. *Science of the Total Environment*, 470, 417–426. https://doi.org/10.1016/j.scitotenv.2013.09.104
- Delfino, R. J., Staimer, N., Tjoa, T., Gillen, D. L., Schauer, J. J., & Shafer, M. M. (2013). Airway inflammation and oxidative potential of air pollutant particles in a pediatric asthma panel. *Journal of Exposure Science & Environmental Epidemiology*, 23(5), 466–473. https://doi.org/10.1038/jes.2013.25
- Dellinger, B., Pryor, W. A., Cueto, R., Squadrito, G. L., Hegde, V., & Deutsch, W. A. (2001). Role of free radicals in the toxicity of airborne fine particulate matter. *Chemical Research in Toxicology*, 14(10), 1371–1377. https://doi.org/10.1021/tx010050x
- Denys S, Tack K, Caboche J, Delalain P. (2006) Assessing metals bioaccessibility to man in human health risk assessment of contaminated site InConference Difpolmine: Quel devenir pour les grands sites pollués par des métaux? What does the future hold for large metal-polluted sites
- Dong, S., Zhang, S., Wang, L., Ma, G., Lu, X., & Li, X. (2020). Concentrations, speciation, and bioavailability of heavy metals in street dust as well as relationships with physiochemical properties: A case study of Jinan City in East China. Environmental Science and Pollution Research International, 27(28), 35724–35737. https://doi.org/10. 1007/s11356-020-09761-6
- Alberta Environment. (2004) Assessment Report on Manganese for Developing Air Quality Objective. https://open.alberta.ca
- Falta, T., Limbeck, A., Koellensperger, G., & Hann, S. (2008). Bioaccessibility of selected trace metals in urban PM_{2.5} and PM₁₀ samples: A model study. *Analytical and Bio*analytical Chemistry, 390(4), 1149–1157. https://doi.org/ 10.1007/s00216-007-1762-5
- Fang, T., Lakey, P. S. J., Weber, R. J., & Shiraiwa, M. (2019). Oxidative potential of particulate matter and generation of reactive oxygen species in epithelial lining fluid. *Envi*ronmental Science and Technology, 53(21), 12784–12792. https://doi.org/10.1021/acs.est.9b03823
- Filonchyk, M., & Peterson, M. P. (2023). An integrated analysis of air pollution from US coal-fired power plants. Geoscience Frontiers, 14(2), 101498. https://doi.org/10.1016/j.gsf.2022.101498
- Gao, D., Ripley, S., Weichenthal, S., & Godri Pollitt, K. J. G. (2020). Ambient particulate matter oxidative potential: Chemical determinants, associated health effects, and strategies for risk management. Free Radical Biology and Medicine, 151, 7–25. https://doi.org/10.1016/j.freeradbio med.2020.04.028

- Gao, X., Yu, Q., & Chen, L. M. (2005). Health effects of airborne particulate matter trace elements. *Biomedical and Environmental Sciences*, 18(5), 349–355.
- Geller, M. D., Ntziachristos, L., Mamakos, A., Samaras, Z., Schmitz, D. A., Froines, J. R., & Sioutas, C. (2006). Physicochemical and redox characteristics of particulate matter (PM) emitted from gasoline and diesel passenger cars. Atmospheric Environment, 40(36), 6988–7004. https:// doi.org/10.1016/j.atmosenv.2006.06.018
- Ghosh, D. (2016). 'We don't want to eat coal': Development and its Discontents in a Chhattisgarh District in India. *Energy Policy*, 99, 252–260. https://doi.org/10.1016/j.enpol.2016.05.046
- Guascito, M. R., Lionetto, M. G., Mazzotta, F., Conte, M., Giordano, M. E., Caricato, R., & Contini, D. (2023). Characterisation of the correlations between oxidative potential and in vitro biological effects of PM₁₀ at three sites in the central Mediterranean. *Journal of Hazardous Materials*, 448, 130872. https://doi.org/10.1016/j.jhazmat. 2023.130872
- Guttikunda, S. K., Pant, P., Nishadh, K. A., & Jawahar, P. (2019). Particulate matter source contributions for Raipur–Durg–Bhilai region of Chhattisgarh India. *Aerosol and Air Quality Research*, 19(3), 528–540. https://doi.org/10.4209/aaqr.2018.06.0237
- Han, Q., Wang, M., Cao, J., Gui, C., Liu, Y., He, X., He, Y., & Liu, Y. (2020). Health risk assessment and bioaccessibilities of heavy metals for children in soil and dust from urban parks and schools of Jiaozuo China. *Ecotoxicology and Environmental Safety*, 191, 110157. https://doi.org/10.1016/j.ecoenv.2019.110157
- Hu, S., Polidori, A., Arhami, M., Shafer, M. M., Schauer, J. J., Cho, A., & Sioutas, C. (2008). Redox activity and chemical speciation of size fractioned PM in the communities of the Los Angeles-Long Beach harbor. *Atmospheric Chemistry and Physics*, 8(21), 6439–6451. https://doi.org/10. 5194/acp-8-6439-2008
- Kabir, M. H., Wang, Q., Rashid, M. H., Wang, W., & Isobe, Y. (2022). Assessment of bioaccessibility and health risks of toxic metals in roadside dust of Dhaka City Bangladesh. *Atmosphere*, 13(3), 488. https://doi.org/10.3390/atmos 13030488
- Kumar, R. P., Perumpully, S. J., Samuel, C., & Gautam, S. (2022). Exposure and health: A progress update by evaluation and scientometric analysis. Stochastic Environmental Research and Risk Assessment: Research Journal. https://doi.org/10.1007/s00477-022-02313-z
- Li, N., Sioutas, C., Cho, A., Schmitz, D., Misra, C., Sempf, J., Wang, M., Oberley, T., Froines, J., & Nel, A. (2003). Ultrafine particulate pollutants induce oxidative stress and mitochondrial damage. *Environmental Health Perspectives*, 111(4), 455–460. https://doi.org/10.1289/ehp.6000
- Li, N., Wang, M., Bramble, L. A., Schmitz, D. A., Schauer, J. J., Sioutas, C., Harkema, J. R., & Nel, A. E. (2009). The adjuvant effect of ambient particulate matter is closely reflected by the particulate oxidant potential. *Environmental Health Perspectives*, 117(7), 1116–1123. https://doi.org/10.1289/ehp.0800319
- Lin, M., & Yu, J. Z. (2019). Dithiothreitol (DTT) concentration effect and its implications on the applicability of DTT assay to evaluate the oxidative potential of atmospheric



Environ Geochem Health (2025) 47:72 Page 13 of 14 72

aerosol samples. *Environmental Pollution*, 251, 938–944. https://doi.org/10.1016/j.envpol.2019.05.074

- Liu, X., Ouyang, W., Shu, Y., Tian, Y., Feng, Y., Zhang, T., & Chen, W. (2019). Incorporating bioaccessibility into health risk assessment of heavy metals in particulate matter originated from different sources of atmospheric pollution. *Environmental Pollution*, 254, 113113. https://doi. org/10.1016/j.envpol.2019.113113
- Mishra, A., Pervez, S., Candeias, C., Verma, M., Bano, S., Dugga, P., Verma, S. R., Tamrakar, A., Shafi, S., Pervez, Y. F., & Gupta, V. (2021). Bioaccessiblity features of particulate bound toxic elements: Review of extraction approaches, concentrations and health risks. *Journal of the Indian Chemical Society*, 98(11), 100212. https://doi. org/10.1016/j.jics.2021.100212
- Mishra, A., Pervez, S., Verma, M., Candeias, C., Pervez, Y. F., Dugga, P., Verma, S. R., Karbhal, I., Ghosh, K. K., Deb, M. K., Satnami, M. L., Shrivas, K., & Tamrakar, A. (2023). Chemical fractionation of particulate-bound metal (loid) s to evaluate their bioavailability, sources and associated cancer risk in India. Science of the Total Environment, 857(2), 159516. https://doi.org/10.1016/j.scitotenv. 2022.159516
- Mukhtar, A., & Limbeck, A. (2013). Recent developments in assessment of bio-accessible trace metal fractions in airborne particulate matter: A review. *Analytica Chimica Acta*, 774, 11–25. https://doi.org/10.1016/j.aca.2013.02. 008
- Netto, L. E. S., & Stadtman, E. R. (1996). The iron-catalyzed oxidation of dithiothreitol is a biphasic process: Hydrogen peroxide is involved in the initiation of a free radical chain of reactions. Archives of Biochemistry and Biophysics, 333(1), 233–242. https://doi.org/10.1006/abbi.1996.0386
- Ntziachristos, L., Ning, Z., Geller, M. D., Sheesley, R. J., Schauer, J. J., & Sioutas, C. (2007). Fine, ultrafine and nanoparticle trace element compositions near a major freeway with a high heavy-duty diesel fraction. *Atmospheric Environment*, 41(27), 5684–5696. https://doi.org/ 10.1016/j.atmosenv.2007.02.043
- Pelfrêne, A., Waterlot, C., Mazzuca, M., Nisse, C., Bidar, G., & Douay, F. (2011). Assessing Cd, Pb, Zn human bio-accessibility in smelter-contaminated agricultural topsoils (northern France). Environmental Geochemistry and Health, 33(5), 477–493. https://doi.org/10.1007/s10653-010-9365-z
- Perrone, M. R., Bertoli, I., Romano, S., Russo, M., Rispoli, G., & Pietrogrande, M. C. (2019). PM_{2.5} and PM₁₀ oxidative potential at a Central Mediterranean Site: Contrasts between dithiothreitol- and ascorbic acid-measured values in relation with particle size and chemical composition. Atmospheric Environment, 210, 143–155. https://doi.org/10.1016/j.atmosenv.2019.04.047
- Puthussery, J. V., Singh, A., Rai, P., Bhattu, D., Kumar, V., Vats, P., Furger, M., Rastogi, N., Slowik, J. G., Ganguly, D., Prevot, A. S. H., Tripathi, S. N., & Verma, V. (2020). Real-time measurements of PM_{2.5} oxidative potential using a dithiothreitol assay in Delhi India. *Environmental Science and Technology Letters*, 7(7), 504–510. https://doi.org/10.1021/acs.estlett.0c00342
- Ruby, M. V., Davis, A., Schoof, R., Eberle, S., & Sellstone, C. M. (1996). Estimation of lead and arsenic bioavailability

- using a physiologically based extraction test. *Environmental Science and Technology*, 30(2), 422–430. https://doi.org/10.1021/es950057z
- Saffari, A., Daher, N., Samara, C., Voutsa, D., Kouras, A., Manoli, E., Karagkiozidou, O., Vlachokostas, C., Moussiopoulos, N., Shafer, M. M., Schauer, J. J., & Sioutas, C. (2013a). Increased biomass burning due to the economic crisis in Greece and its adverse impact on wintertime air quality in Thessaloniki. *Environmental Science and Technology*, 47(23), 13313–13320. https://doi.org/10.1021/es403847h
- Saffari, A., Daher, N., Shafer, M. M., Schauer, J. J., & Sioutas, C. (2013b). Seasonal and spatial variation of trace elements and metals in quasi-ultrafine (PM_{0.25}) particles in the Los Angeles metropolitan area and characterization of their sources. *Environmental Pollution*, 181, 14–23.
- Saffari, A., Daher, N., Shafer, M. M., Schauer, J. J., & Sioutas, C. (2013c). Seasonal and spatial variation in reactive oxygen species activity of quasi-ultrafine particles. In the Los Angeles metropolitan area and its association with chemical composition. *Atmospheric Environment*, 79, 566–575.
- Salim, S. Y., Kaplan, G. G., & Madsen, K. L. (2014). Air pollution effects on the gut microbiota: A link between exposure and inflammatory disease. *Gut Microbes*, 5(2), 215–219. https://doi.org/10.4161/gmic.27251
- Shafer, M. M., Perkins, D. A., Antkiewicz, D. S., Stone, E. A., Quraishi, T. A., & Schauer, J. J. (2010). Reactive oxygen species activity and chemical speciation of size-fractionated atmospheric particulate matter from Lahore, Pakistan: An important role for transition metals. *Journal of Environmental Monitoring*, 12(3), 704–715. https://doi. org/10.1039/b915008k
- Shirmohammadi, F., Hasheminassab, S., Wang, D., Schauer, J. J., Shafer, M. M., Delfino, R. J., & Sioutas, C. (2016). The relative importance of tailpipe and non-tailpipe emissions on the oxidative potential of ambient particles in los Angeles, CA. Faraday Discussions, 189, 361–380. https://doi.org/10.1039/c5fd00166h
- Singh, G. (2006). An index to measure depreciation in air quality in some coal mining areas of Korba industrial belt of Chhattisgarh. *India. Environmental Monitoring and Assessment, 122*(1–3), 309–317. https://doi.org/10.1007/s10661-005-9182-5
- Squadrito, G. L., Cueto, R., Dellinger, B., & Pryor, W. A. (2001). Quinoid redox cycling as a mechanism for sustained free radical generation by inhaled airborne particulate matter. *Free Radical Biology and Medicine*, *31*(9), 1132–1138. https://doi.org/10.1016/s0891-5849(01) 00703-1
- Świetlik, R., & Trojanowska, M. (2022). Chemical fractionation in environmental studies of potentially toxic particulate-bound elements in urban air: A critical review. *Toxics*, 10(3), 124. https://doi.org/10.3390/toxics10030124
- Turner, A. (2011). Oral bioaccessibility of trace metals in household dust: A review. Environmental Geochemistry and Health, 33(4), 331–341. https://doi.org/10.1007/ s10653-011-9386-2
- Turner, A., & Price, S. (2008). Bioaccessibility of platinum group elements in automotive catalytic converter particulates. *Environmental Science and Technology*, 42(24), 9443–9448. https://doi.org/10.1021/es801189q



72 Page 14 of 14 Environ Geochem Health (2025) 47:72

Valko, M., Jomova, K., Rhodes, C. J., Kuča, K., & Musílek, K. (2016). Redox- and non-redox-metal-induced formation of free radicals and their role in human disease. *Archives of Toxicology*, 90(1), 1–37. https://doi.org/10.1007/s00204-015-1579-5

- Verma, V., Polidori, A., Schauer, J. J., Shafer, M. M., Cassee, F. R., & Sioutas, C. (2009). Physicochemical and toxicological profiles of particulate matter in los Angeles during the October 2007 southern California wildfires. *Environmental Science and Technology*, 43(3), 954–960. https:// doi.org/10.1021/es8021667
- Visentin, M., Pagnoni, A., & Pietrogrande, M. C. (2016). Evaluating the toxicity of airborne particulate by measuring oxidative potential with spectrophotometric a-cellular assays. In: Proceedings of the European Aerosol Conference EAC2016.
- Watson, J. G., Tropp, R. J., Kohl, S. D., Wang, X., & Chow, J. C. (2017). Filter processing and gravimetric analysis for suspended particulate matter samples. *Aerosol Science and Engineering*, 1(2), 93–105. https://doi.org/10.1007/s41810-017-0010-4

Zhang, Y., Schauer, J. J., Shafer, M. M., Hannigan, M. P., & Dutton, S. J. (2008). Source apportionment of in vitro reactive oxygen species bioassay activity from atmospheric particulate matter. *Environmental Science and Technology*, 42(19), 7502–7509. https://doi.org/10.1021/es800126y

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.





