

RESEARCH AT A GLANCE



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Research at a Glance

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PREFACE

Introduction

The library of the Central Council for Research in Homoeopathy has been circulating "Research at a Glance". The main objective is to disseminate precise information/citation about scientific articles published in various journals/magazine other than the journals subscribed by this Council.

Scope

This volume covers articles on Homeopathy, Ayurveda, Unani, Yoga.

Arrangement of Entries

The articles are indexed under the name of the authors, arranged in alphabetical order. The entries have been made in the following order:

Author
Title
Name of Journal
year of publication; Volume (issue no.): pagination
Abstract

Acknowledgement

We are grateful to Dr. R.K. Manchanda, Director General, CCRH for his encouragement and valuable suggestions from time to time. We sincerely acknowledge the cooperation of Mrs. Nisha Adhikari, DEO in compiling this bulletin.

(Meenakshi Bhatia)
Junior Librarian

HOMOEOPATHY

Ahankari AS, Myles PR, Tsang S et al. Qualitative study exploring factors influencing clinical decision-making for influenza-like illness in Solapur city, Maharashtra, India. *Anthropol Med.* 2017; 1-22p. doi: 10.1080/13648470.2017.1321459.

Abstract:

The co-existence of different types of medical systems (medical pluralism) is a typical feature of India's healthcare system. For conditions such as influenza-like illness (ILI), where non-specific disease signs/symptoms exist, clinical reasoning in the context of medical pluralism becomes crucial. Recognising this need, we undertook a qualitative study, which explored factors underpinning clinical decisions on diagnosis and management of ILI. The study involved semi-structured interviews including clinical vignettes with 20 healthcare practitioners (working within allopathy, homeopathy and Ayurveda) working in the private healthcare sector in Solapur city, India. An inquiry was conducted into criteria influencing the diagnosis, treatment, referral to specialist care and role of treatment guidelines for ILI. Thematic analysis was used to identify aspects relating to ILI diagnosis, treatment and referral. The diagnosis of influenza was based largely on clinical symptoms suggestive of influenza in the absence of other diagnoses. Referral for laboratory tests was only initiated if illness did not resolve, generally after 2-3 consultations. Antibiotics were often prescribed for persistent illness, with antivirals rarely considered. Some differences between practitioners from different medical systems were observed in relation to treatment and referral in case of persistent illness. A combination of analytical and intuitive clinical reasoning was used by the participants and clinical decisions were based on both social and clinical factors. Clinical decision-making was rarely a linear process and respondents felt that broad guidelines on influenza that allowed doctors to account for the sociocultural context within which they practised medicine would be helpful.

Chirumbolo S, Bjorklund G. Homeopathic potencies of *Arnica montana* L. change gene expression in a Tamm-Horsfall protein-1 cell line in vitro model: the role of ethanol as a possible confounder and statistical bias. *J Integr Med.* 2017; 15(4):255-64p.

Abstract:

Marzotto et al. showed that homeopathic preparations of *Arnica montana* L. acted directly on gene expression of Tamm-Horsfall protein-1 (THP-1) monocyte/macrophage cell lines activated with phorbol12-myristate13-acetate and interleukin-4 (IL-4). *A. montana* homeopathic dilutions are used in complementary and alternative medicine to treat inflammation disorders and post-traumatic events as well as for wound repair. The French Pharmacopoeia of these remedies uses 0.3% ethanol in each centesimal dilution. In this paper, we discuss how ethanol-containing *A. montana* homeopathic centesimal dilutions can change gene expression in IL-4-treated monocyte/macrophage THP-1. We assessed the role of ethanol in the *Arnica* homeopathic dilutions containing this alcohol by investigating its action on gene expression of THP-1 cell. Evidence would strongly suggest that the presence of ethanol in these remedies might play a fundamental role in the dilutions ability to affect gene expression, particularly for doses from 5c to 15c. Where, rather than playing a major role in the mesoscopic structure of water, the ethanol might have a chemical-physical role in the induction of THP-1 gene expression, apoptosis, and deoxyribonucleic acid function. This evidence generates a debate about the suggestion that the use of a binary-mixed solvent in homeopathic chemistry, used by Hahnemann since 1810, may be fundamental to explain the activity of homeopathy on cell models.

Dueva EV, Panchin AY. Homeopathy in disguise. Comment on Don et al.: Dose-dependent antiviral activity of released-active form of antibodies to interferon-gamma against influenza A/California/07/09(H1N1) in murine model. *J Med Virol.* 2017; 89(7):1125-26p.

Gleiss A. Identifiability of components of complex interventions using factorial designs. *J Altern Complement Med.* 2017; doi: 10.1089/acm.2017.0075.

Abstract:

Objective: The aim of this contribution is to demonstrate how the component structure of a complex intervention (CI) can be efficiently exploited for study design and statistical analysis by using concepts of factorial designs. Many studies on CIs in complementary and alternative medicine exhibit the structure of factorial designs, where all possible combinations of the levels of two or more treatments occur together. In this contribution, the treatment arms of CI studies are explicitly viewed as factorial combinations of their components. Experimental design offers the general concept of identifiability of effects, that is, unique estimability of the components' effects from the observed data. For factorial designs, a simple cross table representation of the treatment arms can show the components or sums or interactions of components that are identifiable within a given study design. The question of identifiability arises particularly if some combinations of components are not observed (e.g., individualized homeopathic prescription without consultation). Study designs from published homeopathy studies are used for demonstration.

Conclusions: CI studies should explicitly use an intervention's factorial component structure if it is inherent in the treatment arms being compared. In this way, investigators can avoid study designs from which the effects of interest cannot be uniquely estimated and improve the interpretation of estimated effects.

Iacobucci G. NHS to stop funding homeopathy and some drugs in targeted savings drive. *BMJ.* 2017; 358: j3560.

Nascimento KF, de Santana FR, da Costa CRV et al. M1 homeopathic complex trigger effective responses against *Leishmania (L) amazonensis* in vivo and in vitro. *Cytokine.* 2017; 99:80-90p.

Abstract:

Leishmaniasis is a term referring to a range of clinical conditions caused by protozoan parasites of the genus *Leishmania*, Trypanosomatidae family, Kinetoplastida order that is transmitted by the bite of certain species of mosquitoes Phlebotominae subfamily. These parasites infect hosts wild and domestic mammals, considered as natural reservoirs and can also infect humans. *Leishmania* are obligate intramacrophage protozoa that have exclusively intracellular life style. This suggests that the amastigotes possess mechanisms to avoid killing by host cells. Cutaneous leishmaniasis, the most common form of the disease, causes ulcers on exposed parts of the body, leading to disfigurement, permanent scars, and stigma and in some cases disability. Many studies concluded that the cytokines profile and immune system of host have fundamental role in humans and animals natural

self-healing. Conventional treatments are far from ideals and the search for new therapeutic alternatives is considered a strategic priority line of research by the World Health Organization. A promising approach in the field of basic research in homeopathy is the treatment of experimental infections with homeopathic drugs prepared from natural substances associations highly diluted, which comprise a combination of several different compounds considered as useful for a symptom or disease. Therefore, this study aimed to evaluate the effect of M1, a complex homeopathic product, in macrophage-Leishmania interaction in vitro and in vivo. It was used RAW cells lineage and BALB/c mice as a host for the promastigotes of *L. amazonensis* (WHOM/BR/75/Josefa). Several biochemical and morphological parameters were determined. Together, the harmonic results obtained in this study indicate that, in general, the highly diluted products trigger rapid and effective responses by living organisms, cells and mice, against *Leishmania*, by altering cytokines profile, by NO increasing ($p < 0.05$), by decreasing parasitic load ($p < 0.001$), and modifying classical maturation and biogenesis of parasitophorous vacuoles ($p < 0.001$). M1 complex decreased endocytic index ($p < 0.001$), and the % of infected macrophages ($p < 0.05$), preventing the development of lesions ($p < 0.05$) caused by *L. amazonensis* by increasing Th1 response ($p < 0.05$). Therefore the M1 complex can be a good candidate for a complementary therapy to conventional treatments, since all the parameters observed in vitro and in vivo improved. It could be an interesting clinical tool in association to a classical anti-parasitic treatment, maybe resulting in better quality of life to the patients, with less toxicity.

Turner A. Evaluating the UK House of Commons Science and Technology Committee's position on the implausible effectiveness of homeopathic treatments. *Theor Med Bioeth.* 2017; doi: 10.1007/s11017-017-9415-y.

Abstract:

In 2009, the UK House of Commons Science and Technology Committee (STC) conducted an 'evidence check' on homeopathy to evaluate evidence for its effectiveness. In common with the wider literature critical of homeopathy, the STC report seems to endorse many of the strong claims that are made about its implausibility. In contrast with the critical literature, however, the STC report explicitly does not place any weight on implausibility in its evaluation. I use the contrasting positions of the STC and the wider critical literature to examine the 'implausibility arguments' against homeopathy and the place of such arguments within evidence-based medicine (EBM). I argue that the STC report undervalues its strong claims about the mechanistic plausibility of homeopathy because it relies on a misunderstanding about the role of mechanistic evidence within EBM. This is not a conclusion for a revision of the role mechanistic evidence plays within EBM, however. It is a conclusion about the inconsistency of the STC report's position towards implausibility arguments, given the evidential claims they endorse and the atypical situation that homeopathy presents. It provides a further example of the general point that mechanistic reasoning should not be seen as providing categorically lower quality evidence.

