BIBLIOGRAPHY

Abu-Ouf, N. M., & Jan, M. M. (2015). The impact of maternal iron deficiency and iron deficiency anemia on child's health. *Saudi medical journal*, *36*(2), 146.

Acosta, K. (2019). Seeing the Whole Picture: India's Triple Burden of Malnutrition. *Gates Open Res*, *3*(171), 171.

Acosta, K. (2019). Seeing the Whole Picture: India's Triple Burden of Malnutrition. *Gates Open Res*, *3*(171), 171.

Adeola, O. L., Agudosi, G. M., Akueme, N. T., Okobi, O. E., Akinyemi, F. B., Ononiwu, U. O., ... & Okeaya-Inneh, M. (2023). The Effectiveness of Nutritional Strategies in the Treatment and Management of Obesity: A Systematic Review. *Cureus*, *15*(9).

Agnihotri, V., & Rana, S. (2021). Horse gram an underutilized legume: a potential source of nutraceuticals. *Sustainable Agriculture Reviews 51: Legume Agriculture and Biotechnology Vol 2*, 29-50.

Ahmad, N., Adam, S. I. M., Nawi, A. M., Hassan, M. R., & Ghazi, H. F. (2016). Abdominal obesity indicators: waist circumference or waist-to-hip ratio in Malaysian adults population. *International journal of preventive medicine*, *7*.

Ahmed, K. Y., Rwabilimbo, A. G., Abrha, S., Page, A., Arora, A., Tadese, F, Global Maternal and Child Health Research collaboration (GloMACH). (2020). Factors associated with underweight, overweight, and obesity in reproductive age Tanzanian women. *PloS one*, *15*(8), e0237720.

Ahmed, M. H., Vasas, D., Hassan, A., & Molnár, J. (2022). The impact of functional food in prevention of malnutrition. *PharmaNutrition*, *19*, 100288.

Akkad, R., Buchko, A., Johnston, S. P., Han, J., House, J. D., & Curtis, J. M. (2021). Sprouting improves the flavour quality of faba bean flours. Food chemistry, 364, 130355.

Al Ahdab, S. (2021). A cross-sectional survey of knowledge, attitude and practice (KAP) towards COVID-19 pandemic among the Syrian residents. *BMC public health*, *21*, 1-7.

Al Hassan, N. N. (2015). The prevalence of iron deficiency anemia in a Saudi University female students. *Journal of microscopy and ultrastructure*, *3*(1), 25-28.

Al Kibria, G. M., Swasey, K., Hasan, M. Z., Sharmeen, A., & Day, B. (2019). Prevalence and factors associated with underweight, overweight and obesity among women of reproductive age in India. *Global health research and policy*, *4*, 1-12.

Al-Alimi, A. A., Bashanfer, S., & Morish, M. A. (2018). Prevalence of iron deficiency anemia among university students in Hodeida Province, Yemen. *Anemia*, *2018*.

Alaunyte, I., Stojceska, V., & Plunkett, A. (2015). Iron and the female athlete: a review of dietary treatment methods for improving iron status and exercise performance. *Journal of the international society of sports nutrition*, *12*(1), 38.

Ali, S. A., Ali, S. A., Razzaq, S., Tikmani, S. S., Allana, A., Rizvi, N., & Saleem, S. (2020). Determinants of under-nutrition among women of reproductive age in Sindh, Pakistan: Findings from Pakistan Demographic and Health Survey, 2012-2013. *Population medicine*, *2*(August).

Alkerwi, A. A., Vernier, C., Sauvageot, N., Crichton, G. E., & Elias, M. F. (2015). Demographic and socioeconomic disparity in nutrition: application of a novel Correlated Component Regression approach. *BMJ open*, *5*(5), e006814.

Al-Naseem, A., Sallam, A., Choudhury, S., & Thachil, J. (2021). Iron deficiency without anaemia: a diagnosis that matters. *Clinical Medicine*, *21*(2), 107-113.

Alshwaiyat, N. M., Ahmad, A., Wan Hassan, W. M. R., & Al-Jamal, H. A. N. (2021). Association between obesity and iron deficiency. *Experimental and Therapeutic Medicine*, *22*(5), 1-7.

Amarya, S., Singh, K., & Sabharwal, M. (2015). Changes during aging and their association with malnutrition. *Journal of Clinical Gerontology and Geriatrics*, *6*(3), 78-84.

American Psychological Association. (2018). Children, youth, families and socioeconomic status. *APA Fact Sheet*.