Peer Reviewed and Refereed Journal, ISSN NO. 2456-1037

Available Online: www.ajeee.co.in/index.php/AJEEE

THE IMPACT OF EMPTY NEST SYNDROME ON DIETARY PATTERNS OF EMPTY NESTERS

Dr. Anamika Vastrakar

Assistant Professor (Guest)
Govt. W.W. Patankar Girls College Durg

Dr. Seema Kalra

Assistant Professor (Guest) Govt. Danteshwari College Jagdalpur

Abstract - Empty Nest Syndrome (ENS) is a psychological condition affecting parents when their children leave home, leading to emotional distress and lifestyle changes. This paper explores how ENS influences dietary patterns, highlighting shifts in meal consumption, nutritional choices, and overall health. The study employs qualitative and quantitative methods to analyze dietary modifications due to emotional and social changes. Findings suggest that ENS contributes to irregular eating habits, nutritional deficiencies, and changes in food preferences, necessitating targeted interventions for healthier aging.

Keywords: Empty Nest Syndrome, Dietary Patterns, Emotional Eating, Nutritional Deficiency, Health Impact.

1. INTRODUCTION

The transition from an active household to an empty nest can have profound effects on parents' lifestyles, particularly their dietary habits. Empty Nest Syndrome (ENS) refers to the emotional distress, loneliness, and identity shifts experienced by parents when their children move out. While much attention has been given to the psychological implications of ENS, there is growing interest in how this life stage affects eating behaviors, food choices, and overall nutritional well-being.

As children leave home many parents experience changes in daily routines, including meal preparation and consumption. The need to cook large family meals diminishes, often leading to irregular eating patterns or a reliance on processed and convenience foods. Some parents may lose motivation to cook for themselves, leading to skipped meals or unbalanced diets, while others may overcompensate with emotional eating, favoring comfort foods that are high in sugar and fat. These shifts in dietary habits can contribute to nutritional deficiencies and increased health risks, including weight fluctuations and metabolic disorders.

Furthermore, social and psychological factors play a critical role in dietary adjustments. The absence of family meals can lead to decreased social dining experiences, reducing the motivation to maintain a structured and

nutritious diet. Studies suggest that individuals with strong social support systems are more likely to maintain healthier eating habits, emphasizing the need for interventions that promote balanced nutrition among empty nesters.

Empty Nest Syndrome (ENS) is a psychological state characterized by loneliness, grief, and identity shifts in parents when children leave home. This transition significantly alters lifestyle patterns, including dietary habits. This paper examines how ENS affects the dietary behavior of empty nesters, addressing emotional eating, changes in meal frequency, food preferences, and overall nutritional health.

2. METHODOLOGY Research Design

This study employs a mixed-methods approach to analyze the impact of Empty Nest Syndrome (ENS) on the dietary patterns of empty nesters. A combination of quantitative surveys and qualitative interviews was used to gain a comprehensive understanding of changes in dietary habits following the departure of children from the household.

Study Population and Sampling

The study population consists of adults aged 50 and above who have experienced ENS, defined as parents whose children have permanently moved out of the family home. Participants was recruited through



Peer Reviewed and Refereed Journal, ISSN NO. 2456-1037

Available Online: www.ajeee.co.in/index.php/AJEEE

community centers, social media platforms, and healthcare facilities.

A stratified random sampling method was applied to ensure diversity in gender, socioeconomic status, and cultural background. The target sample size is 300 participants for the quantitative survey and 30 participants for in-depth qualitative interviews.

Data Collection Quantitative Component

A structured questionnaire was designed to assess dietary behaviors, frequency of meal consumption, nutritional intake, and emotional well-being. The questionnaire will consist of the following sections:

- **Demographic Information:** Age, gender, income level, education, marital status.
- **Dietary Patterns:** Meal frequency, food group consumption, snacking habits, alcohol intake.
- **Psychological Measures:** Depression and loneliness scales (e.g., CES-D or UCLA Loneliness Scale).
- **Health Indicators:** Self-reported weight, BMI, and medical conditions related to diet.

The survey was administered online and in-person, and responses was collected using Google Forms and paperbased submissions.

Qualitative Component

Semi-structured interviews was conducted with a subset of participants to gain deeper insights into their emotional and behavioral responses to ENS and how it influences their dietary choices. Topics covered will include:

- Emotional reactions to children moving out.
- Changes in cooking habits and meal preferences.
- Motivations or barriers to maintaining a healthy diet.
- Coping mechanisms and strategies for dietary adaptation.

Interviews was recorded with participant consent, transcribed, and analyzed using thematic analysis.

Data Analysis

Quantitative Data Analysis

Descriptive statistics (means, frequencies, standard deviations) was used to

demographic summarize and dietary variables. Inferential statistical tests such as t-tests and ANOVA was conducted to behaviors compare dietary between subgroups (e.g., gender, socioeconomic status). Correlation and regression analyses was used to assess relationships **ENS-related** psychological between changes and dietary patterns.

Qualitative Data Analysis

Thematic analysis was conducted using various data analytic software to identify recurring patterns in the qualitative data. An inductive approach was used to categorize themes related to dietary changes, emotional well-being, and coping strategies.

Ethical Considerations

Ethical approval was obtained from the relevant institutional review board. Participants will provide informed consent before participation, and confidentiality was ensured. All personal data was anonymized, and participants will have the right to withdraw at any stage without consequence.

Limitations

Potential limitations of the study include self-reported bias in dietary and psychological measures and sample representativeness due to voluntary participation. Strategies such triangulation and validation checks was employed to mitigate these limitations.

By employing a robust mixed-methods approach, this study aims to provide valuable insights into how ENS influences dietary habits and inform interventions to promote healthier eating patterns among empty nesters.

3. RESULTS AND DISCUSSION

3.1. Emotional Eating and Irregular Meal Patterns

- 65% of respondents reported emotional eating, often consuming high-sugar and high-fat foods.
- 40% experienced reduced appetite, leading to skipped meals and lower energy intake.



Peer Reviewed and Refereed Journal, ISSN NO. 2456-1037

Available Online: www.ajeee.co.in/index.php/AJEEE

3.2. Changes in Meal Preparation and Food Choices

- 55% of empty nesters reduced home-cooked meals, opting for convenience foods.
- There was a decline in fruit and vegetable consumption, increasing the risk of nutritional deficiencies.

3.3. Nutritional Deficiencies and Health Risks

- 30% showed signs of micronutrient deficiencies, particularly vitamin D, calcium, and B12.
- A higher prevalence of weight gain and metabolic disorders was observed due to altered dietary habits.

3.4. Social Factors and Dining Behavior

- 70% of respondents reported decreased social dining experiences, contributing to isolation and poor eating habits.
- Those engaging in community activities or social dining maintained healthier dietary patterns.

correlation and regression analyses reveal significant relationships between psychological changes associated with Empty Nest Syndrome (ENS) and dietary patterns among empty nesters as shown in figure 1. The correlation matrix highlights strong associations between loneliness, depression, and dietary behaviors, indicating that emotional wellbeing plays a crucial role in shaping eating habits. Specifically, the regression analysis demonstrates that loneliness has a significant negative effect on calorie intake, while depression has a significant positive effect. This suggests individuals experiencing loneliness may consume fewer calories, whereas those experiencing depression may tend to eat more.

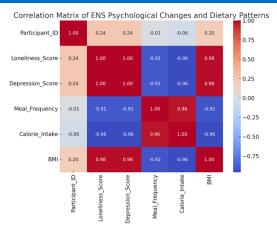


Figure 1 Correlation between dietary pattern and ENS psychological changes

Regression Analysis:

- The model predicts calorie intake using loneliness and depression scores.
- **R-squared** = **0.924**, indicating that 92.4% of the variation in calorie intake is explained by the predictors.
- **Loneliness Score** has a significant negative impact on calorie intake (p<0.001p < 0.001p<0.001).
- **Depression Score** has a significant positive impact on calorie intake (p<0.001p < 0.001p<0.001).
- The model is highly significant (p≈0.000p \approx 0.000p≈0.000).

The regression equation obtained from the analysis can be expressed as follows:

Calorie Intake = 1517.24 - 813.82 ×

Loneliness Score+703.42×

Depression Score

Where

- 1517.24 is the intercept, representing the estimated calorie intake when both loneliness and depression scores are zero.
- -813.82 is the coefficient for loneliness score, indicating that for each unit increase in loneliness, calorie intake decreases by approximately 813.82 calories.
- 703.42 is the coefficient for depression score, meaning that for each unit increase in depression, calorie intake increases by approximately 703.42 calories.
- This equation quantifies the impact of psychological factors on dietary habits and suggests that loneliness and depression have opposite effects



Peer Reviewed and Refereed Journal, ISSN NO. 2456-1037

Available Online: www.ajeee.co.in/index.php/AJEEE

on calorie consumption. Let me know if you need further clarification!

4. CONCLUSION AND RECOMMENDATIONS

The high R-squared value of 0.924 indicates that the model explains a substantial proportion of the variance in calorie intake, making it a strong predictor of dietary behavior. significance levels (p<0.001) for both loneliness and depression scores confirm psychological factors these meaningfully impact eating patterns. One possible explanation for these findings is that loneliness can lead to a lack of motivation to cook or eat properly, leading to a decline in overall food intake. On the other hand, depression is often associated with emotional eating, which could explain the increase in calorie consumption.

These findings align with previous research suggesting that psychological distress significantly alters dietary habits. Individuals facing ENS often undergo emotional adjustments, and their eating behaviors may shift as a coping mechanism. Lonelier individuals might lose interest in preparing meals, while those experiencing depression may turn to food for comfort, leading to higher calorie intake. These insights are critical targeted nutritional developing interventions and mental health support systems to help empty nesters maintain balanced diets.

conclusion, In the study underscores the strong influence of psychological changes on dietary behaviors among empty nesters. The results emphasize the need for mental health awareness and dietary guidance tailored to individuals experiencing ENS. Future research could further explore how different coping mechanisms affect food choices and whether social support systems can mitigate these dietary shifts. By addressing these psychological and nutritional challenges, we can promote healthier lifestyles for those transitioning into the empty nest phase.

REFERENCES

1. Ahmadi, S., Mohammadi, M., Mostafavi, S., & Joulaei, H. (2013). Dependence of the Geriatric Depression on Nutritional Status and

- Anthropometric Indices in Elderly Population. *Iranian journal of Psychiatry*, 8(2), 1-5.
- 2. Ahmed, T., & Haboubi, N. (2010). Assessment and management of nutrition in older people and its importance to health. *Clinical interventions in Aging*, 5(1), 207-216.
- 3. Banarjee, D. (2020). 'Age and ageism in COVID-19': Elderly mental health-care vulnerabilities and needs. *Asian Journal of Psychiatric*, 1-11. doi:10.1016/j.ajp.2020.102154
- 4. Blasco, B., Jimenez, J., Bodoano, I., & Rojas, L. (2020). Obesity and Depression: Its Prevalence and Influence as a Prognostic Factor: A Systematic Review. *Koean Neuropyschiatric Association*, 715-725. doi:10.30773/pi.2020.0099
- 5. Genovesi, S., Giussani, M., Orlando, A., & Orgiu, F. (2021). Salt and Sugar: Two Enemies of Healthy Blood Pressure in Children. *Nutrients*, *13*(2), 697.
- Gilleard, C., & Higgs, P. (2016, April).
 Connecting Life Span Development with the Sociology of the Life Course: A New Direction. Sociology, 50(2), 301-315.
- 7. Johnston, E., Johnson, S., McLeod, P., & Johnston, M. (2004). The Relation of Body Mass Index to Depressive Symptoms. *Canadian journal of Public Health*, 1-6.
- 8. Kalra, S., Verma, S., & Dubey, B. (2021). Body Mass Index and Depression in Older adults living in Old age homes of Durg District. *GIS Science Journal*, 8(3), 1793-1797.

(ISSN No. 2456-1037)

(INTERNATIONAL JOURNAL)

Available online at - www.ajeee.co.in/index.php/AJEEE



<u>Certificate</u>

This is to certify that our Editorial, Advisory and Review Board accepted research paper of Prof./Dr./Shri/Smt./Ku Dr. Anamika Vastrakar, The title of the paper is "THE IMPACT OF EMPTY NEST SYNDROME ON DIETARY PATTERNS OF EMPTY NESTERS". This is original and innovative. It is double blind peer reviewed. This paper has been published on Vol. 10, Issue 03, March 2025.

Publisher & Editor In Chief

Editor In Chief

AJEEE - International Journal

ISSN: 2456-1037

(ISSN No. 2456-1037)

(INTERNATIONAL JOURNAL)

Available online at - www.ajeee.co.in/index.php/AJEEE



<u>Certificate</u>

This is to certify that our Editorial, Advisory and Review Board accepted research paper of Prof./Dr./Shri/Smt./Ku Dr. Seema Kalra, The title of the paper is "THE IMPACT OF EMPTY NEST SYNDROME ON DIETARY PATTERNS OF EMPTY NESTERS". This is original and innovative. It is double blind peer reviewed. This paper has been published on Vol. 10, Issue 03, March 2025.

Publisher & Editor In Chief

Editor In Chief

AJEEE - International Journal

ISSN: 2456-1037

ISSN - 2277 - 5730

AN INTERNATIONAL MULTIDISCIPLINARY QUARTERLY RESEARCH JOURNAL

AJANTA

Volume - XIII

Issue - III

July - September - 2024

ENGLISH / MARATHI / HIDNI PART - I



Peer Reviewed Referred and Ex. UGC Listed Journal No. 40776

Single Blind Review / Double Blind Review

Impact Factor / Indexing 2023 - 7.428 www.sjifactor.com

EDITOR

Dr. Vinay Shankarrao Hatole

Assistant Professor, International Center of Excellence in Engineering & Management (ICEEM) College, Waluj, Chhatrapati Sambhajinagar. (MS)

PUBLISHED BY



AJANTA PRAKASHAN

Jaisingpura, Chhatrapati Sambhajinagar. (MS)



Professor Kaiser Haq

Dept. of English, University of Dhaka, Dhaka 1000, Bangladesh.