AYURVEDA

Agarwal AV, Gupta P, Singh D et al. Comprehensive assessment of the genes involved in withanolide biosynthesis from *Withania somnifera*: chemotype-specific and elicitor-responsive expression. *Funct Integr Genomics*. 2017; 17(4):477-90p.

Abstract:

Withania somnifera (L.) Dunal (Family, Solanaceae), is among the most valuable medicinal plants used in Ayurveda owing to its rich reservoir of pharmaceutically active secondary metabolites known as withanolides. Withanolides are C₂₈-steroidal lactones having a triterpenoidal metabolic origin synthesised via mevalonate (MVA) pathway and methyl-D-erythritol-4-phosphate (MEP) pathway involving metabolic intermediacy of 24-methylene (C₃₀-terpenoid) cholesterol. Phytochemical studies suggest differences in the content and/or nature of withanolides in different tissues of different chemotypes. Though development of genomic resources has provided information about putative genes encoding enzymes for biosynthesis of intermediate steps of terpenoid backbone, not much is known about their regulation and response to elicitation. In this study, we generated detailed molecular information about genes catalysing key regulatory steps of withanolide biosynthetic pathway. The full-length sequences of genes encoding enzymes for intermediate steps of terpenoid backbone biosynthesis and their paralogs have been characterized for their functional and structural properties as well as phylogeny using bioinformatics approach. The expression analysis suggests that these genes are differentially expressed in different tissues (with maximal expression in young leaf), chemotypes and in response to salicylic acid (SA) and methyl jasmonate (MJ) treatments. Sub-cellular localization studies suggest that both paralogs of sterol Δ -7 reductase (WsDWF5-1 and WsDWF5-2) are localized in the endoplasmic reticulum (ER) thus supporting their indispensable role in withanolide biosynthesis. Comprehensive information developed, in this study, will lead to elucidation of chemotype- as well as tissue-specific withanolide biosynthesis and development of new tools for functional genomics in this important medicinal plant.

Ahankari AS, Myles PR, Tsang S et al. Qualitative study exploring factors influencing clinical decision-making for influenza-like illness in Solapur city, Maharashtra, India. *Anthropol Med*. 2017; 1-22p. doi: 10.1080/13648470.2017.1321459.

Abstract:

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decisions were based on both social and clinical factors. Clinical decision-making was rarely a linear process and respondents felt that broad guidelines on influenza that allowed doctors to account for the sociocultural context within which they practised medicine would be helpful.

Ahmad R, Fatima A, Srivastava AN et al. Evaluation of apoptotic activity of Withania coagulans methanolic extract against human breast cancer and Vero cell lines. *J Ayurveda Integr Med.* 2017; pii: S0975-9476(16)30176-0.

Abstract:

Background: The genus *Withania* (Family: Solanaceae) holds an important position in Ayurveda, the Indian traditional system of medicine. *Withania somnifera* Dunal and *Withania coagulans* Dunal have been documented in folklore as panaceas for various ailments since time immemorial. *W. coagulans* (WC), commonly called as Indian cheese maker is used for fermenting milk for cheese production in various parts of India.

Objectives: In the study, in vitro cytotoxicity of methanolic extract of dried fruits (berries) of WC was evaluated in a dose dependent manner using trypan blue dye exclusion method against human breast cancer cell line MDA-MB-231 and normal kidney epithelial cell line Vero in the range 20-200 µg/ml.

Material and Methods: The percentage viability of the cell lines was determined by using MTT assay and cytometry.

Results: Methanolic extract of WC showed significant anticancer activity against MDA-MB-231 cell line. Cell viability was reduced to about 50% at 40 µg/ml of methanolic extract in 50% DMSO. Cytotoxicity of the extract was lower in 10% and 1% DMSO. On the other hand, methanolic extract of WC did not exhibit any significant in vitro activity against Vero cells at 170 and 200 µg/ml. AGE of isolated DNA from treated cancer cells revealed characteristic ladder like fragmentation, a hallmark of apoptosis. HPLC profiling was carried out for identification of the active components, which demonstrated the presence of Withaferin A in the methanolic extract.

Conclusion: Methanolic extract of WC possesses apoptotic activity against human breast cancer cells in vitro albeit lower in comparison to *W. somnifera* and warrants further investigation.

Arun A, Patel OPS, Saini D et al. Anti-colon cancer activity of *Murraya koenigii* leaves is due to constituent murrayazoline and O-methylmurrayamine A induced mTOR/AKT downregulation and mitochondrial apoptosis. *Biomed Pharmacother.* 2017; 93:510-21p.

Abstract:

In recent years, many alkaloids of plant origin have attracted great attention due to their diverse range of biological properties including anti-hyperglycemic, anti-oxidant, anti-inflammatory, anti-diabetic and anti-tumor activity. Herein, the pyranocarbazole alkaloids were isolated from leaves of *Murraya koenigii* and their anti-cancer potential was investigated in different cancer cell lines. Among all tested compounds, murrayazoline and O-methylmurrayamine A demonstrated potent anti-cancer activity against DLD-1 colon

cancer cells with the IC₅₀ values of 5.7µM and 17.9µM, respectively, without any non-specific cytotoxicity against non-cancer HEK-293 and HaCaT cells. Further, studies of pure compounds revealed that the anti-cancer activity of compounds corresponds with altered cellular morphology, cell cycle arrest in G2/M phase, reactive oxygen species level and mitochondrial membrane depolarization of colon cancer cells. In addition, these compounds activated caspase-3 protein and upregulated Bax/Bcl-2 protein expression ratio leading to induction of caspase-dependent apoptosis in DLD-1 cells. These event induced by carbazole alkaloids also coincides with downregulation of Akt/mTOR suggesting downstream targeting of cell survival pathway. Thus, our in vitro studies not only provided scientific basis of the use of *M. koenigii* leaves in the traditional Indian Ayurvedamedicines, but also expands possibilities of medicinal uses of *M. koenigii* leaves against colon cancer. Particularly, these findings will help in further investigating murrayazoline and O-methylmurrayamine A or their improvised derivatives as new therapeutics for the treatment of colon cancer.

Bagheri SM, Abdian Asl A, Moghadam MT et al. Antitumor effect of Ferula assa foetida oleo gum resin against breast cancer induced by 4T1 cells in BALB/c mice. *J Ayurveda Integr Med.* 2017; pii: S0975-9476(16)30397-7.

Abstract:

Background: Ferula assa foetida commonly consumed as a healthy beverage has been demonstrated to have various biological activities, including antioxidation, anti-obesity and anti-cancer.

Objective: Our study aims to investigate the antitumor effect of asafoetida in vivo using mouse mammary carcinoma 4T1 cells.

Materials and Methods: In the study, female BALB/c mice were divided into two groups (n = 6), which were control (untreated) and other group of mice with breast cancer treated with 100 mg/kg of asafoetida, respectively, by oral gavage. All mice were injected into the mammary fat pad with 4T1 cells (1 × 10⁵ 4T1 cells/0.1 ml of phosphate buffer solution). Asafoetida was administered on day 15 after the tumor had developed for 3 weeks. At end of experiment, tumor weight, tumor volume and tumor burden were measured and lung, liver, kidney and tumor were harvested and sections were prepared for histopathological analysis. Lipoyxygenase inhibitory and antioxidant activity of asafoetida was also determined.

Results: Our results showed that treatment with asafoetida was effective in decreasing the tumor weight and tumor volume in treated mice. Body weight significantly increased in female BALB/c mice against control. Apart from the antitumor effect, asafoetida decreased lung, liver and kidney metastasis and also increased areas of necrosis in the tumor tissue respectively.

Conclusions: The present study demonstrated that asafoetida has potent antitumor and antimetastasis effects on breast cancer and is a potential source of natural antitumor products.

Chang E, Pohling C, Beygui N et al. Synergistic inhibition of glioma cell proliferation by Withaferin A and tumor treating fields. *J Neurooncol.* 2017; doi: 10.1007/s11060-017-2534-5.

Abstract:

Glioblastoma (GBM) is the most aggressive and lethal form of brain cancer. Standard therapies are non-specific and often of limited effectiveness; thus, efforts are underway to uncover novel, unorthodox therapies against GBM. In previous studies, we investigated Withaferin A, a steroidal lactone from Ayurvedic medicine that inhibits proliferation in cancers including GBM. Another novel approach, tumor treating fields (TTFields), is thought to disrupt mitotic spindle formation and stymie proliferation of actively dividing cells. We hypothesized that combining TTFields with Withaferin A would synergistically inhibit proliferation in glioblastoma. Human glioblastoma cells (GBM2, GBM39, U87-MG) and human breast adenocarcinoma cells (MDA-MB-231) were isolated from primary tumors. The glioma cell lines were genetically engineered to express firefly luciferase. Proliferative potential was assessed either by bioluminescence imaging or cell counting via hemocytometer. TTFields (4 V/cm) significantly inhibited growth of the four cancer cell lines tested (n = 3 experiments per time point, four measurements per sample, $p < 0.02$ at least; 2-way ANOVA, control vs. treatment). The combination of Withaferin A (10-100 nM) with TTFields significantly inhibited the growth of the glioma cells to a degree beyond that of Withaferin A or TTFields alone. The interaction of the Withaferin A and TTFields on glioma cells was found to be synergistic in nature ($p < 0.01$, n = 3 experiments). These findings were validated by both bioluminescence and hemocytometric measurements. The combination of Withaferin A with TTFields represents a novel approach to treat GBM in a manner that is likely better than either treatment alone and that is synergistic.