Amoore, B. Y., Gaa, P. K., Amalba, A., & Mogre, V. (2023). Nutrition education intervention improves medical students' dietary habits and their competency and self-efficacy in providing nutrition care: A pre, post and follow-up quasi-experimental study. *Frontiers in Nutrition*, *10*, 1063316.

Andriani, H., Friska, E., Arsyi, M., Sutrisno, A. E., Waits, A., & Rahmawati, N. D. (2023). A Multilevel Analysis of the Triple Burden of Malnutrition in Indonesia: Trends and Determinants From Repeated Cross-Sectional Surveys.

Anitha, S., Givens, D. I., Botha, R., Kane-Potaka, J., Sulaiman, N. L. B., Tsusaka, T. W., ... & Bhandari, R. K. (2021). Calcium from finger millet—a systematic review and

meta-analysis on calcium retention, bone resorption, and in vitro bioavailability. *Sustainability*, *13*(16), 8677.

Arango-Angarita, A., Rodríguez-Ramírez, S., Serra-Majem, L., & Shamah-Levy, T. (2018). Dietary energy density and its association with overweight or obesity in adolescents: a systematic review of observational studies. *Nutrients*, *10*(11), 1612.

Arcanjo, F. P. N., Vellozo, E. P., Passos, M. A. Z., Santos, M. D. D., Sousa, F. J. D. S., Arcanjo, C. C., & Vitalle, M. S. D. S. (2021). Iron Deficiency Anemia and Learning Capacity in Children.

Ares, G., & Vidal, L. (2020). Measuring liking for food and drink. *Handbook of Eating and Drinking: Interdisciplinary Perspectives*, 235-256.

Arif, M., Gaur, D. K., Gemini, N., Iqbal, Z. A., & Alghadir, A. H. (2022, December). Correlation of Percentage Body Fat, Waist Circumference and Waist-to-Hip Ratio with Abdominal Muscle Strength. In *Healthcare* (Vol. 10, No. 12, p. 2467). MDPI.

Banerjee, P., Maitra, S., & Banerjee, P. (2020). The role of small millets as functional food to combat malnutrition in developing countries. *Indian Journal of Natural Sciences*, *10*(60), 20412-20417.

Barrea, L., Annunziata, G., Bordoni, L., Muscogiuri, G., Colao, A., & Savastano, S. (2020). Nutrigenetics—personalized nutrition in obesity and cardiovascular diseases. *International Journal of Obesity Supplements*, *10*(1), 1-13.

Berger, M. M., & Manzanares, W. (2021). Micronutrients early in critical illness, selective or generous, enteral or intravenous?. *Current Opinion in Clinical Nutrition & Metabolic Care*, *24*(2), 165-175.

Beto, J. A. (2015). The role of calcium in human aging. *Clinical nutrition research*, *4*(1), 1-8.

Bhadra, P., & Deb, A. (2020). A review on nutritional anemia. *Indian Journal of Natural Sciences*, *10*(59), 18466-18474.

Bhandari, P., Gayawan, E., & Yadav, S. (2021). Double burden of underweight and overweight among Indian adults: spatial patterns and social determinants. *Public Health Nutrition*, *24*(10), 2808-2822.

Biswas, T., Townsend, N., Magalhaes, R., Hasan, M. M., & Al Mamun, A. (2022). Geographical and socioeconomic inequalities in the double burden of malnutrition among women in Southeast Asia: A population-based study. *The Lancet Regional Health-Southeast Asia*, *1*.

Boncompagni, E., Orozco-Arroyo, G., Cominelli, E., Gangashetty, P. I., Grando, S., Kwaku Zu, T. T., ... & Sparvoli, F. (2018). Antinutritional factors in pearl millet grains: Phytate and goitrogens content variability and molecular characterization of genes involved in their pathways. *PloS one*, *13*(6), e0198394.

Borgan, S. M., Khan, L. Z., & Makin, V. (2022). Hypercalcemia and vitamin A: a vitamin to keep in mind. *Cleveland Clinic journal of medicine*, *89*(2), 99-105.

Bower, C., Elliott, E. J., Zimmet, M., Doorey, J., Wilkins, A., Russell, V & Watkins, R. (2017). Australian guide to the diagnosis of foetal alcohol spectrum disorder: a summary. *Journal of Paediatrics and Child Health*, *53*(10), 1021.

Branco, B. H. M., Bernuci, M. P., Marques, D. C., Carvalho, I. Z., Barrero, C. A. L., De Oliveira, F. M.& Júnior, N. N. (2018). Proposal of a normative table for body fat percentages of Brazilian young adults through bioimpedanciometry. *Journal of exercise rehabilitation*, *14*(6), 974.