Dr. Ashaf Fetoh Eata

College of Art's and Science Salmau Bin Adbul Aziz University. KAS

Muhammad Mezbah-ul-Islam

Ph.D. (NEHU, India) Assot. Prof. Dept. of Information Science and Library Management University of Dhaka, Dhaka - 1000, Bangladesh.

Dr. S. Sampath

Prof. of Statistics University of Madras Chennari 600005.

Dr. S. K. Omanwar

Professor and Head, Physics, Sat Gadge Baba Amravati University, Amravati.

Dr. Shekhar Gungurwar

Hindi Dept. Vasantrao Naik Mahavidyalaya Vasarni, Nanded.

Dr. S. Karunanidhi

Professor & Head, Dept. of Psychology, University of Madras.

Dr. Shrikrishna S. Bal

I/C Principal (Retd.), Head, Department of Psychology, D.B.J.College, Chiplun, Dist. Ratnagiri (M.S.)

Prof. P. T. Srinivasan

Professor and Head, Dept. of Management Studies, University of Madras, Chennai.

Roderick McCulloch

University of the Sunshine Coast, Locked Bag 4, Maroochydore DC, Queensland, 4558 Australia.

Dr. Nicholas Loannides

Senior Lecturer & Cisco Networking Academy Instructor, Faculty of Computing, North Campus, London Metropolitan University, 166-220 Holloway Road, London, N7 8DB, UK.

Dr. Meenu Maheshwari

Assit. Prof. & Former Head Dept. of Commerce & Management University of Kota, Kota.

Dr. D. H. Malini Srinivasa Rao

M.B.A., Ph.D., FDP (IIMA) Assit. Prof. Dept. of Management Pondicherry University Karaikal - 609605.

Dr. Rana Pratap Singh

Professor & Dean, School for Environmental Sciences, Dr. Babasaheb Bhimrao Ambedkar University Raebareily Road, Lucknow.

Memon Sohel Md Yusuf

Dept. of Commercee, Nirzwa College of Technology, Nizwa Oman.

Prof. Joyanta Borbora

Head Dept. of Sociology, University, Dibrugarh.

Dr. Manoj Dixit

Professor and Head,
Department of Public Administration Director,
Institute of Tourism Studies,
Lucknow University, Lucknow.

Dr. P. Vitthal

School of Language and Literature Marathi Dept. Swami Ramanand Teerth Marathwada University, Nanded.



Dr. B. R. Kamble

Kirti M. Doongursee College, Dadar, Mumbai-28.

Prof. Ram Nandan Singh

Dept. of Buddhist Studies University of Jammu.

Dr. Jagdish R. Baheti

H.O.D. S. N. J. B. College of Pharmacy, Meminagar, A/P. Tal Chandwad, Dist. Nashik.

Dr. Sadique Razaque

Univ. Department of Psychology, Vinoba Bhave University, Hazaribagh, Jharkhand.

Dr. Safiqur Rahman

Assistant Professor, Dept. of Geography, Guwahati College Bamunimaidam, Guwahati, Assam.

Dr. Vimal K. Lahari

Assistant Professor, Department of Sociology, Banaras Hindu University, Varanasi, Uttar Pradesh.

Dr. Pandit Sheshrao Nalawade

I/C Principle, Pandit Jawaharlal Neharu Mahavidyalay, Aurangabad.

PUBLISHED BY



Ajanta Prakashan

Aurangabad. (M.S.)



SOLUTION SOF ENGLISH PART - I **SOLUTION Q**

S. No.	Title & Author	Page No.
1	Phytoconstituents in Ashwagandha, Guduchi, and Shatavari for	
	Anti-SARS-CoV-2 Potential	
	Dr. Datir Rajkumar Balkrishna	
2	Some Results on Derivatives and Integration of the RAM Finite	8-16
	Sine Hyperbolic Transform	
	Mr. R. A. Muneshwar	
3	Impact of Indian Traditional Food Habits on Health	17-22
	Dr. Reshma Lakesh	
	Tabssum	
4	Empowering Students with Physical Limitations through the	23-33
	Educational Metaverse	
	Bhutivinod Bachhar	
	Dr. Mita Howladar	

SOLUTION SOLUTION S

S. No.	Title & Author	Page No.
१	धाराशिव शहरातील बी. एड. महाविद्यालयातील शिक्षक प्रशिक्षकांना येणाऱ्या अडचणींचा अभ्यास	१-५
	डॉ. खजूरकर दे. त्र्यं.	
२	महिलांची भक्ती चळवळ	६-१२
	डॉ. प्रमिला हरिदास भुजाडे	

SOLUTION SOLUTION S

S. No.	Title & Author	Page No.
१	भारत में न्यायिक सक्रियतावाद	१-५
	डॉ. विनय कुमार सिंह	



सावित्रीबाई फुले पुणे विद्यापीठ

गणेशखिंड, पुणे - ४११००७

Savitribai Phule Pune University

Ganeshkhind, Pune - 411007

दूरध्वनी क्रमांक : ०२०— २५६२११५६/५७/६० Telephone : **020-25621156/57/60**

ईमेल / Email : boards@pun.unipune.ac.in

स्थातव्याचा अस्त महानस्य

शैक्षणिक विभाग (मान्यता कक्ष) Academic Section (Approval Cell) वेबसाईट/ Website: www.unipune.ac.in

परिपत्रक क. 22 1/२०२२

विषय:— शिक्षकांची नियुक्ती, सेवांतर्गत पदोन्नती, मार्गदर्शक मान्यता इत्यादीसाठी शोधनिबंध (Research Paper) ग्राहय धरणेबाबत.

विद्यापीठ अधिकार मंडळाने घेतलेल्या निर्णयानुसार शिक्षकांची नियुक्ती, सेवांतर्गत पदोन्नती (CAS) संशोधन मार्गदर्शक मान्यता (CAS) इत्यादींसाठी खालीलप्रमाणे शोध निबंध ग्राहय धरण्यास मान्यता देण्यात येत आहे.

- अ) UGC Approved List of Journals आणि UGC Care List अस्तित्वात येण्यापूर्वी ISSN क्रमांक असणाऱ्या सर्व संशोधन पत्रिकेतील शोध निबंध.
- बारकाईने पुनर्विलोकन केलेल्या (Peer Reviewed Journal) संशोधन पत्रिकेतील शोध निबंध. परंतु त्यासाठी सदरची प्रक्रिया Single blind review/Double blind review/Open or Transperent Peer Review पध्दतीने पूर्ण केल्याबाबतचे संबंधित संशोधन पत्रिका संपादकांचे प्रमाणपत्र आवश्यक राहील. उपरोक्त प्रक्रिया न करता संशोधन पत्रिकेच्या संपादकांने केवळ बारकाईने पुनर्विलोकित केलेले (Peer Review Journal) असे नमूद केले असेल तर ते ग्राह्य धरण्यात येऊ नये.
- क) वेळोवेळी प्रसिध्द केलेल्या UGC Care List मध्ये Index केलेल्या संशोधन पत्रिकेत प्रसिध्द शोध निबंध.

सदरचे धोरण पुर्वलक्षी प्रभावाने लागू करण्यात येत असून यापूर्वी विहित संख्येएवढे शोध निबंध प्रसिध्द नसल्याच्या कारणास्तव नाकारण्यात आलेले कोणतेही प्रस्ताव या धोरणाप्रमाणे मान्य होत असल्यास अशा अर्जदारांस पुन्हा नव्याने प्रस्ताव सादर करावा लागेल.

मा. प्राचार्य/मा. संचालक, सर्व संलग्न महाविद्यालये/मान्यताप्राप्त परिसंस्था आणि मा. विभागप्रमुख, विद्यापीठातील सर्व शैक्षणिक विभाग यांना विनंती की, सदर परिपत्रकाचा आशय सर्व संबंधितांच्या निदर्शनास आणून द्यावा.

गणेशखिंड, पुणे — ४११००७) जा.क. :— सीबी/६१६) दिनांक :— १२/०८/२०२२) (डॉ. मुंजाजी रासवे) उपकुलसचिव

3. Impact of Indian Traditional Food Habits on Health

Dr. Reshma Lakesh

Govt. Dr. W. W. Patankar Girls P. G. College, Durg, C. G..

Tabssum

Govt. Dr. W. W. Patankar Girls P. G. College, Durg, C. G..

Abstract

With the help of thousands of years of custom and culture, Indian food pattern have developed. Manuscripts, cave paintings, religious writings and stone implements are examples of the documentary evidence for this evaluation. Indian culture is known for its distinct take on vegetarianism, as well as its many dietary avoidance and special condition advice. Indian cuisine usually consists of a variety of items. Over the past 50 years, the type of food consumed has significantly changed due to the availability of refined and processed meals. The inclusion of unrefined variety foods needs the traditional Indian meal patterns healthier. Meal preparation and serving were done according to certain hygienic procedures to insure cleanliness and absence of any contamination.

Key Words: Indian food pattern, Indian culture, Indian cuisine, food habits.

Introduction

Our food defines us. Food is the foundation of life, this old saying holds scientific significance in addition to being accurate symbolically. We get the macro and micronutrients we need for survival, sustenance, and energy to go about our everyday lives from a healthy diet. Our mental, emotional, and physical well-being are significantly impacted by food. It is one of life's most satisfying joys as well as a need. As a result, food is central to many cultures, customs, and celebrations. But as important as food is, it really matters what, how much, and when we eat it.

The Rigveda contains the names of food grains and cooking techniques. Food preparation techniques differ throughout the nation, and traditional dishes have been made for a long time (Yadav 2021).

Customary understanding of food refining, food conservation, and the therapeutic effects of food have been established for several Indian products. The presence of components like antioxidants, anti-inflammatory, body-healing compounds, probiotics, and dietary fibres makes traditional Indian meals recognised as functional foods. Dietary ideas provide our bodies with food components that fulfill a multitude of biological purposes. Processing methods like

fermentation, malting, and sprouting are increasing the functional qualities of different diets (Christian et.al. 2007).

The Soma plant's fermented juice is shown to have been the unique intoxicating beverage consumed throughout Vedic times. Both in India and Iran, the ancients were revered as deities. The Rig-Veda has a single Mandala that is dedicated to this god. The complete process of processing the Soma juice is described in the sixty-sixth hymen of the ninth book of the Rigveda, which is where the passages that follow are taken from.

Soma juice was traditionally drunk in combination with milk. The Rig-Veda's poets exalt the virtues and revitalizing power of the Soma beyond reason, and some of them even go so far as to their justifications have given rise to the strange Puranic tales of the ocean churning and the discovery of the Amrit, or perpetual drink. The milking of Soma, which begins at the Ether, is transformed in the Puranas amid the stirring of the ocean for the Amrit. (Tapan 1906).

Consuming Food can lead to Spirituality

Food is divided into three categories by the Bhagavad-Gita (17.8–10): Satavik, Rajashik and Tamashik.

- **Satavik:** Food with the attribute of goodness.
- **Rajashik**: Food with a passionate quality.
- **Tamashik**: Food with the essence of ignorance in it.

A diet rich in whole grains, fruits, vegetables, dairy products, and other nutritious foods is more suitable. These dietary supplements lengthen life and vital energy, cleanse the body, mind, and spirit, give strength, and boost immunity. These kinds of Satavik meals are appetizing, juicy, and sweet.

Anxiety, conceit, ego, bodily and mental sickness, and the quality of passion are all caused by the cuisine, which is so pungent, sour, bitter, and salty. We refer to these kinds of dishes as Rajashik foods.

Meat, fish, eggs, and non-vegetarian meals are examples of a diet high in ignorance and prone to sadness, lethargy, and illusion, as filthy, decayed, and impure. These kinds of food fall under the category of Tamashi cuisine.

 A healthy diet not only promotes physical stamina, vitality, and longevity, but it also cleanses the body, mind, and soul and raises one's degree of consciousness and spirituality. Considered Satavik foods include boiled vegetables, milk, cereals, nuts, seeds, and legumes as well as fresh fruits.

- Foods classified as Rajasik foods provide sufficient energy to do daily tasks (Dubey 2010).
- Foods that accentuate the worst traits in human behavior foods that are categorized as Tamasik include alcohol, garlic, beef, onions, sour meals, and diets that do not include vegetables.

Dine In a Comfortable Setting

The Ksema-Kuntuhala, a 2nd-century A.D. Vedic text, states that a comfortable setting and a calming atmosphere are as important to proper digestion as the food's quality and composition. Eating a meal in a comfortable setting boosts vital force and enhances the state of mind, body, and soul.

Blend the Diet Well

Foods should be blended for optimal digestion and assimilation of nutrients in the combined meal, in addition to taste. Grains such as rice vegetables go nicely with wheat and millet. While fresh milk does not go well with cooked or boiled vegetables, milk products like cheese, butter yoghurt, and buttermilk do pair well with grains and vegetables. Moreover, foods that are strong, bitter, or spicy shouldn't be combined with milk. The well-known dish known as Vedic lunch, which comprises of rice, lentil and pulse soup, boiling veggies without seasonings, and multigrain chapattis, was a well-balanced meal in the ancient era, as we learned from the Vedas.

Refrain from Drinking Water Right Before or After Eating

As far as we are aware, the fire that burns in our stomachs to break down the food we eat is called Jatharagni, or "The Fire in the Stomach." In general, we have observed After eating, people drink water, and the impact of this liquid on the digestive tract becomes crucial to understanding the art of eating.

Water consumption before meals reduces hunger and, as a result, the inclination to overeat. Water after a meal slows the release of gastric fluids and lowers the digestive fire, yet drinking water right after a meal, even in little amounts, aids the stomach's digesting process. Water should not be consumed for at least 30 minutes before or after taking

Meals for the Body, Mind, and Soul

The people we typically interact with and the food we typically consume can be categorized as Satvic, Rajashik, or Tamasik cuisine.

Because of the high levels of stress and toxins in our modern lifestyle, people's diets fluctuate between Rajasik and Tamasik. In order to be joyful and happy, we must go from eating Tamasik to Rajasik meals and from Rajashik to Satvik meals.

Satvik Diet

Satvik refers to "fine essence." This is frequently the healthiest and purest food for a purposefully spiritual life. It provides the body with nourishment and keeps it in a tranquil condition. According to Ayurveda, this is frequently the most straight forward diet for maintaining physical vigor, mental clarity, optimal physiological health, and endurance. Additionally, it relaxes and cleanses the body and mind, allowing them to function at their peak.