Jagadeeshan S, David D, Jisha S et al. Solanum nigrum Unripe fruit fraction attenuates Adriamycin resistance by down-regulating multi-drug resistance protein (Mdr)-1 through Jak-STAT pathway. BMC Complement Altern Med. 2017; 17(1): 370p.

Abstract:

Background: Solanum nigrum, herbal plant that commonly grows in temperate climate zone, has been used as a traditional folk medicine whose ripen fruits were proven to exhibit anti-tumor properties. In traditional Chinese medicine, it has been used for centuries to cure inflammation, edema, mastitis and hepatic cancer and in the Ayurvedic system of traditional medicine in India, S. nigrum is applied against enteric diseases, ulcer, diarrhea and skin diseases. A methanolic glycosidic extract fraction of unripe fruit of S. nigrum (SNME) was investigated for its anticancer property and possible mechanism to surmount adriamycin resistance in NCI/ADR-RES cells.

Methods: The NCI/ADR-RES cells were treated with 7.8125, 15.625, 31.25, 62.5, 125 and 250 $\mu\text{g}/\text{ml}$ of methanolic extract of S. nigrum (SNME) for 12, 24 and 48 h, to check the cell viability and proliferation. The cells were also exposed to adriamycin alone or in combination with SNME and the effects on cell growth were determined by MTT. Cell cycle analysis, Ethidium bromide and Acridine orange staining, Annexin-binding efficiency, nuclear condensation and DNA fragmentation of the apoptotic NCI/ADR-RES cells were also determined. To elucidate the relationship between SNME and multi drug resistance, we analyzed the expression levels of Mdr-1, JAK1, STAT3, and pSTAT3 in NCI/ADR-RES cells after treatment with SNME.

Results: Results from the cytotoxicity assay showed a direct correlation between the concentration of methanolic glycosidic extract fraction of S. nigrum (SNME) and the surviving cell population. Combination with Adriamycin, SNME exhibits a synergistic

action on NCI/ADR-RES cells, giving the first line of evidence to overcoming Adriamycin resistance. The SNME mediated cell growth suppression was proven to be apoptotic, based on results obtained from DNA fragmentation, annexin V apoptosis assay and PARP cleavage analysis. Looking into the molecular insight SNME surpasses the chemoresistance of NCI/ADR-RES cells by inhibiting the JAK-STAT3 signaling pathway through the down regulation of JAK1, STAT3, pSTAT3, and Mdr1 expression.

Conclusions: Collectively our findings suggest that unripe fruit of *Solanum nigrum* could possibly be used as a chemosensitizing agent against Adriamycin resistant cancers.

Kishor B, Rai P, Bharatia R et al. Adaptogenic potential of Oxitard in experimental chronic stress and chronic unpredictable stress induced dysfunctional homeostasis in rodents. *J Ayurveda Integr Med.* 2017; Jul 7. pii: S0975-9476(16)30334-5.

Abstract:

Background: Oxitard, a polyherbal formulation comprising the extracts of *Withania somnifera*, *Mangifera indica*, *Glycyrrhiza glabra*, *Daucus carota*, *Vitis vinifera*, powders of *Syzygium aromaticum*, *Yashada bhasma* and *Embllica officinalis*; and oils of *Triticum sativum*.

Objective: Current study deals with the assessment of Oxitard (a marketed polyherbal formulation) for its adaptogenic potential in chronic unpredictable stress (CUS) and chronic stress (CS) induced dysfunctional homeostasis in rodents.

Materials & Methods: Animals were immobilized for 2 h every day for ten days to induce CS. In order to induce CUS, animals were employed in a battery of stressors of variable value and duration for ten days. Following administration of Oxitard, stress was induced in the animals. Stress-induced efficient changes were evaluated by assessing organ (adrenal gland) weights, ulcer index, hematological parameters and biochemical levels of reduced glutathione (GSH), thiobarbituric acid reactive substances (TBARS) and catalase (CAT).

Results: CS and CUS significantly modified the oxidative stress parameters (increased MDA and decreased GSH). Furthermore, CS and CUS lead to weight reduction, adrenal hypertrophy and gastric ulceration. Pre-treatment with Oxitard (200 and 400 mg/kg, p.o.) significantly modified CS and CUS induced hematological changes, oxidative stress parameters and pathological effects.

Conclusion: In conclusion, Oxitard-intervened antioxidant actions are accountable for its adaptogenic effects in stress-induced dysfunctional homeostasis.

Onlom C, Phrompittayarat W, Putalun W et al. Immunoaffinity Knockout of Saponin Glycosides from *Asparagus racemosus* to Assess Anti-lipid Peroxidation. *Phytochem Anal.* 2017 ; 28(4):316-23p.

Abstract:

Introduction: *Asparagus racemosus* Willd (Asparagaceae family), known as Shatavari, is important in Ayurveda and traditional Thai medicines. The saponin glycosides, shatavarin I and IV are major constituents in its roots and may be responsible for their actions including protection against lipid peroxidation and carcinogenesis.

Objective: To develop an immunoaffinity column for isolating compounds with structures related to shatavarin IV from crude extracts of *A. racemosus* root.

Methodology: The monoclonal antibody recognising shatavarin IV (mAbShavIV) was coupled to an Affi-Gel Hz gel to isolate compounds with structures related to shatavarin IV from the other components of crude extracts of *A. racemosus* root. The saponin glycosides in each fraction were analysed by mAbShavIV ELISA and LC-MS/MS.

Results: The pooled wash-through fractions contained 3% of loaded mAbShavIV reactive saponin glycosides, while eluted fractions released ~ 90% of shatavarin saponin glycosides in a single step. Using thiobarbiturate (TBARs) to measure lipid-peroxidation, the extract, and the pooled wash-through fractions showed moderate protection against Cu⁺ -induced oxidation of human low density lipoprotein (LDL) (IC₅₀ 11.3 ± 1.4 and 12.6 ± 0.9 µg/mL, respectively). In contrast, the saponin glycosides eluted from the mAbShavIV-column had weaker protectant (IC₅₀ 29.7 ± 1.8 µg/mL) suggesting that A. racemosus shatavarins do not inhibit carcinogenesis through preventing lipid peroxidation.

Conclusion: The strategy described here demonstrates its utility for isolating a group of related compounds from the rest of the extract with selectivity and recovery rate. Pharmacological efficacy and synergistic effects of the components obtained can be further investigated. Copyright © 2017 John Wiley & Sons, Ltd.

Pannakal ST, Jager S, Duranton A et al. Longevity effect of a polysaccharide from Chlorophytum borivilianum on Caenorhabditis elegans and Saccharomyces cerevisiae. PLoS One. 2017;12(7):e0179813.

Abstract:

The traditional Indian medicine, Ayurveda, provides insights and practical solutions towards a healthy life style. Rasayana is a branch of Ayurveda known for preserving and promoting health, enhancing the quality of life and delaying the aging process. In the traditional knowledge, the Rasayana herb, Chlorophytum borivilianum (C. borivilanum) is regarded as a general health promoting tonic that delays aging and increases lifespan, cognitive function and physical strength. Aging is a complex and multifactorial physiological phenomenon that manifests itself over a wide range of biological systems, tissues, and functions. Longevity is an obvious marker of physiological aging. Simple model systems such as the single-cell budding yeast Saccharomyces cerevisiae (S. cerevisiae) and the nematode, Caenorhabditis elegans (C. elegans) are widely used to study the aging process and longevity. Here, we show that a polysaccharide fraction obtained from C. borivilianum increases the lifespan of S. cerevisiae and C. elegans, using an automated screening platform (Chronoscreen™). Chemical analysis of this extract revealed a low molecular weight polysaccharide of 1000 Da, predominantly comprising Glu1→6Glu linkage. This polysaccharide showed significant dose-dependent extension of the median lifespan of S. cerevisiae by up to 41% and of the median lifespan of C. elegans by up to 10%. Taking cue from these results and the traditionally described benefits of Rasayanas on skin rejuvenation, we tested in vitro the polysaccharide for potential skin benefits. In a keratinocyte culture, we observed that this polysaccharide increased cell proliferation significantly, and induced synthesis of hyaluronic acid (HA), a well-known extracellular matrix component. Furthermore, when added to culture medium of human reconstructed epidermis, we observed an enhanced production of epidermal markers, e.g. CD44 and HA that are otherwise diminished in aged skin. Together, these results suggest that in addition to life-span extension of S. cerevisiae and C. elegans, a polysaccharide from the Rasayana herb, C. borivilianum may have beneficial effects on skin aging parameters.

Periyannan V, Vinothkumar V, Babukumar S et al. Chemopreventive effect of syringic acid on 7,12-dimethylbenz(a)anthracene induced hamster buccal pouch carcinogenesis. Toxicol Mech Methods. 2017; 1-35p.

Abstract:

Oral squamous cell carcinoma is most prevalent and refractory cancers worldwide. Recently chemoprevention could be a promising approach in developing countries. The present study investigates the mechanism of syringic acid (SA), a phenolic constituent of plant *Alpinia calcarata* Roscoe the leaves used, traditional Indian Ayurveda medicines, mediated chemoprevention on 7,12-dimethylbenz(a)anthracene (DMBA) induced hamster buccal pouch carcinogenesis (HBPC). Lipid peroxidation and antioxidants were measured in the plasma and buccal tissues in experimental hamsters. Modulating effect of SA on the expression pattern of cell proliferation PCNA, Cyclin D1 and mutant p53 markers were used for immunoeexpression and western blotting analysis. In the present study, 100% tumor formation with marked abnormalities in the biochemical parameters of lipid peroxidation and antioxidants through up regulation of molecular markers like PCNA, Cyclin D1 and mutant p53 were accompanied with tumor bearing hamsters. Oral administration of SA at the doses of 50 and 100 mg/kg b.w to DMBA treated hamsters were significantly inhibited adverse changes of biochemical parameters in the plasma and buccal mucosal tissues and also down regulation of molecular marker expression (PCNA, Cyclin D1 and mutant p53). The present study thus suggests that syringic acid has potent anti-lipid peroxidative, antioxidant, anti-cell proliferative and apoptosis inducing properties during DMBA induced HBPC.