Bromage, S., Ahmed, T., & Fawzi, W. W. (2016). Calcium deficiency in Bangladesh: burden and proposed solutions for the first 1000 days. *Food and nutrition bulletin*, *37*(4), 475-493.

Brown, V., Barr, A., Scheurer, J., Magnus, A., Zapata-Diomedi, B., & Bentley, R. (2019). Better transport accessibility, better health: a health economic impact assessment study for Melbourne, Australia. *International journal of behavioral nutrition and physical activity*, *16*, 1-10.

Budzyński, J., & Szukay, B. (2022). BMI as a biomarker in patients' nutritional assessment. In *Biomarkers in nutrition* (pp. 1-35). Cham: Springer International Publishing.

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., ... & Willumsen, J. F. (2020). World Health Organization 2020 guidelines on physical activity and sedentary behaviour. *British journal of sports medicine*, *54*(24), 1451-1462.

Burns, C. L., Wishart, L. R., Kularatna, S., & Ward, E. C. (2020). Knowing the costs of change: an introduction to health economic analyses and considerations for their use in implementation research. *Speech, Language and Hearing*, *23*(1), 30-36.

Buyuktuncer, Z., Ayaz, A., Dedebayraktar, D., Inan-Eroglu, E., Ellahi, B., & Besler, H. T. (2018). Promoting a healthy diet in young adults: the role of nutrition labelling. *Nutrients*, *10*(10), 1335.

Byrd-Bredbenner, C., Wu, F., Spaccarotella, K., Quick, V., Martin-Biggers, J., & Zhang, Y. (2017). Systematic review of control groups in nutrition education intervention

research. *International Journal of Behavioral Nutrition and Physical Activity*, *14*(1), 1-26.

Cameron, A. J., Magliano, D. J., Shaw, J. E., Zimmet, P. Z., Carstensen, B., Alberti, K. G. M., & Söderberg, S. (2015). The influence of hip circumference on the relationship between abdominal obesity and mortality. *International journal of epidemiology*, *41*(2), 484-494.

Cameron, N. (2022). The measurement of human growth. In *Human growth and development* (pp. 317-345). Academic Press.

Casgrain, A., Collings, R., Harvey, L. J., Hooper, L., & Fairweather-Tait, S. J. (2012). Effect of iron intake on iron status: a systematic review and meta-analysis of randomized controlled trials. *The American journal of clinical nutrition*, *96*(4), 768-780.

Cashman, K. (2002). Calcium intake, calcium bioavailability and bone health. *British journal of Nutrition*, *87*(S2), S169-S177

Castell, G. S., Serra-Majem, L., & Ribas-Barba, L. (2015). What and how much do we eat? 24-hour dietary recall method. *Nutricion hospitalaria*, *31*(3), 46-48.

Castell, G. S., Serra-Majem, L., & Ribas-Barba, L. (2015). What and how much do we eat? 24-hour dietary recall method. *Nutricion hospitalaria*, *31*(3), 46-48.

Cawley, S., Mullaney, L., McKeating, A., Farren, M., McCartney, D., & Turner, M. J. (2016). An analysis of folic acid supplementation in women presenting for antenatal care. *Journal of Public Health*, *38*(1), 122-129.

Chakravorty, S. (2023). Data analysis of malnutrition in India: a review of numerous factors. *International Journal of Community Medicine and Public Health*, *10*(7), 2629.

Chao, A. M., Quigley, K. M., & Wadden, T. A. (2021). Dietary interventions for obesity: clinical and mechanistic findings. *The Journal of clinical investigation*, *131*(1).

Cheah, K., & Illsley, A. (2020). What you need to know about malnutrition in older adults. *British Journal of Hospital Medicine*, *81*(9), 1-8.

Chen, M., Chen, Q., Liu, W., Tong, H., & Wu, Y. (2022). The effectiveness of diet intervention in improving the metabolism of overweight and obese women: a systematic review and meta-analysis. *American Journal of Translational Research*, *14*(5), 2926.

Chen, Y., Fan, Z., Yang, Y., & Gu, C. (2019). Iron metabolism and its contribution to cancer. *International journal of oncology*, *54*(4), 1143-1154.

Chilot, D., Belay, D. G., Merid, M. W., Kibret, A. A., Alem, A. Z., Asratie, M. H.& Aragaw, F. M. (2023). Triple burden of malnutrition among mother–child pairs in low-income and middle-income countries: a cross-sectional study. *BMJ open*, *13*(5), e070978.

Chitayat, D., Matsui, D., Amitai, Y., Kennedy, D., Vohra, S., Rieder, M., & Koren, G. (2016). Folic acid supplementation for pregnant women and those planning pregnancy: 2015 update. *The Journal of Clinical Pharmacology*, *56*(2), 170-175.