Thus, a satvik meal leads to true health: a calm mind above all else, a healthy body, and a constant flow of vitality between the two. For people who want to live a quiet, contemplative, and tranquil life, a satvik diet is ideal. Meals classified as satvik are ones that don't make you feel queasy.

Rajasik Diet

Rajasik diet Ayurveda states that eating meals that stimulate the pitta and vata doshas causes restlessness and wrath. They arouse greater desire, ferocity, violence, inventiveness, and outward motion. The Rajashik diet is very piquant, acidic, and spicy. Pickles, tea, coffee, alcohol, sour and spicy dishes, and vegetables like garlic and onions are considered to be rajasik in nature. Foods high in rajasik will upset the mind-body balance and cause restlessness and uncontrollability.

Tamasik Diet

Foods that exacerbate feelings of inner darkness and bewilderment are referred to as tamasik foods. Fried and frozen foods are among the tamasik foods foods, meat, fish, eggs, onions, processed foods, microwaved meals, quick food, foods left over overnight, etc. They work well to increase inertia, numbness, depression, and slow down the metabolism. Out of these three categories, tamasik cuisine is the least healthful. People prepared food in a variety of ways throughout the Vedic era.

The Advantages of a Traditional Indian Diet for Health

The world of Indian food is a delectable fusion of traditional recipes and exotic ingredients. You may not be aware of this, but your favorite Indian foods do more for you than just delight your palate. In fact, they might be a pass to better health! Let's examine how the nutrient-dense, traditional Indian diet- known for its amazing spices and wide variety of dishesmight turn into your very own personal health shield.

Bright Components to Promote Health

The wide variety of ingredients utilized in Indian cuisine is one of its most prominent features. A wide range of whole grains, legumes, fruits, and vegetables are included in the traditional Indian diet, all of which have a substantial positive impact on health.

Many Indian dishes are built around entire grains including whole wheat, millets, and brown rice. For example, "Ragi Mudde" (finger millet balls) and "Bajra Roti" (pearl millet bread) are high in fiber, protein, and vital minerals like magnesium, which help support heart health and better digestion.

The protein-rich main ingredients in recipes like "Dal Makhani" (lentil curry) and "Chana Masala" (spicy chickpeas) are lentils and chickpeas. They are a great option for vegetarians and vegans since they supply a sizable amount of plant-based protein. They also help to manage blood sugar levels and a healthy gut microbiota because they are an excellent source of dietary fiber.

Spices: The Pleasant Warriors of Health

The undeniable stars that elevate Indian cuisine to a gastronomic joy are the spices. In addition to adding taste to food, each of the following: turmeric, ginger, garlic, cumin, fennel, cinnamon, fenugreek, and chili peppers-also has a wealth of health advantages that can improve your overall health.

Well-Composed Meals: A Harmony of Flavors

The emphasis Indian food places on striking a balance between flavors and nutrients is among its most exquisite features. The traditional Indian diet, which is based on Ayurvedic principles, stresses the use of all six tastes—sweet, sour, salty, bitter, pungent, and astringent in every meal. This method produces a more pleasurable dining experience by ensuring a thorough nutritional profile and eliciting a range of sensory reactions.

Conventional Methods: Preserving the Quality

The traditional cooking methods used in Indian cuisine are renowned for maintaining the nutritional worth of the ingredients while bringing out their tastes. A variety of methods, including slow cooking, fermenting, smoking, and sprouting, have specific uses in preserving and sometimes improving the nutritional composition of food.

Slow cooking lets the ingredients stew in their juices for an extended amount of time and is frequently used to make meals like "Dal Makhani" or "Rogan Josh." In addition to enhancing flavor depth and facilitating faster digestion, this technique helps preserve the majority of the nutrients in the meal.

Another method that has several advantages is fermentation, which is used to make foods like "Dhokla" and "Dosa." Fermentation improves the texture and flavor of food while also increasing the nutrients' bioavailability, or how easily our bodies can absorb them. Moreover, it produces probiotics that support a more balanced intestinal flora.

Using sprouts in recipes such as "Sprouted Moong Dal" or "Sprouted Salad" is another way to increase the nutritional value of food. Legumes and grains that contain antinutrients are broken down during the sprouting process, which facilitates better digestion and increases the amount of nutrients our systems can absorb. Those who have digestion problems or sensitive stomachs can especially benefit from this.

Conclusion

The purpose of this paper is to learn about the many types of food preparation and eating practices used during the Vedic era.

A proper, natural, and healthy diet can help one achieve improved health. Diet is a fundamental component in life. The majority of health issues that arise in the modern era are caused by improper cooking and eating habits.

The Vedas place greater emphasis on the first of the three pillars of sustenance for lifediet, sleep, and practice of celibacy and believe it to be the most important. A suitable, optimal, and expert application of these trios, human body to preserve its integrity for the duration of its life, maintaining enhanced physical and immunological strength, complexion, and growth of nutrients.

References

- 1. Cristine Hotz, Rosalind S. Gibson. "Traditional Food, Processing & Preparation Practices to Enhance the Bioavailability of Micronutrients in Plant Based Diets." Journal of Nutrition (2007): 1097-1100.
- 2. Dubey, K. "The Indian Cuisine; delhi." PHI Learning PVt. Ltd, India (2010).
- 3. Rayachoudhari, Tapan. "Dutt Romesh Chunder, Ed. Jackson Williams AV; history of India, in nine Volumes-vol. 1, from the Earliest Times to sixth Centuary B.C.; New York, USA" Cosmio Classics (1906).
- 4. Yadav, A. "Traditional Methods of Food habits and Dietry Preparations in Vedas", alternative and Integrative Medicine (2021).



https://africanjournalofbiomedicalresearch.com/index.php/AJBR

Afr. J. Biomed. Res. Vol. 27(4s) (December 2024); 11795-11799
Research Article

Effect of Yoga on Psychological wellbeing of Visually Impaired Students

Dr Reshma Lakesh^{1*}, Dr. Shabnam Khan², Dr Rashmi Shrivastava³, Dr Moniya Rakesh Singh⁴, Shikha Markam⁵, Tabassum⁶

^{1*}Govt. Dr. W. W. Patankar Girls PG College, Durg, Chhattisgarh.
 ²St. Thomas College, Bhilai, Chhattisgarh.
 ³Government Home Science PG College, Narmadapuram, (MP).
 ⁴Govt Dr. W. W. Patankar Girls PG College, Durg, Chhattisgarh.
 ⁵College of Horticulture and Research, Dhamtari, Chhattisgarh.
 ⁶Govt. Dr. W. W. Patankar Girls PG College, Durg, Chhattisgarh.

Abstract: The aim of the study was to find out the effect of Yoga on Psychological Wellbeing of Visually Impaired Students. The study was experimental in nature with Quasi experimental research design, which includes Pre-test, Post-test control group design. A Sample of 60 Visually Impaired students, 30 for experimental group (15 Males and 15 Females) and 30 for control group (15 Males and 15 Females) were selected as sample for the present study. For assessment of **Psychological Well-being** of the students', Self-made Psychological Well-being Scale was used by the researcher. One-way ANCOVA was employed for analyses of data and interpretation of the results. The psychological well-being of experimental group which have been treated with Yoga was better than the control group.

Keywords: Yoga, Psychological Well-Being, Visually Impaired

Received 15/11/2024, Acceptance 30/12/2024

DOI: https://doi.org/10.53555/AJBR.v27i4S.6032

© 2024 The Author(s).

This article has been published under the terms of Creative Commons Attribution-Noncommercial 4.0 International License (CC BY-NC 4.0), which permits noncommercial unrestricted use, distribution, and reproduction in any medium, provided that the following statement is provided. "This article has been published in the African Journal of Biomedical Research"

INTRODUCTION

Yoga is an ancient Indian practice, which consists of physical exercise, technique of breath control and meditation and has been increasingly recognised as useful in improving psychological health. More recently, has been used with a range of people including specifically those with disabilities especially the physically disabled, the blind in particular. In this introduction, the author explores the topic of yoga as an intervention strategy to boost the psychological health of visually impaired learner and discusses prior research and important features.

Mental Health Status and the Blind

Subjective mental health encompasses affects and emotional level, perceived quality of life and the ability to cope. The general psychological health of visually impaired students is difficult to attain because of the above societal hindrances, stigma, as well as restricted resources (Singh & Misra, 2019). Such students mostly experience high rates of anxiety and depression according to Sharma and his colleagues (2018). Therefore, efforts to enhance the students' performances should be targeted to cater for their individual's peculiarities.

The Integration of Yoga for psychological Health

Yoga has been found to have the potential of enhancing mental health of various samples because of it sustainability advantages. Researches have shown its efficiency in stress decreasing, increasing the wellbeing and regulation of the emotions, and self mastery (Khalsa et al., 2016). Furthermore, as an androgynous exercise,

yoga can easily be practiced by people with physical disability such as blindness.

Yoga and Psychological Benefits: General Population

Experimental and nonexperimental research with nonclinical samples reveals clear evidence for the psychological utility of yoga. For example, Cramer et al (2013) in their meta-analysis suggested that yoga leads to reduced anxiety and depression symptoms. In the same year, Field also noted another study focused on how yoga can improve one's mood and also decrease cortisol level, a stress hormone. Still, these works are a starting point; even more important is the examination of the effects of yoga on particular groups of learners, particularly visually impaired students.

Yoga for Persons with Different Abilities

- 1. Blindness and Mental Health Inability to interact socially and to be self-reliant means that visually impaired persons have psychological problems. For instance, there is a mixed study by Rezai et al. (2017) about yoga's effects in blind adults recommending a reduction in signs of depression combined with enhanced self- esteem. The researchers also pointed out that through yoga, the participants were trained on meditation this enabled them to be independent.
- 2. Disability-specific Interventions Narayanan and Menon (2015) also reviewed the impact of yoga in children with disability, for example, visual impaired children. The research study pointed out that practicing yoga has positive effect on the participants as it improved self- awareness, reduced anxiety and improved quality of life. The authors stressed on the aspect of utility of pranayama to mitigate the nervous system and achieve the state of emotional balance.

Yoga's Role in Education for Visually Impaired Students

Yoga in educational establishments for children which has potential, according to Borquest et al (2013). The students' attitudes towards yoga as an activity that is integrated in school curriculum of the visually impaired students in India was a subject of study done by Kumar et al. (2020). It revealed that the enhancements were made in the aspects of fundamental learning and attention span, management of anger, and peer interaction. From the researchers' point of view, yoga is a physical and mental activity that can help a student with a disability thresh out difficulties connected with the disability.

The mechanisms through which yoga influences psychological well-being include:

- 1. Neurobiological Changes: It is stated that performing yoga increases the levels of endorphin and decreases the levels of cortisol and thus the mood is good (Streeter et al., 2012).
- 2. Mindfulness and Focus: Yoga promotes an awareness of the mind-body connection; therefore, it inhibits the thinking process, specifically worry (Davidson & McEwen, 2016).

3. Social Connection: Shareable group classes can enhance the overall student's feeling of being connected and less alone which is useful in case of a visually challenged candidate, according to Novotney (2014). Of Course, Some of the experiments and pilot ones are the following:

Some of the pilot studies have determined the viability and effects of yoga practice towards the visually impaired learners. For instance, in Patanjali & Associates (2019) performed a six months yoga program for the visually impaired high school students in Maharashtra. It revealed positive changes in self-esteem, reduction in Lone STAR scores and later on an increase in academic achievement. This also highlighted the fact that this program showed how the participants could easily incorporate YOGA into their programs sufficiently meeting the needs of the visually impaired.

Gaps in Existing Literature

Although prior research explains the use of yoga for mental health improvement, few works have focused on visually impaired students. Moreover, a large proportion of studies undertake investigations on short-term based interventions directly without assessing long-term effects. Furthermore, there is a dearth of culturally appropriate research that takes into account the various environments in which visually impaired students find themselves.

There is significant promise in the integration of yoga in reducing negative aspects of psychological characteristics impeding the visually impaired students and ameliorating their issues holistically. This is an area that prior research has nonetheless started to open, but there is a clear demand for broad-based studies of the phenomenon to assess its enduring consequences and viable development. It means that including teaching of Yoga into the educational and rehabilitative processes will allow visually impaired students to be happy and lead a worthy life with stable emotions and self-esteem.

OBJECTIVES:

• To find out the effect of Yoga on psychological wellbeing of the students of experimental and control group by considering pre- psychological wellbeing scores as covariate.

HYPOTHESIS:

• There will be no significant effect of Yoga on psychological wellbeing of the students of experimental and control group by considering pre- psychological wellbeing scores as covariate.

METHODOLOGY:

The present study was Quasi-Experimental in nature. The pre-test post-test Non-equivalent Control Group Design was followed. According to Campbell and Stenly (1963), the lay-out of Non - equivalent Control Group Design is as follows:

The students in both the groups will be pre-tested by administering psychological well-being Scale. The

Experimental Group was treated through 50 mins. Yoga, 5 days a week for 12 weeks.

On the other hand, the Control Group continued with their routine activities. At the end of 12 weeks classes both the groups were post-tested with the help of the same tools which were used for per-testing.

SAMPLE:

A Sample of 60 Visually Impaired students living in various Government and aided hostels situated in Chhattisgarh State, 30 for experimental group (15 Males and 15 Females) and 30 for control group (15 Males and 15 Females) were selected as sample for the present study.

TOOLS:

Psychological Well-being Scale: Self-made

Psychological Well-being Scale was used by the researcher to assess the psychological well-being of the students.

STATISTICAL ANALYSES:

One-way ANCOVA was employed for analyses of data and interpretation of the results.

ANALYSES OF DATA AND INTERPRETATION OF RESULT:

• Data collected with respect to the objective, to compare adjusted mean scores of psychological wellbeing of the students of experimental and control group by considering pre- psychological wellbeing scores as covariate, One-way ANCOVA was employed.

Table 1 Effect of Yoga on Psychological wellbeing

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1679.644 ^a	2	839.822	10.389	.000
Intercept	9281.196	1	9281.196	114.814	.000
Pre-test	6.489	1	6.489	.080	.778
Treatment	1677.147	1	1677.147	20.747	.000
Error	4607.689	57	80.837		
Total	474454.000	60			
Corrected Total	6287.333	59			

^{**} Significant at 0.01 level of Significance

From table 1 above it is evident that the F value of treatment i.e. 20.747, df=1/57 was found to be significant at 0.01 level of significance. This reveals that Yoga produces a significant effect on psychological well-being of the Visually Impaired students. Therefore, null hypothesis stated as, "There will be no significant effect of Yoga on psychological wellbeing of the students of experimental and control group by

considering pre- psychological wellbeing scores as covariate" is rejected.