Peterson CT, Denniston K, Chopra D. Therapeutic uses of triphala in ayurvedic medicine. *J Altern Complement Med.* 2017; Jul 11. doi: 10.1089/acm.2017.0083.

Abstract:

Aim: The aim of this article is to review the current literature on the therapeutic uses and efficacy of Triphala. Herbal remedies are among the most ancient medicines used in traditional systems of healthcare such as Ayurveda. Triphala, a well-recognized and highly efficacious polyherbal Ayurvedic medicine consisting of fruits of the plant species *Embolia officinalis* (Amalaki), *Terminalia bellerica* (Bibhitaki), and *Terminalia chebula* (Haritaki), is a cornerstone of gastrointestinal and rejuvenative treatment.

Methods: A search of the PubMed database was conducted.

Results: In addition, numerous additional therapeutic uses described both in the Ayurvedic medical literature and anecdotally are being validated scientifically. In addition to laxative action, Triphala research has found the formula to be potentially effective for several clinical uses such as appetite stimulation, reduction of hyperacidity, antioxidant, anti-inflammatory, immunomodulating, antibacterial, antimutagenic, adaptogenic, hypoglycemic, antineoplastic, chemoprotective, and radioprotective effects, and prevention of dental caries. Polyphenols in Triphala modulate the human gut microbiome and thereby promote the growth of beneficial *Bifidobacteria* and *Lactobacillus* while inhibiting the growth of undesirable gut microbes. The bioactivity of Triphala is elicited by gut microbiota to generate a variety of anti-inflammatory compounds.

Conclusions: This review summarizes recent data on pharmacological properties and clinical effects of Triphala while highlighting areas in need of additional investigation and clinical development.

Sadler M, Bell S. Ayurvedic plumbism. *Intern Med J.* 2017; 47(7):823-25p.

Abstract:

Ayurveda is a traditional medicine native to India but is used in many parts of the world as an alternative or adjunct to standard medicine. Preparation can involve incorporation of

heavy metals, including lead. We report the case of a 64-year-old man presenting with malaise, abdominal pain, anaemia and very high lead levels. He was found to be taking ayurvedic medicines to help his diabetic control. Analysis of the ayurvedic medications showed several with very high lead content. Following treatment with an oral chelating agent, the patient's symptoms and blood abnormalities resolved. This case highlights the need to be aware of potentially toxic alternative medications patients take and the efficacy of oral treatment choices in lead poisoning.

Sanap A, Chandravanshi B, Shah T et al. Herbal pre-conditioning induces proliferation and delays senescence in Wharton's Jelly Mesenchymal Stem Cells. *Biomed Pharmacother.* 2017; 93:772-78p.

Abstract:

Background: Mesenchymal Stem Cells (MSCs) are multipotent stem cells which are being explored for various clinical applications. Isolation and in-vitro expansion of MSCs remain important in achieving desired cell number for the therapy. However, in-vitro proliferation of MSCs is often associated with senescence and early onset of apoptosis which limits its therapeutic ability and long term clinical use. *Tinospora cordifolia* and *Withania somnifera* are used widely in Ayurveda: the traditional Indian system of medicine and are reported to have rejuvenating and anti-aging potential. In the present study, we investigated the effect of *Tinospora cordifolia* and *Withania somnifera* on proliferation and senescence of wharton's jelly MSCs (WJMSCs) in-vitro.

Methods: WJMSCs were treated in culture medium with *Tinospora cordifolia* leaf and *Withania somnifera* root extracts to examine their effect on proliferation and senescence properties of WJMSCs. Proliferation of WJMSCs was assayed by cell count, MTT, BrdU incorporation assay, cell cycle analysis and Ki67 mRNA expression. Senescence was demonstrated using β -galactosidase senescence assay and associated mRNA markers.

Results: Culture medium supplemented with *Tinospora cordifolia* leaf and *Withania somnifera* root extracts exhibited significant increase in proliferation of WJMSCs as evidenced by cell count and MTT assay. Cell cycle analysis using propidium iodide showed increase in G2/M phase and decrease in apoptotic cells. BrdU incorporation and upregulation of proliferation marker ki67 by RT PCR showed increased DNA synthesis/proliferation in *Tinospora cordifolia* and *Withania somnifera* extract treated MSCs. Delayed senescence was confirmed by β -galactosidase senescence assay and down regulation of senescence marker p21.

Conclusion: Our results demonstrate for the first time that *Tinospora cordifolia* and *Withania somnifera* extracts support proliferation and inhibit senescence in WJMSCs making them suitable candidates as supplements for in-vitro expansion without affecting the cell viability indicating its non-toxic nature.

Singh S, Kumar V, Upadhyay N et al. Efficient biodegradation of acephate by *Pseudomonas pseudoalcaligenes* PS-5 in the presence and absence of heavy metal ions [Cu(II) and Fe(III)], and humic acid. *3 Biotech.* 2017; 7(4):262p.

Abstract:

The present study was intended to investigate the biodegradation of acephate in aqueous media in the presence and in the absence of metal ions [Fe(III) and Cu(II)], and humic acid (HA). Biodegradations were performed using *Pseudomonas pseudoalcaligenes* PS-5 (PS-5) isolated from the heavy metal polluted site. Biodegradations were monitored by UV-Visible, FTIR, and electron spray ionization-mass spectrometry (ESI-MS) analyses. ESI-MS analysis revealed that PS-5 degraded acephate to two metabolites showing intense ions at mass-to-charge ratios (m/z) 62 and 97. The observed kinetic was the pseudo-first order, and half-life periods ($t_{1/2}$) were 2.79 d⁻¹ (of PS-5 + acephate), 3.45 d⁻¹ [of PS-5 + acephate + Fe(III)], 3.16 d⁻¹ [of PS-5 + acephate + Cu(II)], and 5.54 d⁻¹ (of PS-5 + acephate + HA). A significant decrease in degradation rate of acephate was noticed in the presence of HA, and the same was confirmed by UV-Visible and TGA analyses. Strong aggregation behavior of acephate with humic acid in aqueous media was the major cause behind the slow degradation rate of acephate. New results on acephate metabolism by strain PS-5 in the presence and in the absence of metal ions [Fe(III) and Cu(II)] and humic acid were obtained. Results confirmed that *Pseudomonas pseudoalcaligenes* strain PS-5 was capable of mineralization of the acephate without formation of toxic metabolite methamidophos. More significantly, the *Pseudomonas pseudoalcaligenes* strain PS-5 could be useful as potential biological agents in effective bioremediation campaign for multi-polluted environments.

UNANI MEDICINE

Ahmed M, Azmat A. Decreased brain serotonin turnover rate following administration of Sharbat-e-Ahmed Shah produces antidepressant and anxiolytic effect in rats. *Metab Brain Dis.* 2017; Jul 7. doi: 10.1007/s11011-017-0065-6.

Abstract:

Sharbat-e-Ahmed Shah (SAS) has usually been used in Traditional Unani Medicine (TUM) for depression and insomnia but still not evaluated for its anti-depressant and Neuropharmacological activity. In the present study, a Human dose of SAS (0.6 ml/kg/d) was administered orally to the rats for 15 consecutive days. Antidepressant and anxiolytic were screened scientifically in rats by using Forced swim test and light and dark box test. At the end of study high-performance liquid chromatographic (HPLC) method with electrochemical (EC) detector was used for the measurement of blood and brain tryptophan and brain serotonin levels. The present reported results are according to what is known in TUM, where is prescribed as an antidepressant agent. After the administration, SAS (at a human dose for 15 days) reduced the immobility time in rats analogous to Imipramine (positive control) indicating the antidepressant effect of SAS. In the present study, Diazepam or SAS (0.6 ml/kg/day) treated rats stayed in the illuminated side of the light-dark box, as compare to control rats (Veh, 134.62 ± 4.430 s; SAS 0.6 ml/kg, 192.2 ± 8.11 s; DZP 1.0 mg/kg, $205.21.20 \pm 10.26$ s, $p < 0.05$). It was also observed that SAS increased the availability of tryptophan in blood and brain and hence increases 5-hydroxytryptamine (Serotonin: 5HT) in the brain. At the end, it was concluded that SAS contains some active principles which increase the availability of neurochemical (tryptophan and 5HT) and decrease the 5HT turnover rate thus causes antidepressant and anxiolytic effects in experimental animals.

Khan SA, Nami SAA, Bhat SA et al. Synthesis, characterization and antimicrobial study of polymeric transition metal complexes of Mn(II), Co(II), Ni(II), Cu(II) and Zn(II). *Microb Pathog.* 2017; 110:414-25p.