Cohen, E., Bernard, J. Y., Ponty, A., Ndao, A., Amougou, N., Saïd-Mohamed, R., & Pasquet, P. (2015). Development and validation of the body size scale for assessing body weight perception in African populations. *PloS one*, *10*(11), e0138983.

Craven, D. L., Lovell, G. P., Pelly, F. E., & Isenring, E. (2018). Community-living older adults' perceptions of body weight, signs of malnutrition and sources of information: a descriptive analysis of survey data. *The Journal of nutrition, health and aging*, *22*(3), 393-399.

Cutter, S. L. (2017). The forgotten casualties redux: Women, children, and disaster risk. *Global environmental change*, *42*, 117-121.

D'ambrosio, T., Amodio, M. L., Pastore, D., De Santis, G., & Colelli, G. (2017). Chemical, physical and sensorial characterization of fresh quinoa sprouts (Chenopodium quinoa Willd.) and effects of modified atmosphere packaging on quality during cold storage. *Food Packaging and Shelf Life*, *14*, 52-58.

da Silva Lopes, K., Ota, E., Shakya, P., Dagvadorj, A., Balogun, O. O., Peña-Rosas, J. P., ... & Mori, R. (2017). Effects of nutrition interventions during pregnancy on low birth weight: an overview of systematic reviews. *BMJ global health*, *2*(3), e000389.

Daphnee, D. K., John, S., Rajalakshmi, P., Vaidya, A., Khakhar, A., Bhuvaneshwari, S., & Ramamurthy, A. (2018). Customized nutrition intervention and personalized counseling helps achieve nutrition targets in perioperative liver transplant patients. *Clinical nutrition ESPEN*, *23*, 200-204.

Darling, A. M., Fawzi, W. W., Barik, A., Chowdhury, A., & Rai, R. K. (2020). Double burden of malnutrition among adolescents in rural West Bengal, India. *Nutrition*, *79*, 110809.

Darsini, D., Hamidah, H., Notobroto, H. B., & Cahyono, E. A. (2020). Health risks associated with high waist circumference: A systematic review. *Journal of public health research*, *9*(2), jphr-2020.

Das, S., Mitra, K., & Mandal, M. (2016). Sample size calculation: Basic principles. *Indian Journal of Anaesthesia*, *60*(9), 652.

Dayakar Rao, B., Bhaskarachary, K., Arlene Christina, G. D., Sudha Devi, G., Vilas, A. T., & Tonapi, A. (2017). Nutritional and health benefits of millets. *ICAR_Indian Institute of Millets Research (IIMR) Rajendranagar, Hyderabad*, *2*.

de Camargo, A. C., Favero, B. T., Morzelle, M. C., Franchin, M., Alvarez-Parrilla, E., de la Rosa, L. A., ... & Schwember, A. R. (2019). Is chickpea a potential substitute for soybean? Phenolic bioactives and potential health benefits. *International journal of molecular sciences*, *20*(11), 2644.

de Santana, K. V. D. S., Oliver, S. L., Mendes, M. M., Lanham-New, S., Charlton, K. E., & Ribeiro, H. (2022). Association between vitamin D status and lifestyle factors in Brazilian women: Implications of Sun Exposure Levels, Diet, and Health. *EClinicalMedicine*, *47*.

Debnath, S., Mondal, N., & Sen, J. (2019). Double burden of malnutrition among adolescents in India.

Desyibelew, H. D., & Dadi, A. F. (2019). Burden and determinants of malnutrition among pregnant women in Africa: A systematic review and meta-analysis. *PloS one*, *14*(9), e0221712.

Dhandevi, P. E. M., & Jeewon, R. (2015). Fruit and vegetable intake: Benefits and progress of nutrition education interventions-narrative review article. *Iranian journal of public health*, *44*(10), 1309.

Di Cairano, M., Tolve, R., Cela, N., Sportiello, L., Scarpa, T., & Galgano, F. (2022). Functional cereal-based bakery products, breakfast cereals, and pasta products. In *Functional Cereals and Cereal Foods: Properties, Functionality and Applications* (pp. 215-249). Cham: Springer International Publishing.

Dietz, W., & Santos-Burgoa, C. (2020). Obesity and its implications for COVID-19 mortality. *Obesity*, *28*(6), 1005.

Divekar, M. T., Karunakaran, C., Lahlali, R., Kumar, S., Chelladurai, V., Liu, X & Jayas, D. S. (2017). Effect of microwave treatment on the cooking and macronutrient qualities of pulses. *International Journal of Food Properties*, *20*(2), 409-422.