Further it was also found out whether experimental group produces better psychological wellbeing or control group, mean and standard deviation scores of psychological wellbeing was calculated. Summary of this calculation is presented in table 2 below:

Table 2 Mean and Standard Deviation Scores of Psychological Wellbeing of students

Group	N	Mean	Standard Deviation
Experimental	30	93.79	4.60
Control	30	83.22	8.57

From table 2 above it can be seen that the Mean and Standard Deviation of psychological wellbeing scores of experimental group students was 93.79 and 4.60 and that of control group was 83.22 and 8.57 respectively. This indicates that the psychological well-being of experimental group which have been treated with Yoga was better than the control group.

CONCLUSION:

The psychological well-being of experimental group which have been treated with Yoga was better than the control group.

The psychological well-being of visually impaired students treated with yoga is often better than their peers in a control group due to yoga's unique ability to foster inclusivity, enhance sensory awareness, and promote self-regulation. Yoga does not rely on vision, making it an accessible practice for visually impaired individuals. For visually impaired students, yoga encourages the development of heightened body awareness and mindfulness through physical postures and breathing exercises. This can boost confidence in their abilities and promote a sense of self-efficacy. Breathing techniques help regulate emotions and reduce stress, particularly crucial for visually impaired students who may face additional social and academic challenges.

Yoga also fosters a sense of inner peace and reduces feelings of isolation, which are common among visually impaired individuals. Practicing yoga in a group setting can enhance social interaction and create a supportive environment, improving emotional well-being.

Meditation, an integral part of yoga, helps these students develop focus and manage anxiety, particularly in situations where they may feel disadvantaged or overwhelmed. The holistic benefits of yoga address their physical, emotional, and social needs, leading to improved psychological well-being compared to the control group that does not receive this intervention.

SUGGESTIONS BASED ON FINDINGS

Based on the positive impact of yoga on the psychological well-being of visually impaired students, the following suggestions can enhance its effectiveness and inclusivity:

1. Develop Inclusive Yoga Programs

- Design yoga sessions specifically for visually impaired students, focusing on verbal instructions, tactile guidance, and clear auditory cues.
- Use props like yoga blocks and straps to assist students in maintaining postures comfortably and safely.

2. Train Specialized Yoga Instructors

- Provide training to yoga instructors on how to work effectively with visually impaired individuals.
- Emphasize the use of descriptive language and handson adjustments to ensure correct posture and safety.

3. Foster Group Participation

- Encourage group yoga sessions to create a sense of community and reduce feelings of isolation.
- Integrate interactive activities that allow visually impaired students to engage socially with peers.

4. Promote Mindfulness and Meditation

- Focus on meditation and breathing techniques to help students manage stress and improve concentration.
- Tailor mindfulness exercises to build self-awareness and emotional regulation.

5. Include Yoga in Educational Settings

- Incorporate yoga into school curriculums or afterschool programs for visually impaired students.
- Partner with NGOs or community organizations to provide accessible yoga resources.

6. Use Technology to Enhance Accessibility

- Develop audio-based yoga guides or apps tailored for visually impaired users.
- Provide materials like Braille instructions for yoga sequences and benefits.

7. Evaluate and Adapt

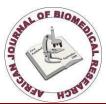
- Conduct regular assessments to monitor the psychological and physical progress of students participating in yoga programs.
- Modify sessions based on individual needs and feedback to ensure maximum benefits.

These steps can ensure that visually impaired students experience the full psychological benefits of yoga, enhancing their overall well-being and quality of life.

References

- 1. Büssing, A., Michalsen, A., Khalsa, S. B. S., Telles, S., & Sherman, K. J. (2012). Effects of yoga on mental and physical health: A short summary of reviews. Evidence-Based Complementary and Alternative Medicine, 2012, 1–7. https://doi.org/10.1155/2012/165410
- Caldwell, K., Harrison, M., Adams, M., & Triplett, N. T. (2010). Effect of Pilates and yoga training on self-efficacy, sleep quality, and mood in college students. *Journal of Behavioral Health*, 9(1), 213–221. https://doi.org/10.1007/s11469-009-9249-8
- 3. **Deshpande, S., Nagendra, H. R., & Raghuram, N. (2009).** A randomized control trial of the effect of yoga on verbal aggressiveness in normal healthy volunteers. *International Journal of Yoga, 2*(2), 76–79. https://doi.org/10.4103/0973-6131.60044
- 4. **Gupta, M., & Verma, P. (2017).** Role of yoga in enhancing social skills among visually impaired children. *Journal of Rehabilitation Studies*, 5(2), 78–86
- 5. **Hagood**, L. **(2020)**. Yoga's impact on children with visual impairment at the Texas School for the Blind and Visually Impaired. *TSBVI Research Reports*.
- 6. Hartfiel, N., Havenhand, J., Khalsa, S. B. S., Clarke, G., & Krayer, A. (2011). The effectiveness of yoga for the improvement of well-being and resilience to stress in the workplace. *Scandinavian Journal of Work, Environment & Health*, 37(1), 70–76. https://doi.org/10.5271/sjweh.2916
- 7. **Jain, P., & Yadav, D.** (2021). Examining the efficacy of yoga for stress management in blind university students. *Asian Journal of Psychology*, 8(2), 89–101.
- 8. Khalsa, S. B. S., Hickey-Schultz, L., Cohen, D., Steiner, N., & Cope, S. (2012). Evaluation of the mental health benefits of yoga in a secondary school: A preliminary randomized controlled trial. *The Journal of Behavioral Health Services & Research*, 39(1), 80–90. https://doi.org/10.1007/s11414-011-9249-8
- 9. **Lemay, V., Hoolahan, J., & Buchanan, A. (2019).** Impact of a yoga intervention on young children with disabilities. *Journal of Yoga and Physical Therapy,* 8(3), 123–130. https://doi.org/10.4172/2157-7595.1000317
- 10. **Narayan, S., & Kaur, H. (2020).** Yoga for cognitive and emotional wellness in blind adolescents: An intervention study. *Journal of Indian Psychology,* 12(3), 123–130.
- Noggle, J. J., Steiner, N. J., Minami, T., & Khalsa, S. B. S. (2012). Benefits of yoga for psychosocial well-being in a US high school curriculum: A preliminary randomized controlled trial. *Journal of Developmental & Behavioral Pediatrics*, 33(3), 193–201.
 - https://doi.org/10.1097/DBP.0b013e31824afdc4
- 12. **Patel, N., & Tiwari, S. (2015).** The impact of yoga on mental well-being in visually challenged youth. *Journal of Disability Studies, 6*(2), 45–50.
- 13. Raje, S., & Shah, R. (2019). Yoga practices and their role in improving psychological health of

- visually impaired students. *Journal of Allied Health, 11*(1), 33–41.
- 14. **Ross, A., & Thomas, S. (2010).** The health benefits of yoga and exercise: A review of comparison studies. *Journal of Alternative and Complementary Medicine,* 16(1), 3–12. https://doi.org/10.1089/acm.2009.0044
- 15. **Sharma, M., & Haider, T. (2015).** Yoga as an alternative and complementary approach for stress management: A systematic review. *Journal of Evidence-Based Complementary & Alternative Medicine,* 20(1), 3–13. https://doi.org/10.1177/2156587214552910
- 16. Smith, A., & Gupta, R. (2018). Yoga as a therapeutic intervention for enhancing psychological resilience in visually impaired adolescents. *Indian Journal of Psychological Science*, 9(4), 55–64.
- 17. **Stone, R. (2022).** Practicing yoga and mindfulness strategies with students who are visually impaired. *Occupational Therapy Doctoral Capstone Projects*. Indiana University. https://doi.org/10.377/2178564
- 18. **Telles, S., Singh, N., & Joshi, M. (2009).** Risk of post-traumatic stress disorder and depression in survivors of the 2004 tsunami in South India: Benefits of yoga intervention. *BMC Psychiatry*, *9*(1), 28. https://doi.org/10.1186/1471-244X-9-28
- 19. **Thomas, R. (2022).** Yoga and mindfulness for visually impaired students: A pilot study. *Journal of Educational Research and Practice*. https://doi.org/10.217850
- Williams, K., & Turner, J. (2016). Psychological outcomes of yoga practice in visually impaired individuals: A systematic review. *Journal of Visual Impairment & Blindness*, 110(5), 345–355.



https://africanjournalofbiomedicalresearch.com/index.php/AJBR

Afr. J. Biomed. Res. Vol. 27(3s) (September 2024); 6848 -6852 Research Article

Effect Of Internet Addiction On Psychological Wellbeing Of Visually Impaired Students

Dr. Shabnam Khan¹, Dr Reshma Lakesh², Dr. Pooja Sonkar³, Dr. Sandhaya Singh Yadav⁴, Juhi Peter⁵, Tabassum⁶

^{1*}St. Thomas College, Bhilai, Chhattisgarh.

²Govt. Dr. W. W. Patankar Girls PG College, Durg, Chhattisgarh.

³Govt. Dr. W. W. Patankar Girls PG College, Durg, Chhattisgarh.

⁴Govt. Dr. W. W. Patankar Girls PG College, Durg, Chhattisgarh.

⁵Agrasen College Dhanora, Durg, Chhattisgarh. ⁶Govt. Dr. W. W. Patankar Girls PG College, Durg, Chhattisgarh.

Abstract: The aim of the study was to find out the effect of Internet Addiction on Psychological wellbeing of visually impaired students. A Sample of 50 Visually Impaired students (25 Males and 25 Females), living in various Government and aided hostels situated in Raipur, Bilaspur, Durg, Rajnadgaon, and Dhamtari Districts of Chhattisgarh State, were selected as sample for the present study. Internet Addiction Scale: Internet Addiction Scale constructed by Damandeep Kaur Gulati, Jose J. Kurisunkal and Mamta Bakliwal (2021) was used. This scale consists 20 items divided into Four area— I. preoccupation, II. mood management, III. external consequences and IV. self-control for age group 13 to 18 years. Psychological Well-being Scale: Self-made Psychological Well-being Scale was used by the researcher to assess the psychological well-being of the students. 2×2 Factorial Design Anova was employed for analyses of data and interpretation of the results. Results revealed that Internet addiction negatively impacted the psychological well-being of visually impaired students, leading to increased stress, anxiety, and social withdrawal. It exacerbated feelings of isolation, hindered adaptive coping mechanisms, and reduced self-esteem, while excessive online use disrupted sleep patterns and real-world interactions essential for their mental health and overall development.

Keywords: Internet Addiction, Psychological Well-Being, Visually Impaired

Received 06/9/2024, Acceptance 27/12/2024

DOI: https://doi.org/10.53555/AJBR.v27i3S.6234

© 2024 The Author(s).

This article has been published under the terms of Creative Commons Attribution-Noncommercial 4.0 International License (CC BY-NC 4.0), which permits noncommercial unrestricted use, distribution, and reproduction in any medium, provided that the following statement is provided. "This article has been published in the African Journal of Biomedical Research"

INTRODUCTION Internet Addiction

Technological advancement specifically the use of the internet has greatly transformed social relations, knowledge acquisition, and basically the relation to the surrounding environment. However, as more people get access to internet the negative effects of internet has also emerged and has developed into problems as internet addiction to the youths. Internet addiction implies the use of the internet in a destructive manner whereby the user spends most of their time on the internet often to the detriment of normal functioning and personal

performance in class, interpersonal relations and emotional stability. This condition includes the preoccupation with Internet activities, feelings of generalized anxiety when the person is not online and social and occupational impairments (Young, 1998). But with time as the students and especially the disabled become more incorporated into the internet through the updated digital technologies the demarcation that severs productivity in usage of the internet from its drawback becomes all the more blurred. **Kuss and Griffiths** (2012) found that, while specific time management skills might help an individual avoid spending too much time

Afr. J. Biomed. Res. Vol. 27, No.3s (September) 2024

Dr. Shabnam Khan et al.

online, the problem is a psychological one associated with multiple psychological states, including anxiety, depression, and stress. **Chromedata (2015)**, reveals that social media misapplication plus streaming games and digital entertainment results in overindulgence in these activities tends to have horrific, unfavourable, emotive, and psychological consequences.

To the visually impaired students, who usually use computers and other gadgets in learning and social interaction, internet becomes a double-edged sword. The internet with its potential of open access to resources can open a broad range of opportunities in terms of inclusion and educational achievement; however, it comes with potential threats of addiction. Persons with visually impairment may find themselves greatly depending on internet platforms for communication, learning and other activities as well as entertainment hence may lose touch with physical interactions which are very vital for the sound mind and body.

PSYCHOLOGICAL WELL-BEING

Psychological Well-Being includes six components self-acceptance, personal happiness, and interpersonal relationships, life satisfaction, personal fulfilment, and optimum functioning. Self-actualization, self-acceptance, interpersonal relatedness, acceptance of the self and of others, self-transcendence, humour and spirituality and finally, etc. Successful psychological adaptation is necessary to address difficulties and conflicts, to provide stress-coping and life-cycle adjustments, and to facilitate goal accomplishment for clients' optimal and sustainable lifestyles.

In teenagers and youths' psychological performance is to a great extent dependent on social interactions, academic demands, and emotional stresses. Reasons for psychological distress among visually impaired students are rooted with practical difficulties which they encounter in their daily activities. Things like lack of friends, getting poor learning materials, and loneliness are approved to affect students' emotional well-being. But sometimes such problems can be partially solved through the use of internet as a medium for communication, learning and interaction. If applied properly, it becomes useful to improve their learning and it helps them in their social integration. Nevertheless, a passive use of the Internet means that intensification of the existing emotional problems and, as a result, the level of psychological health diminishes.

Many research studies have shown that the overuse of the Internet has negative psychological outcomes. Pantic (2014) discovered that the long-term use of online platforms was attached to low self-esteem, depressive symptoms, and increased anxiety, especially in the case of adolescents. Chen and Nath (2016) also proved that excessive internet use caused sleep cycles to be disrupted, attention to weaken, and stress to increase, which were the underlying causes of the decline in overall psychological health. Students with visual impairments, who already face significant challenges in their daily lives, may suffer further emotional regulation disruption from excessive Internet use, which could

bring about more intense feelings of isolation and frustration for them.