Abstract:

Salen ligands comprising of o-phenylenediamine (salop) and p-phenylenediamine (salpp) have been synthesized. The salen ligand, salop undergo Schiff base reaction with Formaldehyde and Barbituric acid to generate novel polymeric Schiff base, SBOPA in one instance while the second salen ligand, salpp on Schiff base reaction with formaldehyde and piperazine gives another novel polymeric Schiff base, SBPBA. These polymeric Schiff base ligands, SBOPA and SBPBA generates polymeric metal complexes in high yields on reaction with transition metal acetates, $M(\text{CH}_3\text{COO})_2 \cdot x\text{H}_2\text{O}$ where $M = \text{Mn(II)}, \text{Co(II)}, \text{Ni(II)}, \text{Cu(II)}$ and Zn(II) . The polymeric Schiff bases, SBOPA and SBPBA and their transition metal complexes were systematically characterized, using various spectroscopic techniques. The structure, composition and geometry of SBOPA and SBPBA and their metal complexes were confirmed by spectral techniques (FT-IR, and ^1H NMR), elemental analysis, and electronic spectra magnetic moment. On the basis of FT-IR, ^1H NMR, electronic spectra and magnetic moment values Mn(II), Co(II) and Ni(II) ion were found to have octahedral geometry while Cu(II) and Zn(II) were found to be square-planar in nature. Thermogravimetric analysis (TGA) was used to evaluate their thermal behaviour and Cu(II)-SBOPA and Cu(II)-SBPBA were found to be thermally most stable. The polymeric Schiff base ligands, SBOPA and SBPBA and their metal complexes have also been

screened for their plausible antimicrobial activity. Tetracyclin and Miconazole were used as standard drug to study the antibacterial and antifungal activity respectively. The Cu(II)-SBOPA and Cu(II)-SBPBA were found to be most potent antimicrobial agents.

YOGA

Andrews JM. Editorial: Yoga for QoL in ulcerative colitis-any better than other supportive activities? *Aliment Pharmacol Ther.* 2017; 46(2):201-02p.

Ayyildiz D, Arga KY. Hypothesis: Are there molecular signatures of yoga practice in peripheral blood mononuclear cells? *OMICS.* 2017; 21(7):426-28p.

Bailowitz Z, Grams R 2nd, Teeple D et al. Exercise: Associated hyponatremia in a lactating female. *Clin J Sport Med.* 2017; 27(4):e55-e57p.

Abstract:

A 37-year-old woman presented to the emergency department with severe headache, which quickly progressed to altered mental status and seizure activity in hospital. Her initial serum sodium concentration ([Na]) was 126 mmol/L. In the 24 hours before admission, she exercised vigorously for 120 minutes (interval training plus yoga) and also consumed more than 4 liters of fluid during that time to both stay hydrated and facilitate milk production because she was actively nursing 2 children. Her serum [Na] and altered mental status corrected slowly over the next 48 hours with furosemide, hypertonic saline, and fluid restriction. This case is unique because it discusses the possible pathogenic role that lactation-induced oxytocin release may have on sustained antidiuresis and dilutional exercise-associated hyponatremia (EAH). This would be the first report documenting EAH in a lactating woman, which may highlight an underrecognized risk factor for physically active women who are concurrently breast-feeding.

Bhaskar L, Kharya C, Deepak KK et al. Assessment of cardiac autonomic tone following long sudarshan kriya yoga in art of living practitioners. *J Altern Complement Med.* 2017; Jul 10. doi: 10.1089/acm.2016.0391.

Abstract:

Objective: The breathing processes are known to modulate cardiac autonomic tone and improve psychological status. We investigated cardiac autonomic tone following long Sudarshan Kriya Yoga (SKY) using heart rate variability (HRV) and skin conductance level (SCL).

Methods: Thirty healthy volunteers (age 28.3 ± 8.4 years; 23 M: 7 F) participated in the study. Electrocardiogram (ECG) and SCL were recorded for 5 min each, before and after long SKY. Long SKY is a combination of pranayama and cyclic rhythmic breathing and is performed by following the guided audio instructions. HRV analysis was used for the assessment of cardiac autonomic tone. Time and frequency domain parameters of HRV were calculated by using RR interval of ECG. SCL was acquired using Galvanic skin response (GSR) amplifier of PowerLab in microSeimens (μ S).

Results: Time domain parameters of HRV, including mean RR interval ($p = 0.000$), respiratory sinus arrhythmia (RSA) ($p = 0.037$), standard deviation of all NN intervals (SDNN) ($p = 0.013$), NN50 count divided by the total number of all NN intervals (pNN50) ($p = 0.004$), and square root of the mean of the sum of the squares of differences between adjacent NN intervals (RMSSD) ($p = 0.002$) increased, and mean heart rate decreased ($p = 0.000$) following long SKY. In frequency domain analysis, power of low-frequency (LF) component ($p = 0.010$) and LF/HF

ratio ($p = 0.008$) decreased significantly, whereas power of high frequency (HF) significantly increased ($p = 0.010$). SCL decreased following long SKY, although it did not attain statistical significance.

Conclusions: The results suggest that long SKY induces significant oscillations in cardiac autonomic tone. Parasympathetic activity increases and sympathetic activity decreases and sympathovagal balance improves following long SKY. Decrease in sympathetic activity is also demonstrated by decrease in conductance although it did not reach statistical significance. From this study it can be concluded that long SKY has a beneficial effect on cardiac autonomic tone, and psychophysiological relaxation. It may serve as a tool to improve HRV, which is the marker of cardiovascular health.

Browning KK, Kue J, Lyons F, Overcash J. Feasibility of mind-body movement programs for cancer survivors. *Oncol Nurs Forum*. 2017; 44(4):446-56p.

Abstract:

Purpose/Objectives: To evaluate mind-body movement exercise (MBME) classes (yoga, tai chi, and Qigong) for cancer survivors.

Design: A single-group, repeated-measures design.

Setting: The Ohio State University Wexner Medical Center-Arthur G. James Cancer Hospital in Columbus.

Sample: 33 adult cancer survivors, with any cancer diagnosis, participating in MBME classes.

Methods: The researchers sought to examine feasibility of multiple data collection time points and data collection measures; acceptability; and changes to physical, emotional, and biometric measures over time, as a result of participation in MBME classes.

Main research variables: Quality of life, sleep, depressive symptomatology, fatigue, stress, upper body strength, gait and balance, body mass index, heart rate, and blood pressure.

Findings: The current study was feasible because survivors were willing to participate and completed most of the questionnaires. Participants found these classes to be beneficial not only for exercise, but also for social support and social connectedness. Poor sleep quality was consistently reported by participants. MBME classes should be recommended to survivors and are beneficial for oncology practices to offer.

Conclusions: Conducting MBME research with cancer survivors is feasible, and participants find the MBME acceptable and a way of addressing health and managing cancer-related symptoms.

Implications for nursing: Nurses should help patients and caregivers identify locations and times when MBME class participation is possible, assess MBME class participation during each clinic visit to promote continued involvement and to understand if positive effects are occurring, and continue to provide support for MBME classes throughout the survivorship experience.

Brenneman EC, Maly MR. Identifying changes in gait waveforms following a

strengthening intervention for women with knee osteoarthritis using principal components analysis. *Gait Posture*. 2017 ; S0966-6362(17)30709-9.

Abstract:

Lower limb strengthening exercise is pivotal for the management of symptoms related to knee osteoarthritis (OA). Though improvement in clinical symptoms is well documented, concurrent changes in gait biomechanics are ill-defined. This may occur because discrete analyses miss changes following an intervention, analyses limited to the knee undermine potential mechanical trade-offs at other joints, or strengthening interventions not been designed based on biomechanical principles. The purpose of this study was to characterize differences in entire gait waveforms for sagittal plane ankle, knee, and hip angles and external moments; the knee adduction moment; and frontal plane hip angle and moment following 12-weeks of a previously designed novel lower limb strengthening program. Forty women with knee OA completed two laboratory visits: one at baseline and one immediately following intervention (follow-up). Self-report measures, strength, and gait analyses were completed at each visit. Principal components analyses were completed for sagittal angles and external moments at the ankle, knee, and hip joints, as well as frontal plane angle and moment for the hip. Participants improved self-report and strength ($p \leq 0.004$). Two significant, yet subtle differences in principal components were identified between baseline and follow-up waveforms ($p < 0.05$) pertaining to the knee and hip sagittal external moments. The subtle changes in concert with the lack of differences in other joints and planes suggest the lower limb strengthening program does not translate to changes in the gait waveform. It is likely this program is improving symptoms without worsening mechanics.

Bussing A, Poier D, Ostermann T et al. Treatment of chronic lower back pain: Study protocol of a comparative effectiveness study on yoga, eurythmy therapy, and physiotherapeutic exercises. *Complement Med Res*. 2017; doi: 10.1159/000471801

Cramer H, Dobos G, Langhorst J. Editorial: Yoga for QoL in ulcerative colitis-any better than other supportive activities? Authors' reply. *Aliment Pharmacol Ther*. 2017; 46(2):202-03p.

Ellis JM, Ben-Moshe R, Teshuva K. Laughter yoga activities for older people living in residential aged care homes: A feasibility study. *Australas J Ageing*. 2017; doi: 10.1111/ajag.12447.

Abstract:

Objective: To evaluate the effects of a laughter yoga activities (LY) program for older people living in residential aged care homes (RACHs).

Methods: A 6-week LY program was implemented at three RACHs with twenty-eight residents. A pre-post design was used to measure positive and negative affect, happiness, blood pressure and pulse.

Results: Post-session mean scores for positive mood, and happiness were significantly higher than pre-session scores in weeks 1, 3 and 6, and the post-session mean negative mood scores were significantly lower than pre-session scores in weeks 3 and 6. Post-session readings for mean systolic blood pressure were significantly lower than pre-session readings in weeks 1 and 6.