Relationship Between Internet Addiction and Psychological Well-Being

The link between internet addiction and psychological well-being is not only intricate but also reciprocal. On one side, individuals with low psychological well-being are may go online to cope. The model stated that individuals use the internet to make up for what they lack both in their emotional and social lives. Isolation or stress, when people experience feelings of being alone, they may participate in online activities to escape, which leads to compulsive internet use. For students who have disabilities, such as students with visual impairments, the Internet can be a channel for socializing and an educational tool. The situation is when Internet use is exorbitant it nevertheless the same one thing that was supposed to alleviate turns into the source of the problem making it even worse.

Research by Weinstein and Lejoyeux (2010) note the interactive relationship between internet addiction and psychological distress. Although individuals who are the first to suffer a terrible nerve-racking situation may start with the internet to avoid these problems, excess internet use can create a dangerous situation, where the user becomes more isolated and emotionally distressed. To be more specific to the students with disabilities via the internet, it is very important to say that the extreme dependency on this technology, which is for both communication and teaching, may lead to a slight excursion along the path of the physical world, thus the students will no longer participate in the most important relationships and activities in the physical world.

Moreover, internet has been shown to have massive negative effects on educational accomplishment and the subsequent social life individuals crave. With youngsters who are blind by the way they already cope with issues of these kinds of cases, extreme internet use by them can seriously amplify their education issues, social isolation, and emotional difficulties. Researchers Van Rooij et al.; (2017) have shown that students with more addictions to internet usage have a higher probability of facing academic underachievement and social withdrawal. According to it, one relatively reasonable solution that can be implemented to deal with it is by creating a balance between the advantages of internet use together with face-to-face interactions, physical activity, and emotional resilience.

What is more, over to Berson et al. (2020) and Pontes et al. (2015) papers on this, they managed to demonstrate that internet addiction can only cause loneliness and poor life satisfaction for most people and specifically among the vulnerable ones. Visually impaired teenagers, who already are suffering from the social exclusion phenomenon, could then be even in more danger of the negative outcomes. It is obvious from the research results that using the internet too much can increase the odds of students with disabilities experiencing both physical and mental harm, especially as it makes them more isolated and less able to be included in their community.

The interaction between internet addiction and psychological well-being is quite vital when it comes to visually impaired students who depend to a great extent on digital technologies for both communication and education. Even though the internet provides infinite options for accessibility, education, and socialization, the overusing it may lead to different psychological issues such as anxiety, depression, and social withdrawal. The overuse of the internet is a vicious circle of dependency that research shows which emotional health and academic achievement are threatened by the perfectly balanced life.

The solution of these problems is to be achieved by promoting Internet usage within limits among a group of visually impaired students and persuading them to take part in offline activities, form social relationships, and develop emotional resilience as well. Besides developing a healthy relationship with technology, the students can leverage digital tools for their academic success without compromising the mental health of theirs. Future studies should further focus on the nuances of this relationship in particular reference to different groups of pupils such as those with visual impairment through the Crafting the proper interventions and support systems necessitate studying the cases of the specific populations involved thereby promoting healthy digital habits and mental health.

OBJECTIVES:

To study the effect of Internet Addiction on Psychological wellbeing of visually impaired students.

HYPOTHESIS:

There will be no significant effect of Internet Addiction on Psychological wellbeing of visually impaired students.

METHODOLOGY: SAMPLE:

A Sample of 50 Visually Impaired students (25 Males and 25 Females), living in various Government and aided hostels situated in Raipur, Bilaspur, Durg, Rajnadgaon, and Dhamtari Districts of Chhattisgarh State, were selected as sample for the present study.

TOOLS

Internet Addiction Scale: Internet Addiction Scale constructed by Damandeep Kaur Gulati, Jose J. Kurisunkal and Mamta Bakliwal (2021) was used. This scale consists 20 items divided into Four area— I. preoccupation, II. mood management, III. external consequences and IV. self-control for age group 13 to 18 years.

Psychological Well-being Scale: Self-made Psychological Well-being Scale was used by the researcher to assess the psychological well-being of the students.

STATISTICAL ANALYSES:

2×2 Factorial Design Anova was employed for analyses of data and interpretation of the results.

ANALYSES OF DATA AND INTERPRETATION OF RESULT:

Data collected with respect to the objective, to study the effect of Internet Addiction on Psychological wellbeing of visually impaired students, was analysed by using 2×2 Factorial Design Anova. Summary of this analyses has been presented in table 1 below:

Table 1 Effect of Internet Addiction of	on Psycholog	gical Wellbeing	of Visually	Impaired Students

Source	Type III Sum of Squares		Mean Square	F
Internet Addiction	1005.924	1	1005.924	10.965**
Gender	267.175	1	267.175	2.912
Internet Addiction * Gender	1.133	1	1.133	0.012
Error	4220.156	46	91.743	
Total	352049.000	50		
Corrected Total	5770.580	49		

^{**}Significant at 0.05 level.

EFFECT OF INTERNET ADDICTION ON PSYCHOLOGICAL WELL-BEING

From table 1 above it is evident that the f value of Internet Addiction i.e. 10.965, df=1/46, was found to be significant at 0.01 level of significance. This reveals that there exists a significant effect of Internet Addiction on

psychological well-being of the visually Impaired students. Further to find out whether the students having high Internet Addiction or low Internet Addiction were have better psychological well-being, Mean and SD of psychological well-being Scores was calculated, which has been presented in table 2 below:

Table 2 Mean and SD of psychological well-being Scores

Internet Addiction	N	Mean	SD
High Internet Addiction	23	78.55	11.86
Low Internet Addiction	27	88.69	6.14

From table 2 it can be seen that the Mean and SD of Psychological Well-being Scores of students having High Internet Addiction was 78.55 and 11.86 and Mean and SD of Psychological Well-being Scores of students having Low Internet Addiction was 88.69 and 6.14. It can therefore be concluded that the Psychological Well-being of the students having low level of Internet Addiction was better than the Psychological Well-being of the students having high Internet Addiction.

EFFECT OF GENDER ON PSYCHOLOGICAL WELL-BEING

From table 1 above it is evident that the f-value of Gender i.e. 2.912, df=1/46, was not found to be significant. This reveals that there do not exist any significant effect of Gender on Psychological Well-Being of the visually Impaired students. Therefor it can be concluded that male and female students were having similar level of psychological well-being.

EFFECT OF INTERACTION BETWEEN INTERNET ADDICTION AND GENDER

From table 1 above it is evident that the f value of interaction between Internet Addiction and Gender i.e. 0.012, df=1/46, was not found to be significant. This reveals that there do not exist any significant effect of interaction between Internet Addiction and Gender on Psychological Well-Being of the visually Impaired students.

CONCLUSION:

- Psychological Well-being of the students having low level of Internet Addiction was better than the Psychological Well-being of the students having high Internet Addiction.
- Male and female students were having similar level of psychological well-being.
- There do not exist any significant effect of interaction between Internet Addiction and Gender on Psychological Well-Being of the visually Impaired students.

SUGGESTIONS BASED ON FINDINGS

- Motivate students to have a balanced internet usage through educational programs that train students to manage screen time, go offline and do social activities and hobbies, and teach through methods the children will avoid overdependence on devices for them to survive.
- Launch an online program for visually impaired students (female and male) with a holistic approach

offering counselling services, stress-relief techniques, and peer support networks to complete school challenges and thus attain emotional resilience.

- Go for tailored strategies such as Cognitive Behavioural Therapy (CBT) and emotional regulation skills development for those with high internet addiction levels to reduce dependency and enhance healthier coping skills.
- Encourage face-to-face social interaction through activities, including but not limited to, group meetings, sports, volunteering, or even a club activity, which will give the individual a sense of belonging and, therefore, diminish the reliance on the internet.
- Bring up student digitally, teaching them responsible internet use, self-management strategies like setting time limits, and recognizing signs of internet addiction to minimize negative impacts on mental health. Include the parents and the teachers in the process of monitoring their internet activity, through which they are also guiding the students on how to create a supportive online environment, and provide those necessary resources to encourage them to acquire healthy internet habits. Regular face-to-face meetings will show if the issues have been resolved and if the problems still exist.
- Promote offline hobbies and physical activities like sports, music, art, or outdoor excursions to reduce screen time and improve emotional well-being while contributing to physical health.
- Ensure accessible mental health resources for visually impaired students, offering counselling services, stress management workshops, group therapy, and peer support to address psychological distress related to internet addiction.
- Regularly monitor students' psychological health through assessments and follow-ups to identify and address potential issues related to internet addiction in a timely manner.
- Conduct awareness campaigns and workshops to educate students, teachers, and parents on the risks of internet addiction, promoting a healthy balance between online and offline activities and encouraging early intervention when needed.

By adopting these strategies, visually impaired students can manage their internet usage effectively, improving their psychological well-being and overall life satisfaction.

REFERENCES:

1. **Bakken, T. L., Wenzel, S. L., & Ramm, E. E.** (2009). Internet addiction in individuals with disabilities: The importance of understanding its

- unique characteristics. *Journal of Disability Policy Studies*, 19(3), 165-173. https://doi.org/10.1177/1044207309333002
- Berson, I. R., Berson, M. J., & Ferron, J. M. (2020). Challenges and opportunities for students with disabilities in the digital age: How technology can support academic success. *Journal of Special Education Technology*, 35(2), 115-130. https://doi.org/10.1177/0162643419897617
- 3. **Berson, M. J., & Berson, I. R.** (2020). Children with disabilities and the internet: The need for digital literacy education. *Journal of Disability Policy Studies,* 31(4), 235-246. https://doi.org/10.1177/1044207320943652
- 4. Chen, Y. L., & Nath, S. (2016). The impact of internet addiction on adolescent health: A review. *The Journal of Adolescence*, 49, 32-40. https://doi.org/10.1016/j.adolescence.2016.02.003
- 5. **Chou, C.** (2005). A comparison of internet addiction and social anxiety. *CyberPsychology & Behavior,* 8(4), 417-424. https://doi.org/10.1089/cpb.2005.8.417
- 6. Chou, C., Condron, L., & Belland, J. C. (2005). A review of the research on internet addiction. *Educational Psychology Review, 17*(4), 357-387. https://doi.org/10.1007/s10648-005-8138-1
- 7. **Heiman, T., & Olenik-Shemesh, D.** (2015). Social support, internet addiction, and the psychological well-being of adolescents with disabilities. *Journal of Special Education Technology*, 30(2), 77-86. https://doi.org/10.1177/0162643415575855
- 8. Kraut, R. E., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (2002). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, *53*(9), 1017-1031. https://doi.org/10.1037/0003-066X.53.9.1017
- 9. **Kuss, D. J., & Griffiths, M. D.** (2012). Internet addiction and problematic use of the internet. *International Journal of Environmental Research and Public Health*, 9(10), 565-592. https://doi.org/10.3390/ijerph9100565
- 10. **Pantic, I.** (2014). Online social networking and mental health. *Cyberpsychology, Behavior, and Social Networking, 17*(10), 662-667. https://doi.org/10.1089/cyber.2014.0070
- 11. Pontes, H. M., Griffiths, M. D., & Barge, D. (2015). Internet addiction and problematic internet use: A systematic review of recent studies. *Journal of Behavioral Addictions*, 4(4), 173-185. https://doi.org/10.1556/2006.4.2015.044
- 12. **Ryff, C. D.** (1989). Happiness is everything, or is it? Explorations on the meaning of psychological wellbeing. Journal of Personality and Social Psychology, 57(6), 1069-1081. https://doi.org/10.1037/0022-3514.57.6.1069
- Van Rooij, A. J., Ferguson, C. J., & Renshaw, D. (2017). Internet addiction: A systematic review of the literature. *European Journal of Clinical Psychology*, 22(4), 149-155. https://doi.org/10.1007/s12141-017-0771-2

- 14. **Weinstein, A., & Lejoyeux, M.** (2010). Internet addiction or excessive internet use. *The American Journal of Drug and Alcohol Abuse, 36*(5), 277-283. https://doi.org/10.3109/00952990.2010.491880
- 15. **Young, K. S.** (1998). Internet addiction: The emergence of a new clinical disorder. *CyberPsychology & Behavior, 1*(3), 237-244. https://doi.org/10.1089/cpb.1998.1.237

IJRAR.ORG

E-ISSN: 2348-1269, P-ISSN: 2349-5138



INTERNATIONAL JOURNAL OF RESEARCH AND ANALYTICAL REVIEWS (IJRAR) | IJRAR.ORG

An International Open Access, Peer-reviewed, Refereed Journal

Anglophone Used For Creating Images Of Any Branding Company.

From

Dr. Sandhya Singh Yadav

Guest Lecturer (English)

Government V.V. Patankar Girls P.G College Durg, Chhattisgarh, India.

English is an international language and it is used for representation of any company name with the help of alphabets which have been used to create a word to form a meaningful word and these words give origin to the brand name of the globally recognized branded names of the company.

Abstract This research paper depict about how English alphabets are used to form a meaningful word which in present scenario used to describe the brands in a global way and abbreviation is called logo which can be seen on any hoardings describing about the reputation of any company or rather we can say that it is segregating the brand among the other brands present in the market.

Alphabets of English play a major role in reflecting the image of the brand in the form of the company's name. Every English word which has been used has a meaning in reference to the dictionary. Most of the companies have a meaningful name but in the global aspect due to segregating on the bases of countries and Language still the word has a definite meaning in context to the English dictionary. Which concludes that English plays a vital role in promoting a good product by its name globally.

A founder business name, sometimes referred to as an eponymous name, is a title for your organization based on the name of its creator. Founder names are an alternative approach to naming your organization to some of the more popular options like descriptive or invented names.

Some were named after their founders; others were invented artificially or emerged by chance. The fact is that behind every outstanding brand there is a great story or a person who makes the company stand out among competitors and have its devoted followers and disciples.

English acronyms are used for representation of English alphabets in order to form an abbreviation which give the illustration of the whole company name or product in short form or in a meaningful way for example B. M. W., Rolls - Royce, Ferrari, Mustang, Hyundai, Maruti, Tata Harrier, Land Rover', Ciaz, L. G., havells, Samsung, lenovo, dell, compaq, apple, iPhone, Royal Enfield, Harley Davidson, K. T. M, Brezza, swift, L. G, Havells, Samsung, lenovo, compaq, dell, apple, iPhone, Royal Enfield, K.T.M Harley Davidson.

Brand names of cars with their English meaning.

"B. M. W. " (Bayerische Motoren Werke). It's a German acronym for Bayerische Motoren Werke, which translates to Bayarian Motor Works in English.

"'Rolls - Royce "refers to informal: informal means a thing which is not to be seen in a casual way; this would have been the mind thought of the inventor who discovered the name Rolls- Royce. Rolls-Royce is a manufacturer of very high quality, luxurious, and prestigious British cars.

"Ferrari" comes from Ferraro, meaning "blacksmith," putting it on par with the English & American surname "Smith." And much like "Smith," the Ferrari name is quite common — it's the third most common surname in Italy. But when we look at the english meaning of the ferrari it refers to a prancing horse when we look at the logo of the company it also states that the company's name would have been on this prancing horse which illustrates the story of a horse symbol which was the used in the war which was fought for nine years between Duchy of Savoy which was the part of the Grand Alliance and France. It took place in the 17th century.

"Mustang" is an American feral horse which is typically small and lightly built. The logo features a running horse, which reflects the spirit of the Mustang and represents speed, freedom, and style. Philip T. Mustang logo is adored by all auto fans from all over the world. It can be recognized anywhere.

"Hyundai" is a Korean word that means "modernity" to reflect the company's commitment to innovation. And while the name "Hyundai" was chosen back in 1947, the idea of modernity remains a part of the brand's identity.

"Maruti" refers to Hanuman or Maruti, a Hindu god, son of the wind deity Maruta. Maruti Suzuki, an Indian automobile manufacturer. Maruti Suzuki India Limited is an automobile manufacturer in India. It was founded as a joint venture between the Government of India and Suzuki Motor Corporation. The company was named "Maruti" after the Indian deity Hanuman, who is also known as Maruti.

"Tata Harrier" in literal terms means "a dominant beast imbued with endless stamina and strength". For the first time in history In Ratan Tata's company a passive word is used to describe the name of any car. It might be the influence of reels of gene groups.

"Land Rover", a type of strong and powerful vehicle made to travel in steep and rough roads or grounds mainly can be called a strong and powerful off-road vehicle. Which lately became a brand and a status mark in the field of cars.

The "Ciaz" name stands for "Comfort, Intelligence, Attitude and Zeal", or "City from A to Z". The name "Ciaz" for the Maruti Suzuki car was chosen through a combination of creativity and market research. The name is not based on any specific acronym or word; rather, it is a unique and distinctive name designed to evoke a sense of elegance and sophistication.

"Brezza" noun. breeze [noun] a gentle wind. Which refers to a car which is as light as a breeze when it runs on the roads.

"Swift" a swift-flying insectivorous bird with long, slender wings and a superficial resemblance to a swallow, spending most of its life on the wing. It refers to a car which can fly like a bird on the road.

"Google" ultimately raised about \$1 million from investors, family, and friends and set up shop in Menlo Park, California, under the name Google, which was derived from a misspelling of Page's original planned name, googol (a mathematical term for the number one followed by 100 zeroes).

Brand names of Electronic Companies with their English meaning.

"L.G." stands for Lucky Goldstar is a multinational electronics company that offers a wide range of telecommunication products, electronic products and chemicals. "LG" Company was established on 5 January 1947. It is an old and very famous company.

"Havells" means a man who is a respected leader in national or international affairs. Havells India Limited is a leading Fast Moving Electrical Goods (FMEG) Company and a major power distribution equipment manufacturer with a strong global presence.

"Samsung": In Korean, the word Samsung means "three stars." The name was chosen by Samsung founder Lee Byung-chull whose vision was for his company to become powerful and everlasting like stars in the sky.

"Lenovo" is a portmanteau of "Le-" (from Legend) and "novo", Latin ablative for "new". Which depicts newlegand in the field of laptops.

The word "dell" comes from the Old English word dell, which is related to the Old English word dæl, modern 'dale'. Dells in literature. The term is sometimes used interchangeably with dingle, although this specifically refers to deep ravines or hollows that are empowered with trees.

"Compaq", which stood for "compatibility and quality," was founded in 1982 by Rod Canion, Jim Harris and Bill Murto, all from Texas Instruments .Purpose of naming laptops on the name of Compaq refers to a laptop which is easy to carry or handle.

The name "Apple" was chosen partly due to Jobs liking apples and to appear ahead of Atari in the phone book. Another theory is that the name represents Isaac Newton, and the original logo featured a picture of him under an apple tree. Jobs included a quote from a poem indicating a connection to Newton.

"I Phone "according to Jobs in 1998, the "i" word in "iMac" (and thereafter "iPod", "iPhone" and "iPad") stands for internet, individual, instruct, inform, and inspire. Which has become the renowned mobile company in the whole globe.

"Philips" In Biblical Names the meaning of the name Philip is: Warlike; a lover of horses. If the company's name is on warlike then it would have been chosen to be in a situation of do or die inorder to survive. If the company's name is "lover of horses" it refers to a person who wants to be like a horse, fast, furious and strong and unbeatable in the field of electronics.

Brand names of bikes with their English meaning.

The "Royal Enfield" and "Bullet "names were derived from the British company which had been a subcontractor to the Royal Small Arms Factory in Enfield, London. The name 'Enfield' most likely came from Old English Eanafeld or similar, meaning "open land belonging to a man called Eana". At the time of the Domesday Book in 1086, the manor of Enfield, spelt 'Enfelde', was the property of Geoffrey de Mandeville, a powerful Norman granted large estates by William the Conqueror.

"Harley Davidson" according to the Cambridge dictionary meanings of Harley Davidson means a brand name for a type of powerful motorbike.

"KTM" is one of the leading names in the automobile industry. The full form of ktm is Kraftfahrzeuge Trunkenpolz Mattighofen. It translates into English to mean "motor Vehicle". Thus, it is evident that it is a sports car and motorcycle manufacturing company based in Austria.

These were the various examples by which we can depict that whatever be the language of the inventor but in order to give recognition to the whole world we need a common language by which we can be in this market to sell our products and that language is English. It costs more to write in our native language than writing in English. Who made this language so acceptable and popular? The blame will come on us because we didn't understand the importance of our native languages and its power. If we would have been then we would have not been under the shackles of these British languages from such an ancient time.

English Acronyms play a vital role in framing the image of any company or product in India giving a meaning full name to any company is in less trend because Indians firmly believe in family and they are very affectionate towards the family and they believe in succession also that is why when we look at the names of company either we will see the name of a company on the name of their mother or father. Or one the name of a wife or children for example Godrej, Tata, Goel Tmt, Vimal, Raymond, Haldiram, Bikaji. etc.

Bollywood directors are the best believer of God in India that is why they keep their company name in the name of Gods or the deities present in India. For example Balaji motion pictures, Sai production Trimurti production and they also keep the company name on their family member's name or on their name itself for example Dharma production, Sohail Khan production, Amir khan production, Sanjay Leela Bhansali production, Rajshree Production, Vishesh films, Yash Raj production, Vinod Chopra production.

There few names of the company which are been named by using the initial alphabets of the name of their owners, partner or the place for example P & G (Proctor and Gamble), D & G (Dolce & Gabbana), KFC (Kentucky fried chicken), BBC (British Broadcasting Corporation), NDTV (New Delhi Television limited).

It is firmly believed that in the year 1150 the name of the word company came into existence. The English word company is derived from the French word compagnie which means society, friendship, intimacy; body of soldiers which came from late Latin word companion " one who eats bread and butter with you".

The first company which was formed worldwide was a Japanese company of Japan its name was Kongo Gumi it was Founded in 578 C. E. and it is the oldest company in world wide.

The first company which was formed in India was a trading company of India and it's name was on the Surname of its founder and it's name was Wadia group and was founded in 1736.

Across the whole world where English is a primary, secondary or tertiary language English acronyms are used prominently in naming the name of a company or product. It plays a vital role in creating a brand name because if we want to express the features of the product to a customer without a verbal interaction we can either use an image to explain it or we will use a name which will define the attributes of the product by addressing it with a word and if that word will be in English acronyms than It will be easily understood by the people because English acronyms are used in twenty six countries and 4.8 million people speaks English in whole world.

Reference

www.oxfordlanguages.com/

www.oxfordlanguages.com/

www.oxfordlanguages.com/

www.oxfordlanguages.com/

www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com / www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ Philips." www.oxfordlanguages.com / www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/ www.oxfordlanguages.com/

ISSN - 2277 - 5730

AN INTERNATIONAL MULTIDISCIPLINARY QUARTERLY RESEARCH JOURNAL

AJANTA

Volume - XIV

Issue - I

January - March - 2025

ENGLISH PART - I / II



Peer Reviewed Referred and UGC Listed Journal No. 40776

Single Blind Review / Double Blind Review

Impact Factor / Indexing 2023 - 7.428 www.sjifactor.com

EDITOR

Dr. Vinay Shankarrao Hatole

Assistant Professor, International Center of Excellence in Engineering & Management (ICEEM) College, Waluj, Chhatrapati Sambhajinagar. (MS)

PUBLISHED BY



AJANTA PRAKASHAN

Jaisingpura, Chhatrapati Sambhajinagar. (MS)

The information and views expressed and the research content published in this journal, the sole responsibility lies entirely with the author(s) and does not reflect the official opinion of the Editorial Board, Advisory Committee and the Editor in Chief of the Journal "AJANTA". Owner, printer & publisher Vinay S. Hatole has printed this journal at Ajanta Computer and Printers, Jaisingpura, University Gate, Chhatrapati Sambhajinagar (Aurangabad), also Published the same at Chhatrapati Sambhajinagar (Aurangabad)

Printed by

Ajanta Computer, Near University Gate, Jaisingpura, Chhatrapati Sambhajinagar (Aurangabad), Maharashtra, India

Published by

Ajanta Prakashan,

Near University Gate, Jaisingpura,

Chhatrapati Sambhajinagar (Aurangabad), Maharashtra, India

Cell No.: 9579260877, 9822620877

E-mail: ajanta2023@gmail.com, www.ajantaprakashan.in

AJANTA - ISSN 2277 - 5730 - Impact Factor - 7.428 (www.sjifactor.com)



Professor Kaiser Haq

Dept. of English, University of Dhaka, Dhaka 1000, Bangladesh.

Dr. Ashaf Fetoh Eata

College of Art's and Science Salmau Bin Adbul Aziz University. KAS

Muhammad Mezbah-ul-Islam

Ph.D. (NEHU, India) Assot. Prof. Dept. of Information Science and Library Management University of Dhaka, Dhaka - 1000, Bangladesh.

Dr. S. Sampath

Prof. of Statistics University of Madras Chennari 600005.

Dr. S. K. Omanwar

Professor and Head, Physics, Sat Gadge Baba Amravati University, Amravati.

Dr. Shekhar Gungurwar

Hindi Dept. Vasantrao Naik Mahavidyalaya Vasarni, Nanded.

Dr. S. Karunanidhi

Professor & Head, Dept. of Psychology, University of Madras.

Dr. Shrikrishna S. Bal

I/C Principal (Retd.), Head, Department of Psychology, D.B.J.College, Chiplun, Dist. Ratnagiri (M.S.)

Prof. P. T. Srinivasan

Professor and Head, Dept. of Management Studies, University of Madras, Chennai.

Roderick McCulloch

University of the Sunshine Coast, Locked Bag 4, Maroochydore DC, Queensland, 4558 Australia.

Dr. Nicholas Loannides

Senior Lecturer & Cisco Networking Academy Instructor, Faculty of Computing, North Campus, London Metropolitan University, 166-220 Holloway Road, London, N7 8DB, UK.

Dr. Meenu Maheshwari

Assit. Prof. & Former Head Dept. of Commerce & Management University of Kota, Kota.

Dr. D. H. Malini Srinivasa Rao

M.B.A., Ph.D., FDP (IIMA) Assit. Prof. Dept. of Management Pondicherry University Karaikal - 609605.

Dr. Rana Pratap Singh

Professor & Dean, School for Environmental Sciences, Dr. Babasaheb Bhimrao Ambedkar University Raebareily Road, Lucknow.

Memon Sohel Md Yusuf

Dept. of Commercee, Nirzwa College of Technology, Nizwa Oman.

Prof. Joyanta Borbora

Head Dept. of Sociology, University, Dibrugarh.

Dr. Manoj Dixit

Professor and Head,
Department of Public Administration Director,
Institute of Tourism Studies,
Lucknow University, Lucknow.

Dr. P. Vitthal

School of Language and Literature Marathi Dept. Swami Ramanand Teerth Marathwada University, Nanded.



Dr. B. R. Kamble

Kirti M. Doongursee College, Dadar, Mumbai-28.

Prof. Ram Nandan Singh

Dept. of Buddhist Studies University of Jammu.

Dr. Jagdish R. Baheti

H.O.D. S. N. J. B. College of Pharmacy, Meminagar, A/P. Tal Chandwad, Dist. Nashik.

Dr. Sadique Razaque

Univ. Department of Psychology, Vinoba Bhave University, Hazaribagh, Jharkhand.

Dr. Safiqur Rahman

Assistant Professor, Dept. of Geography, Guwahati College Bamunimaidam, Guwahati, Assam.

Dr. Vimal K. Lahari

Assistant Professor, Department of Sociology, Banaras Hindu University, Varanasi, Uttar Pradesh.

Dr. Pandit Sheshrao Nalawade

I/C Principle, Pandit Jawaharlal Neharu Mahavidyalay, Aurangabad.

PUBLISHED BY



Ajanta Prakashan

Aurangabad. (M.S.)