Conclusion: This study demonstrates the potential for using LY to improve mood and lower blood pressure of older people living in RACHs.

Freedenberg VA, Hinds PS, Friedmann E. Mindfulness-Based stress reduction and group support decrease stress in adolescents with cardiac diagnoses: A randomized two-group study. *Pediatr Cardiol.* 2017; doi: 10.1007/s00246-017-1679-5.

Abstract:

Adolescents with cardiac diagnoses face unique challenges that can cause psychosocial distress. This study compares a Mindfulness-Based Stress Reduction (MBSR) program to a video online support group for adolescents with cardiac diagnoses. MBSR is a structured psycho-educational program which includes yoga, meditation, cognitive restructuring, and group support. A published feasibility study by our group showed significant reduction in anxiety following this intervention. Participants were randomized to MBSR or video online support group, and completed measures of anxiety, depression, illness-related stress, and coping pre- and post-6-session interventions. Qualitative data were obtained from post-intervention interviews. A total of 46 teens participated (mean 14.8 years; 63% female). Participants had congenital heart disease and/or cardiac device (52%), or postural orthostatic tachycardia syndrome (48%). Illness-related stress significantly decreased in both groups. Greater use of coping skills predicted lower levels of depression in both groups post-study completion. Higher baseline anxiety/depression scores predicted improved anxiety/depression scores in both groups. Each group reported the benefits of social support. The MBSR group further expressed benefits of learning specific techniques, strategies, and skills that they applied in real-life situations to relieve distress. Both the MBSR intervention and video support group were effective in reducing distress in this sample. Qualitative data elucidated the added benefits of using MBSR techniques to manage stress and symptoms. The video group format is useful for teens that cannot meet in person but can benefit from group support. Psychosocial interventions with stress management techniques and/or group support can reduce distress in adolescents with cardiac diagnoses.

Groessl EJ, Liu L, Chang DG et al. Yoga for military veterans with chronic low back pain: A randomized clinical trial. *Am J Prev Med.* 2017; pii: S0749-3797(17)30290-8.

Abstract:

Introduction: Chronic low back pain (cLBP) is prevalent, especially among military veterans. Many cLBP treatment options have limited benefits and are accompanied by side effects. Major efforts to reduce opioid use and embrace nonpharmacological pain treatments have resulted. Research with community cLBP patients indicates that yoga can improve health outcomes and has few side effects. The benefits of yoga among military veterans were examined.

Design: Participants were randomized to either yoga or delayed yoga treatment in 2013-2015. Outcomes were assessed at baseline, 6 weeks, 12 weeks, and 6 months. Intention-to-treat analyses occurred in 2016.

Setting/Participants: One hundred and fifty military veterans with cLBP were recruited from a major Veterans Affairs Medical Center in California.

Intervention: Yoga classes (with home practice) were led by a certified instructor twice weekly for 12 weeks, and consisted primarily of physical postures, movement, and breathing techniques.

Main outcome measures: The primary outcome was Roland-Morris Disability Questionnaire scores after 12 weeks. Pain intensity was identified as an important secondary outcome.

Results: Participant characteristics were mean age 53 years, 26% were female, 35% were unemployed or disabled, and mean back pain duration was 15 years. Improvements in Roland-Morris Disability Questionnaire scores did not differ between the two groups at 12 weeks, but yoga participants had greater reductions in Roland-Morris Disability Questionnaire scores than delayed treatment participants at 6 months -2.48 (95% CI= -4.08, -0.87). Yoga participants improved more on pain intensity at 12 weeks and at 6 months. Opioid medication use declined among all participants, but group differences were not found.

Conclusions: Yoga improved health outcomes among veterans despite evidence they had fewer resources, worse health, and more challenges attending yoga sessions than community samples studied previously. The magnitude of pain intensity decline was small, but occurred in the context of reduced opioid use. The findings support wider implementation of yoga programs for veterans.

Huberty J, Matthews J, Leiferman J et al. Study protocol of a three-group randomized feasibility trial of an online yoga intervention for mothers after stillbirth (The Mindful Health Study). *Pilot Feasibility Stud.* 2017; 4:12. doi: 10.1186/s40814-017-0162-7.

Abstract:

Background: In the USA, stillbirth (in utero fetal death ≥ 20 weeks gestation) is a major public health issue. Women who experience stillbirth, compared to women with live birth, have a nearly sevenfold increased risk of a positive screen for post-traumatic stress disorder (PTSD) and a fourfold increased risk of depressive symptoms. Because the majority of women who have experienced the death of their baby become pregnant within 12-18 months and the lack of intervention studies conducted within this population, novel approaches targeting physical and mental health, specific to the needs of this population, are critical. Evidence suggests that yoga is efficacious, safe, acceptable, and cost-effective for improving mental health in a variety of populations, including pregnant and postpartum women. To date, there are no known studies examining online-streaming yoga as a strategy to help mothers cope with PTSD symptoms after stillbirth.

Methods: The present study is a two-phase randomized controlled trial. Phase 1 will involve (1) an iterative design process to develop the online yoga prescription for phase 2 and (2) qualitative interviews to identify cultural barriers to recruitment in non-Caucasian women (i.e., predominately Hispanic and/or African American) who have experienced stillbirth (N = 5). Phase 2 is a three-group randomized feasibility trial with assessments at baseline, and at 12 and 20 weeks post-intervention. Ninety women who have experienced a stillbirth within 6 weeks to 24 months will be randomized into one of the following three arms for 12 weeks: (1) intervention low dose (LD) = 60 min/week online-streaming yoga (n = 30), (2) intervention moderate dose (MD) = 150 min/week online-streaming yoga (n = 30), or (3) stretch and tone control (STC) group = 60 min/week of stretching/toning exercises (n = 30).

Discussion: This study will explore the feasibility and acceptability of a 12-week, home-based, online-streamed yoga intervention, with varying doses among mothers after a stillbirth. If feasible, the findings from this study will inform a full-scale trial to determine the effectiveness of home-based online-streamed yoga to improve PTSD. Long-term, health care providers could use online yoga as a non-pharmaceutical, inexpensive resource for stillbirth aftercare.

Huberty JL, Matthews J, Leiferman J et al. Experiences of women who participated in a beta-test for an online-streamed yoga intervention after a stillbirth. *Int J Yoga Therap.* 2017; doi: 10.17761/IJYT2017_Research_Huberty_Epub.

Abstract:

Background: Little is known about how to best care for mothers after stillbirth. As such, this paper will report the satisfaction and perceptions of an online yoga intervention (12-week beta test) in women after stillbirth.

Methods: Participants (n=74) had a stillbirth within the last 24-months (M time since loss 9.65 ± 6.9 months). Post-intervention satisfaction surveys and interviews and dropout surveys were conducted. Descriptive statistics were used to analyze survey responses and demographic information. A phenomenological approach was used to explore and understand unique experiences of participant interviews. Data were analyzed using NVivo10.

Results: Twenty-six women (M age 33.73 ± 4.38) were completers (> 3 wks of yoga), 26 (M age 31.82 ± 4.13) were non-completers (< 3 wks of yoga), and 22 (M age 32.94 ± 2.93) dropped out. Twenty completers participated in a post-intervention satisfaction survey with 75% (n=15) reporting being very satisfied or satisfied with the online yoga intervention, found it to be very enjoyable or enjoyable, and very helpful or helpful to cope with grief. Satisfaction and perceptions of the intervention in those who completed an interview (n=12) were clustered around the following themes: benefits, barriers, dislikes, satisfaction, and preferences. Of the 22 dropouts, 14 completed a dropout survey. Women withdrew from the study due to pregnancy (n=3, 21%), burden (n=3, 21%), stress (n=2, 14%), lack of time (n=2, 14%), did not enjoy (n=1, 7%), and other (n=3, 21%).

Conclusion: Findings here may be used to help design future research.

Hylander F, Johansson M, Daukantaitė D et al. Yin yoga and mindfulness: a five week randomized controlled study evaluating the effects of the YOMI program on stress and worry. *Anxiety Stress Coping*. 2017; 30(4):365-78p.

Abstract:

Background and Objectives: The YOMI program is a psychoeducational training and physical practice-based program that bridges knowledge from evidence-based psychotherapy with the practice of mindfulness and yin yoga. It consists of 10 content-specific sessions and does not include home assignments. The primary purpose of this randomized controlled trial is to evaluate the effects of the five-week YOMI program on perceived stress, worry and mindfulness in a non-clinical sample.

Design and Method: In this randomized controlled trial participants were assigned to two groups. Group 1 participated in the five-week intervention twice a week while Group 2 was assigned to a waiting-list condition and participated in the intervention after Group 1. All measures were administered through self-report questionnaires, conducted via a web-based program.

Results and Conclusions: The results of the study indicated significant effects of the YOMI program on decreasing stress and worry, and increasing mindfulness. Notably these changes were still present at five-week follow up. Consistent with the hypotheses, results suggested that the YOMI program established a group setting where individuals learned to use tools and methods to facilitate better self-directed practice. The study shows moderate to large effect sizes.

Ikai S, Uchida H, Mizuno Y et al. Effects of chair yoga therapy on physical fitness in patients with psychiatric disorders: A 12-week single-blind randomized controlled trial. *J Psychiatr Res*. 2017; 94:194-201p.

Abstract:

Introduction: Since falls may lead to fractures and have serious, potentially fatal outcomes, prevention of falls is an urgent public health issue. We examined the effects of chair yoga therapy on physical fitness among psychiatric patients in order to reduce the risk of falls, which has not been previously reported in the literature.