∞ CONTENTS OF ENGLISH PART - II **∞**

S. No.	Title & Author	Page No.
1	"Unlocking India's Agricultural Export Potential: Addressing	1-8
	Challenges and Opportunities	
	Dr. Nirmala Talape	
	Aaryan Patil	
2	Analysing Petroleum Prices: Factors, Trends, and Economic Implications	9-17
	Dr. Hemlata Namdev Kavare	
3	Enhancing Cooperative Education and Training in India: The Pivotal Role	18 - 24
	of the National Council for Cooperative Training (NCCT)	
	Mr. Vandkar Mahesh S	
4	The Impact of Digital Learning on the Academic Performance of	25 - 30
	Secondary School Students: A Study of Online Education in India	
	Tarannum Banu Mohammed Abdul Ghous	
5	A Study on the Effect of Artificial Intelligence on Human Labor and	31 - 35
	Workplace Practices	
	Ms. Lekhani Agrawal	
	Ms. Khushi Keshan	
6	Present Position of Agricultural Labour in India	36-43
	Dr.Capt. Abasaheb Dhondiba Jadhav	
7	Effect of Perceived Social Support on Self-Efficacy of Thalassemia Patient	44 - 48
	Mayuri A. Jadhav	
8	Women's Voices in Indian English Literature: A Study of Sarojini Naidu,	49 - 53
	Kamala Das, and Arundhati Roy	
	Ku. Namrata S. Rajgure	
9	A Comparative Analysis of State Road Transport Corporations in India	54 - 60
	MS. Nikita Suryaprakash Keshan	
	Dr. Nanda Pawan Bothra	
10	A Study to Assess the Overview Regarding Implementation of	61 - 68
	Additional Diploma and Pg Nursing Courses Among Academician,	
	Nursing Leaders and Staff Nurses As an Job Training Model As	
	Used in Medical Courses	
	MS. Roshni Mohammed	
	Mrs.Shilpa Shettiger	

∞ CONTENTS OF ENGLISH PART - II **∞**

S. No.	Title & Author	Page No.
11	Transforming India's Public Healthcare: Impact of the COVID-19 Pandemic	69 - 74
	Mr. Shridhar Balasaheb Pandit	
	Dr. Rama Pande	
12	Comparing the Effectiveness of Autobiography As An Innovative Teaching	75 - 80
	Method V/S Traditional Method for Teaching Anti-Hypertensive Drugs	
	Among Nursing Student	
	MS. Vaishnavi Vedre	
	Mrs. Greeshma Minesh	
13	Is the Paleolithic way of Healthy Lifestyle a Fact or False Belief	81 - 86
	Dr. Toshina Telang	
	Dr. Amita Sehgal	
14	Latest Trends in Library Automation	87-93
	Natkar Sangita Sheshrao	
15	Factors Affecting Student's Motivation - A Case Study	94-102
	Mrs. Siddiqui Farhin Mominodine	
16	The Exploration of Realism in the Select Novels of Arundhati Roy's	103-107
	The Ministry of Utmost Happiness and Manju Kapur's A Married	
	Woman: A Comparative Study	
	Mr. Wadje Shivraj Babarao	
	Dr. Asha G. Dhumal	
17	A Sanskrit-Dictionary: Resources and Research	108-114
	Amrapali Govindrao Tiwhale	
18	The Role of Foreign Direct Investment (FDI) In Indian Economy	115-118
	Dr. Parturkar M. S.	
19	Corporate Law: Exploring the Impact of Evolving ESG Regulations	119-122
	Dr. Sangeeta Sharma	
20	A Study to Assess the Effectiveness of Music Therapy on Stress	123-129
	Management among the Nursing Student on Selected Nursing College	
	of Metropolitan City	
	Ms. Trusha Sitap	
	Ms. Nikhita Logade	
21	We Should All Be Feminists: Breaking Stereotypes	130-134
	Dr. Swati Tande	

∞ CONTENTS OF ENGLISH PART - II **≪**

S. No.	Title & Author	Page No.		
22	Comparing the Effectiveness of Autobiography as an Innovative	135-140		
	Teaching Method V/S Traditional Method for Teaching Anti-			
	Hypertensive Drugs Among Nursing Student			
	Ms. Vaishnavi Vedre			
23	Is The Paleolithic Way of Healthy Lifestyle a Fact or False Belief?	141-146		
	Dr. Toshina Telang			
	Dr. Amita Sehgal			

23. Is The Paleolithic Way of Healthy Lifestyle a Fact or False Belief?

Dr. Toshina Telang

Assistant Professor, Department of Home Science, Guest, Goverment Dr. W. W. Patankar Girls' P. G. College, Durg, Chhattisgarh, India.

Dr. Amita Sehgal

Professor, Head of Department Home Science, Government Dr. W. W. Patankar Girls' P.G. College, Durg Chhattisgarh, India.

Can going back to the ancient way of eating transform one's lifestyle? Does a Paleo diet provide your body with enough nutrients that it needs? Is the idea of eating a diet which comes straight from the Stone Age or the hunting era a clear truth or sheer false belief? Should you also go with the flow of Paleo dieting? These all are a few questions that you must understand before stepping on the journey of learning about a diet lifestyle the paleolithic way.

Introduction

Dieting is not about consuming bland fancy food which requires multiple visits to the grocery store. And what if you get a plan which is healthy and full of natural food that is easily available in your home kitchen and that you are used to eating since the very beginning? The Paleo diet is all about that only.

Following a Paleolithic or Paleo diet is the new black yet again and it's gaining increased popularity. A number of health-conscious individuals, fitness freaks, lifestyle experts, and celebrities are going gaga over it and the benefits attained with the Paleo diet. The USP of the Paleo diet is that it is seen as the natural way of eating. It is purely based on the dieting pattern of paleolithic or stone age humans and focuses on the increased consumption of meat, fish, eggs, seeds, nuts, fruits and vegetables. Besides, it limits the amount of consumption of grains, legumes, and processed food.

Various Nutritionists and Advocates have been promoting the Paleo diet as a means of better health. There are some proven evidence as well which shows that following it religiously might lead to visible improvements in the body composition and metabolism as compared to the typical Western diet. But on the contrary, there are also some claims stating that following the

Paleo diet can lead to nutritional deficiencies because of an inadequate calcium-rich food intake along with few side effects including weakness, diarrhoea, and headaches.

The Popular Paleo Diet

A Paleo diet or Caveman diet is an eating plan based on foods the humans used to eat during the Paleolithic or the primordial era which is supposed to date from around 2.5 million to 10,000 years ago. This diet basically started to gain popularity in the 21st century, where it attracted a large internet-based following through a number of websites, health forums and social media platforms. In the year 2012 based on the popularity of a number of diet books about it, the Paleo diet was described as being one of the latest trends in the field of nutrition and dietetics. In 2013 and 2014 it was Google's most searched weight-loss diet plan.

According to many nutrition experts and Paleo proponents since the stone age, humans have evolved rapidly due to the changing diet but their anatomy and genetics have moderated very little. Also, the idea is that our genes are not well adjusted for modern diets that consist of food grown out of farming. Hence eating the food which was made available then through hunting or gathering could promote good health and eventually a healthy lifestyle for the modern generation. Based on this idea, the modern Paleo diet includes fresh fruits, vegetables, lean meat, fish, eggs, nuts and seeds. These are foods that in the past people could get by hunting and gathering. It doesn't include foods that became more common when small-scale farming began about 10,000 years ago. These foods include grains, legumes, processed oil, coffee, dairy products and even alcohol.

Ever Since humans began farming, they easily produced foods such as grains, pulses and legumes. Furthermore, it introduced them to dairy. Farming completely changed the diets of animals that people used to eat. On that note, the Paleo diet's idea is that these changes in diet outpaced the human body's ability to adapt to the change. Thus today, that mismatch occurred is eventually believed to contribute to obesity, diabetes and heart diseases faced by the modern generation.

Basis of Paleo Diet: What To Eat What Not To

A healthy diet can play an important role in losing weight, gaining stamina along with preventing many chronic diseases. A recent, large-scale meta-analysis has proven that the Paleo diet is healthy, natural and way better than the other Mediterranean diets for overall control of cholesterol, glycemic control, and inflammation.

Let's see as per the Caveman diet or the Paleo diet, what food items are best to be consumed and what are supposed to be avoided in order to attain the complete benefits of it.

What to Eat

- Fresh Fruits and berries
- Vegetables especially non-starchy vegetables, such as onions, and peppers
- Root vegetables like sweet potatoes
- Salads made with a combination of fruits and vegetables and little amount of honey
- Seeds and Nuts including cashews, almonds, walnuts, and pumpkin seeds
- Lean Meat, especially obtained from grass-fed animals
- Eggs
- Shellfish and Fish, especially Mackerel, Salmon and Albacore Tuna as they are rich in Omega-3 fatty acids
- Oils processed from nuts or fruits like Walnut oil, Flaxseed oil, Coconut oil and Olive oil, in moderation

What Not To Eat

- Cereal grains such as wheat, rice, oats and barley
- Refined grains like white flour, and white rice
- Legumes such as lentils, peanuts and beans
- Dairy products like milk, yoghourt, butter and cheese
- Added sugar and sweets
- Added salt
- Artificial sweeteners
- Coffee
- Alcohol
- Refined vegetable oils such as canola
- Starchy vegetables like white potato, corn, peas
- Highly processed foods like chips, cookies, pasta and bread

Potential Health Benefits of the Paleo Diet

The Paleo diet is a very simple diet and has immense health benefits specifically for those who are dealing with poor health and issues like obesity and diabetes. It also helps in lowering

blood pressure and maximising high-quality protein intake which potentially prevents them from certain life-risking diseases.

As per various studies and researches all these past years, The Paleo diet contributes to weight loss along with boosting stamina and improving health by eliminating high-fat and processed foods having less nutritional value and more calories. This plan focuses on fruits and vegetables that are loaded with healthy vitamins, and minerals, and are rich in Fiber. This proves to be adequate filling for the human body faster, hence they eat less, which eventually helps in curbing weight gain.

While there is specifically no perfect diet for Diabetes, few researchers suggest that the Paleo diet might majorly help people with Type 2 diabetes. Since the diet plan focuses on whole foods, that will help in managing the diabetic's blood sugar values along with lowering their blood pressure and weight loss as well.

Snacking or munching on nuts, seeds or berries instead of added sugar or processed foods like chips, sweets or candies could increase your intake of vitamins and minerals which support your body to function at its best.

Hence the potential benefits of the Paleo diet include effective weight loss, controlled blood pressure and blood sugar levels, improvement and prevention of autoimmune health conditions, and improved appetite management. With the Paleo diet, you get to eventually lower the intake of processed foods, which means you are less likely to eat high-calorie, high-sugar and low-nutrient food items. People following this diet also experience high energy levels as they are eliminating the high-sugar, processed foods they were used to eating which are responsible for inflammation in the brain causing depression and fatigue.

Possible Risks Associated with the Paleo Diet

It is proved by many studies pursued worldwide that a lot about the Paleo diet is healthy. The reason being major focus is over fresh fruits, vegetables, nuts, high protein, and heart-suitable oils, like olive oil along with the elimination of processed foods, added sugar, coffee and alcohol from the daily eating plan. But besides all these benefits, the downside is that the Paleo diet followers often eat extremely saturated fat, which directly or indirectly affects your heart.

According to the research of Dr. Lona Sandon, PhD, RD, an associate professor of clinical nutrition at the University of Texas Southwestern Medical Center in Dallas, you will certainly lose weight anytime you restrict entire food groups and when your calorie intake tends to be lower. In

the Paleo diet plan, the focus on lean protein, fruits, and vegetables over high-calorie and sodiumrich processed foods automatically contributes to weight loss. But Dr. Sandon points out that the Paleo diet was never designed to be a clean weight loss diet.

The Paleo diet ends up being low in starchy foods with wheat products like bread and pasta made up of either semolina, wheat or oats which are beneficial to the human body. Even mostly unprocessed products like potatoes, lentils and legumes are all heavily restricted. Dairy is also a no-go in the Paleo diet which results in calcium deficiency as a possibility which causes extreme fatigue or lack of energy, dizziness, sluggishness, lack of concentration or even insomnia.

However, nuts and seeds are permitted to be consumed as per the Paleo diet, but they can still be high in calories. Hence for focused weight loss, their consumption must be either avoided or limited.

Conclusion

The Paleo diet unfolds certain secrets of the caveman era which informs us about the differences between the Paleolithic food habits and the modern diet. It states that on the satisfactory ground, the Paleo diet can support and uplift the lives of those with certain underlying health conditions. Most importantly, the low sugar and low carbohydrate aspect of the diet could be beneficial for those with diabetes, heart problems, obesity and other metabolic health conditions as it can help increase insulin sensitivity. But contradicting the fact the Paleo diet is partially controversial due to the exaggerated health claims made regarding it by the group of people already following it. The fact has been proven as well that following the Paleo diet may be problematic for some people who are already facing nutrient deficiencies or underlying health problems.

When there are several case studies which show that the Paleo diet works miracles in curing severe health issues, many scientists have expressed concern and stated that there is still not a sheer surety and enough evidence to make any strong claims about the Paleo diet's complete health benefits, especially, its long-term effects. As for the long-term effect, you have to be sure that you are consuming calcium and other nutrients which you are missing out on by not including dairy products and certain grains in your diet. Some Paleo-approved foods, such as salmon and spinach, contain adequate amounts of calcium. Hence you have to be sure you are including them in your diet.

Therefore, on the whole, the Paleolithic Way of a healthy lifestyle is not a false belief but a fact, but with certain restrictions and limitations. Following the Paleo diet is not at all a bad

choice, but only if there are certain choices made prior only. The best way could be cutting out processed food, processed meats, and sugar-sweetened beverages and swapping them for more fresh fruits, non-starchy vegetables, and healthy fats.

Hence, the Paleo diet is a great option if you are really looking forward to embarking on the journey of healthy eating and weight loss with managed health issues. But the fact is the diet is not for everyone, but it could be helpful to some. Thus, it becomes mandatory for each person to consult a learned and experienced dietitian or nutritionist to carefully understand the Paleo diet before jumping into it.

Reference links

- https://www.livescience.com/53368-paleo-diet.html
- The Paleo Diet® | The Paleo Diet® by Dr Loren Cordain https://thepaleodiet.com/
- https://www.mayoclinic.org/healthy-lifestyle/nutrition-and-healthy-eating/in-depth/paleo-diet/art-20111182
- https://www.hsph.harvard.edu/nutritionsource/healthy-weight/diet-reviews/paleo-diet/#:~:text=The%20Paleo%20diet%2C%20also%20referred,low%2Dglycemic%20fruits%20and%20vegetables
- https://en.m.wikipedia.org/wiki/Paleolithic_diet
- https://www.everydayhealth.com/diet-nutrition/the-paleo-diet.aspx

E-ISSN No: 2456-5040



Impact Factor: 7.517

Certificate of Publication

Is hereby awarding this certificate to

Prof./Dr. /Mr./Mrs./Miss. VIJAY WASNIK

International Educational Applied Scientific Research Journal

In recognition of the publication of the paper entitled

Title". THE ROLE OF NBFCS IN MONEY LENDING AND DEVELOPMENT OF WOMEN'S SELF-HELP GROUPS IN DURG DIVISION: A COMPREHENSIVE STUDY

Published with Peer-Reviewed (Refereed) Journal in

Volume. 9 , Issue. 10 , Oct - 2024

Editor in Chief

E-ISSN No: 2456-5040



Impact Factor: 8.145

Certificate of Publication

Is hereby awarding this certificate to

Prof./Dr. /Mr./Mrs./Miss. VIJAY WASNIK

International Educational Applied Scientific Research Journal

In recognition of the publication of the paper entitled

Title" WOMEN SELF HELP GROUP'S LENDING : A CRITICAL OVERVIEW

Published with Peer-Reviewed (Refereed) Journal in

Volume. 10 , Issue. 04 , Apr - 2025

Editor in Chief