Methods: In this 12-week single-blind randomized controlled trial with a 6-week follow-up, inpatients with mixed psychiatric diagnoses were randomly assigned to either chair yoga therapy in addition to ongoing treatment, or treatment-as-usual. Chair yoga therapy was conducted as twice-weekly 20-min sessions over 12 weeks. Assessments included anteflexion in sitting, degree of muscle strength, and Modified Falls Efficacy Scale (MFES) as well as QOL, psychopathology and functioning.

Results: Fifty-six inpatients participated in this study (36 men; mean \pm SD age, 55.3 ± 13.7 years; schizophrenia 87.5%). In the chair yoga group, significant improvements were observed in flexibility, hand-grip, lower limb muscle endurance, and MFES at week 12 (mean \pm SD: 55.1 ± 16.6 to 67.2 ± 14.0 cm, 23.6 ± 10.6 to 26.8 ± 9.7 kg, 4.9 ± 4.0 to 7.0 ± 3.9 kg, and 114.9 ± 29.2 to 134.1 ± 11.6 , respectively). Additionally, these improvements were observable six weeks after the intervention was over. The QOL-VAS improved in the intervention group while no differences were noted in psychopathology and functioning between the groups. The intervention appeared to be highly tolerable without any notable adverse effects.

Conclusions: The results indicated sustainable effects of 20-min, 12-week, 24-session chair yoga therapy on physical fitness. Chair yoga therapy may contribute to reduce the risk of falls and their unwanted consequences in psychiatric patients.

Kuppili PP, Manohar H, Pattanayak RD et al. ADHD research in India: A narrative review. *Asian J Psychiatr.* 2017; 30:11-25.

Abstract:

Introduction: Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder with no clear etiopathogenesis. Owing to unique socio cultural milieu of India, it is worthwhile reviewing research on ADHD from India and comparing findings with global research. Thereby, we attempted to provide a comprehensive overview of research on ADHD from India.

Methods: A boolean search of articles published in English from September 1966 to January 2017 on electronic search engines Google Scholar, PubMed, IndMED, MedIND, using the search terms "ADHD", "Attention Deficit and Hyperactivity Disorder", "Hyperactivity", "Child psychiatry", "Hyperkinetic disorder", "Attention Deficit Disorder", "India" was carried out and peer - reviewed studies conducted among human subjects in India were included for review. Case reports, animal studies, previous reviews were excluded from the current review.

Results: Results of 73 studies found eligible for the review were organized into broad themes such as epidemiology, etiology, course and follow up, clinical profile and comorbidity, assessment /biomarkers, intervention/treatment parameters, pathways to care and knowledge and attitude towards ADHD.

Discussion: There was a gap noted in research from India in the domains of biomarkers, course and follow up and non-pharmacological intervention. The prevalence of ADHD as well as comorbidity of Bipolar Disorder was comparatively lower compared to western studies. The studies found unique to India include comparing the effect of allopathic intervention with Ayurvedic intervention, yoga as a non pharmacological intervention. There is a need for studies from India on biomarkers, studies with prospective research design, larger sample size

and with matched controls.

Lauche R, Schumann D, Sibbritt D et al. Associations between yoga practice and joint problems: A cross-sectional survey among 9151 Australian women. *Rheumatol Int.* 2017; 37(7):1145-48p.

Abstract:

Yoga exercises have been associated with joint problems recently, indicating that yoga practice might be potentially dangerous for joint health. This study aimed to analyse whether regular yoga practice is associated with the frequency of joint problems in upper middle-aged Australian women. Women aged 62-67 years from the Australian Longitudinal Study on Women's Health (ALSWH) were questioned in 2013 whether they experienced regular joint pain or problems in the past 12 months and whether they regularly practiced yoga. Associations of joint problems with yoga practice were analysed using Chi-squared tests and multiple logistic regression modelling. Of 9151 women, 29.8% reported regular problems with stiff or painful joints, and 15.2, 11.9, 18.1 and 15.9% reported regular problems with shoulders, hips, knees and feet, respectively, in the past 12 months. Yoga was practiced sometimes by 10.1% and often by 8.4% of women. Practicing yoga was not associated with upper or lower limb joint problems. No association between yoga practice and joint problems has been identified. Further studies are warranted for conclusive judgement of benefits and safety of yoga in relation to joint problems.

Mak C, Whittingham K, Cunnington R et al. MiYoga: A randomised controlled trial of a mindfulness movement programme based on hatha yoga principles for children with cerebral palsy: A study protocol. *BMJ Open.* 2017; 7(7):e015191.

Abstract:

Introduction: Cerebral palsy (CP) is the most common childhood physical disability, with life-long impacts for 1.77 in 1000 children. Although CP is primarily a physical disability, children with CP have an increased risk of experiencing cognitive difficulties, particularly attention and executive function deficits. Impairment in cognitive abilities can lead to subsequent impairment in independent functioning, education, employment and interpersonal relationships. This paper reports the protocol of a randomised controlled trial of a novel family-centred lifestyle intervention based on mindfulness and hatha yoga principles (MiYoga). MiYoga aims to enhance child and parent outcomes for children with CP.

Methods and Analysis: The aim is to recruit 36 child-parent dyads (children aged 6-16 years; bilateral or unilateral CP; Gross Motor Function Classification System I-III), who will be randomly assigned to two groups: MiYoga and waitlist control. The MiYoga programme will be facilitated in a group format for 8 weeks. Assessments will be administered at baseline, prior to MiYoga, following completion of MiYoga, and at 6-month follow-up (retention). The primary outcome will be the child's sustained attentional ability as measured by the Conner's Continuous Performance Test II. Other outcomes of interest for children with CP consists of attentional control, physical functioning, behavioural and well-being. For parents, the outcomes of interest are mindfulness, psychological flexibility and well-being. Data will be analysed using general linear models, specifically analysis of covariance and analysis of variance.

Ethics and Dissemination: Full ethical approval for this study has been obtained by the Children's Health Queensland Hospital and Health Service Research Ethics Committee (HREC/12/QRCH/120) and The University of Queensland (2012000993). If MiYoga is proven

effective, its dissemination would assist children with CP and complement their ongoing therapy by improving the ability of the child to pay attention at school and in therapy, and alleviating environmental stressors for both the child and his/her parents.

Trial Registration Number: ACTRN12613000729729; Pre-
results.<http://www.ANZCTR.org.au/ACTRN12613000729729.aspx> DATE OF TRIAL
REGISTRATION: Prospectively registered on 2 July 2013-present (ongoing).

Findings to Date: Recruitment is complete. Data are still being collected at present. We aim to complete data collection by February 2017.

Minhas G, Mathur D, Ragavendrasamy B et al. Hypoxia in CNS pathologies: Emerging role of mirna-based neurotherapeutics and yoga based alternative therapies. *Front Neurosci.* 2017; 11:386p.

Abstract:

Cellular respiration is a vital process for the existence of life. Any condition that results in deprivation of oxygen (also termed as hypoxia) may eventually lead to deleterious effects on the functioning of tissues. Brain being the highest consumer of oxygen is prone to increased risk of hypoxia-induced neurological insults. This in turn has been associated with many diseases of central nervous system (CNS) such as stroke, Alzheimer's, encephalopathy etc. Although several studies have investigated the pathophysiological mechanisms underlying ischemic/hypoxic CNS diseases, the knowledge about protective therapeutic strategies to ameliorate the affected neuronal cells is meager. This has augmented the need to improve our understanding of the hypoxic and ischemic events occurring in the brain and identify novel and alternate treatment modalities for such insults. MicroRNA (miRNAs), small non-coding RNA molecules, have recently emerged as potential neuroprotective agents as well as targets, under hypoxic conditions. These 18-22 nucleotide long RNA molecules are profusely present in brain and other organs and function as gene regulators by cleaving and silencing the gene expression. In brain, these are known to be involved in neuronal differentiation and plasticity. Therefore, targeting miRNA expression represents a novel therapeutic approach to intercede against hypoxic and ischemic brain injury. In the first part of this review, we will discuss the neurophysiological changes caused as a result of hypoxia, followed by the contribution of hypoxia in the neurodegenerative diseases. Secondly, we will provide recent updates and insights into the roles of miRNA in the regulation of genes in oxygen and glucose deprived brain in association with circadian rhythms and how these can be targeted as neuroprotective agents for CNS injuries. Finally, we will emphasize on alternate breathing or yogic interventions to overcome the hypoxia associated anomalies that could ultimately lead to improvement in cerebral perfusion.

Moonaz S, Jeter P, Schmalzl L. Importance of research literacy for yoga therapists. *Int J Yoga Therap.* 2017; doi: 10.17761/IJYT2017_Perspective_Moonaz_Epub.

Abstract:

Evidence-Informed Practice (EIP) utilizes the three components of expert opinion, research evidence, and client values. It is a recommended training competency for integrative health practitioners in diverse fields, such as acupuncture and massage therapy. Research Literacy (RL) is a necessary pre-requisite to EIP. Many yoga therapists have limited training in these skills, which negatively impacts inter-professional communication and collaboration, as well as further advancement of yoga therapy research and practice. In this article, we propose inclusion of RL and EIP in the training of yoga therapists. Benefits for client care,

collaborative care, and the field of yoga therapy are discussed.

Neumark Sztainer D, MacLehose RF, Watts AW et al. How is the practice of yoga related to weight status? population-based findings from project eat-IV. *J Phys Act Health.* 2017; 1-25p.

Background: Yoga may provide a strategy for healthy weight management in young adults. This study examined prevalence and characteristics of young adults' yoga practice and associations with changes in body mass index (BMI).

Methods: Surveys were completed by 1830 young adults (31.1±1.6 years) participating in Project EAT-IV. Cross-sectional and five-year longitudinal analyses were conducted stratified by initial weight status.

Results: Two-thirds (66.5%) of non-overweight women and 48.9% of overweight women reported ever doing yoga, while 27.2% of non-overweight women and 16.4% of overweight women practiced regularly (≥30 minutes/week). Fewer men practiced yoga. Among young adults practicing regularly (n=294), differences were identified in intensity, type, and location of yoga practice across weight status. Young adults who were overweight and practiced yoga regularly showed a non-significant five-year decrease in their BMI (-0.60 kg/m²; p=0.49), while those not practicing regularly had significant increases in their BMI (+1.37 kg/m²; p<0.01). Frequency of yoga was inversely associated with weight gain among both overweight and non-overweight young adults practicing yoga regularly.

Conclusions: Young adults of different body sizes practice yoga. Yoga was associated with less weight gain over time, particularly in overweight young adults. Practicing yoga on a regular basis may help with weight gain prevention.

Patwardhan AR. Aligning yoga with its evolving role in health care: Comments on yoga practice, policy, research. *J Prim Care Community Health.* 2017; 8(3):176-179p.

Abstract:

Evidence is accumulating that suggests that yoga has beneficial effects in mitigating the impact of certain diseases. As a result, efforts are being made to medicalize yoga and use it within integrative medicine as a therapy. However, there are substantial shortcomings in the practice, policy, and research of yoga that undermine its optimal use. Yoga as a modality functions within a context. Therefore, it is important to occasionally step back and examine the entirety of the context from a high vantage to assess whether the tactical and programmatic endeavors are aligned with the strategic intended purpose. This commentary discusses a few policy issues relevant to some key stakeholders. It suggests that yoga therapists need to calibrate their model of yoga by reducing emphasis on postures and increasing it on meditation and breathing exercises while catering to clients with chronic conditions. It recommends that yoga research should be more critical in evaluating yoga's fundamental tenets and use reductionist approach to do so. It proposes that autonomous regulators should extricate injury prone postures from the body of yoga practice for regulatory purposes, rather than regulate yoga summarily. It is suggested that payers should pay for yoga. However, they should use payment model as it is used for vaccination, instead of paying as it is done for physiotherapy. It concludes that yoga can help, but before it can help it needs help itself, and the various stakeholders need to reflect on the big picture so that they can collaborate on these improvements.

Sciarrino NA, DeLucia C, O'Brien K et al. Assessing the Effectiveness of Yoga as a Complementary and Alternative Treatment for Post-Traumatic Stress Disorder: A Review and Synthesis. *J Altern Complement Med.* 2017; doi: 10.1089/acm.2017.0036.

Abstract:

Objectives: Posttraumatic stress disorder (PTSD) is a debilitating condition that affects many who have experienced trauma. In addition to skills-focused treatments, exposure-based treatments, cognitive therapy, combination treatments, and EMDR, a number of alternative treatments for PTSD have emerged in recent years. The search for alternative treatments is justified based on the empirical observation that a large percentage of individuals fail to benefit optimally from existing treatments (e.g., between 30 and 60). Moreover, current studies often utilize stringent inclusion criteria (e.g., absence of comorbid disorders), raising the likelihood that results will not generalize to many individuals currently experiencing PTSD. The primary objective of the current paper was to explore the effects of one type of alternative treatment: yoga.

Design: A comprehensive review of the literature was conducted targeting research examining yoga postures and PTSD. Seven randomized controlled trials (RCTs) were identified and reviewed, and effect sizes were computed for the post-test assessments.

Results: Cohen's *d* for each study ranged (in absolute value) from a low of -0.06 to a high of 1.42 (average weighted *d* across studies was 0.48; 95% CI: 0.26, 0.69).

Conclusions: Putative mechanisms of action for the possible beneficial effects of yoga for PTSD-related symptomatology and clinical implications are discussed.

Sreedevi A, Unnikrishnan AG, Karimassery SR et al. Effect of yoga and peer support interventions on the quality of life of women with diabetes: Results of a randomized controlled trial. *Indian J Endocrinol Metab.* 2017; 21(4):524-30p.

Abstract:

Objective: This was an interventional study to understand the effect of two low-cost interventions; yoga and peer support on the quality of life (QOL) of women with type 2 diabetes.

Methodology: An open label parallel three-armed randomized control trial was conducted among 124 recruited women with diabetes for 3 months. Block randomization with a block length of six was carried out. In the yoga arm, sessions by an instructor, consisting of a group of postures coordinated with breathing were conducted for an hour, 2 days a week. In the peer support arm, each peer mentor after training visited 13-14 women with diabetes every week followed by a phone call. The meeting was about applying disease management plans in daily life. At the beginning and end of the study, QOL was assessed by the translated, validated World Health Organization QOL-BREF in four domains physical, psychological, social, and environmental domains.

Results: The majority (96%) of the study participants perceived the peer support and yoga intervention to be beneficial. Paired *t*-test revealed significant increases in the social and environmental domain in the peer group and in the environmental domain in the yoga group, though this disappeared in the between-group comparison perhaps due to poor glycemic control (hemoglobin A1c varied from 9.4 to 9.6) and the short duration of 3 months of the study.

Conclusion: Peer support and yoga improved perceptions of QOL though its impact on scores was not significant due to a short period of study among women with poor glycemic control.

Taylor SL, Giannitrapani KF, Yuan A et al. What patients and providers want to know about complementary and integrative health therapies. *J Altern Complement Med.* 2017; Jul 27. doi: 10.1089/acm.2017.0074.

Abstract:

Objectives: We conducted a quality improvement project to determine (1) what information providers and patients most wanted to learn about complementary and integrative health (CIH) therapies and (2) in what format they wanted to receive this information. The overall aim was to develop educational materials to facilitate the CIH therapy decision-making processes.

Design: We used mixed methods to iteratively pilot test and revise provider and patient educational materials on yoga and meditation. We conducted semistructured interviews with 11 medical providers and held seven focus groups and used feedback forms with 52 outpatients. We iteratively developed and tested three versions of both provider and patient materials. Activities were conducted at four Veterans Administration medical facilities (two large medical centers and two outpatient clinics).

Results: Patients want educational materials with clearly stated basic information about: (1) what mindfulness and yoga are, (2) what a yoga/meditation class entails and how classes can be modified to suit different abilities, (3) key benefits to health and wellness, and (4) how to find classes at the hospital/clinic. Diverse media (videos, handouts, pocket guides) appealed to different Veterans. Videos should depict patients speaking to patients and demonstrating the CIH therapy. Written materials should be one to three pages with colors, and images and messages targeting a variety of patients. Providers wanted a concise (one-page) sheet in black and white font with no images listing the scientific evidence for CIH therapies from high-impact journals, organized by either type of CIH or health condition to use during patient encounters, and including practical information about how to refer patients.

Conclusions: Providers and patients want to learn more about CIH therapies, but want the information in succinct, targeted formats. The information learned and materials developed in this study can be used by others to educate patients and providers on CIH therapies.

Telles S, Gupta RK, Yadav A et al. Hemisphere specific EEG related to alternate nostril yoga breathing. *BMC Res Notes.* 2017; 10(1):306.

Abstract:

Background: Previously, forced unilateral nostril breathing was associated with ipsilateral, or contralateral cerebral hemisphere changes, or no change. Hence it was inconclusive. The present study was conducted on 13 normal healthy participants to determine the effects of alternate nostril yoga breathing on (a) cerebral hemisphere asymmetry, and (b) changes in the standard EEG bands.

Methods: Participants were randomly allocated to three sessions (a) alternate nostril yoga breathing (ANYB), (b) breath awareness and (c) quiet sitting, on separate days. EEG was recorded from bilaterally symmetrical sites (FP1, FP2, C3, C4, O1 and O2). All sites were referenced to the ipsilateral ear lobe.

Results: There was no change in cerebral hemisphere symmetry. The relative power in the theta band was decreased during alternate nostril yoga breathing (ANYB) and the beta amplitude was lower after ANYB. During quiet sitting the relative power in the beta band

increased, while the amplitude of the alpha band reduced.

Conclusion: The results suggest that ANYB was associated with greater calmness, whereas quiet sitting without specific directions was associated with arousal. The results imply a possible use of ANYB for stress and anxiety reduction.

Verma A, Shete S, Kulkarni D et al. Effect of yoga practices on micronutrient absorption in urban residential school children. *J Phys Ther Sci.* 2017; 29(7):1254-58p.

Abstract:

[Purpose] This study was conducted with a view to find out the effect of yoga practices on micronutrient absorption in urban residential school children. [Subjects and Methods] The study population comprised 66 urban school children aged 11-15 years staying in a residential school in Pune City, Maharashtra, India. A stratified random sampling method was used to divide the students into experimental and control groups. There were 33 students in experimental group and 33 students in control group. Both experimental and control groups were assessed for the status of zinc, copper, iron and magnesium at the baseline and at the end of 12 weeks of yoga training. The study participants of experimental group underwent yoga training for 12 weeks, for one hour in the morning for six days a week. The control group did not undergo any yoga training during this time period. [Results] The experimental group participants showed significant improvement in micronutrient absorption as compared to control group. [Conclusion] The findings of this study indicate that yoga practices could improve micronutrient absorption in urban residential school children.