Doley, J., & Marian, M. J. (Eds.). (2022). *Adult malnutrition: Diagnosis and treatment*. CRC Press.

Dutta, S. (2024). Double Burden of Malnutrition and Other Associated Factors among Reproductive Age Group Women in Assam, India. *Indian Journal of Science and Technology*, *17*(26), 2719-2726.

Elizabeth, K. E. (2019). Nutrition and malnutrition. *The Encyclopedia of Child and Adolescent Development*, 1-18.

Fauza, G., Muhammad, D. R. A., Affandi, D. R., & Ariviani, S. (2021, July). Sensory profile analysis of steamed brownies using Quantitative Descriptive Analysis (QDA). In *IOP Conference Series: Earth and Environmental Science* (Vol. 828, No. 1, p. 012058). IOP Publishing.

Festin, K., Thomas, K., Ekberg, J., & Kristenson, M. (2017). Choice of measure matters: A study of the relationship between socioeconomic status and psychosocial resources in a middle-aged normal population. *PLoS One*, *12*(8), e0178929.

Gadekar, T., Dudeja, P., Basu, I., Vashisht, S., & Mukherji, S. (2020). Correlation of visceral body fat with waist–hip ratio, waist circumference and body mass index in healthy adults: A cross sectional study. *Medical Journal Armed Forces India*, *76*(1), 41-46.

Gawande, K., Jha, N., Bhadoria, A. S., Saxena, G., & Yadav, S. (2021). Micro-nutrient deficiencies among children in India. *Journal of Medical Evidence*, *2*(2), 134-139.

Godswill, A. G., Somtochukwu, I. V., Ikechukwu, A. O., & Kate, E. C. (2020). Health benefits of micronutrients (vitamins and minerals) and their associated deficiency diseases: A systematic review. *International Journal of Food Sciences*, *3*(1), 1-32.

Gonmei, Z., & Toteja, G. S. (2018). Micronutrient status of Indian population. *Indian Journal of Medical Research*, *148*(5), 511-521.

Gorain, S. C. (2023). Impact of population education on population explosion: An Indian perspective. *International Journal of Research Publication and Reviews*, *4*(2), 1213-1218.

Gore, R. H., Khan, T. N., & Nerlekar, J. P. (2020). Efficacy of iron rich Bajra chiwada on haemoglobin content of adolescent girls.

Gosadi, I. M., Alatar, A. A., Otayf, M. M., AlJahani, D. M., Ghabbani, H. M., AlRajban, W. A., & Al-Nasser, K. A. (2017). Development of a Saudi Food Frequency Questionnaire and testing its reliability and validity. *Saudi medical journal*, *38*(6), 636.

Gu, J., Bk, A., Wu, H., Lu, P., Nawaz, M. A., Barrow, C. J. & Suleria, H. A. R. (2023). Impact of processing and storage on protein digestibility and bioavailability of legumes. *Food Reviews International*, *39*(7), 4697-4724.

Gupta, D. (2020). Seasonal migration and everyday lives of children of salt workers from little rann of Kutch, Gujarat. *IASSI-Quarterly*, *39*(3), 482-497.

Gupta, R. K., Gupta, K., Sharma, A., Das, M., Ansari, I. A., & Dwivedi, P. D. (2017). Health risks and benefits of chickpea (Cicer arietinum) consumption. *Journal of agricultural and food chemistry*, *65*(1), 6-22.

Habib, M. A., Alam, M. R., Rahman, T., Chowdhury, A. I., & Shill, L. C. (2023). Knowledge, attitudes, and practices (KAP) of nutrition among school teachers in Bangladesh: A cross-sectional study. *Plos one*, *18*(3), e0283530.

Hadiyati, F., Supriastuti, R., & Mujiharti, A. (2021). The Effect of Dietary Modification and Nutritional Education on Nutrition Care Process (NCP) for Increasing Dietary Intake, Body Weight, and Nutritional Status of Cancer Patients at Risk of Malnutrition and Malnourished in the Inpatient of Dharmais Cancer. *Indonesian Journal of Cancer*, *15*(2), 69-77.

Hall, C., Hillen, C., & Garden Robinson, J. (2017). Composition, nutritional value, and health benefits of pulses. *Cereal Chemistry*, *94*(1), 11-31.

Hall, K. D., Farooqi, I. S., Friedman, J. M., Klein, S., Loos, R. J., Mangelsdorf, D. J& Tobias, D. K. (2022). The energy balance model of obesity: beyond calories in, calories out. *The American journal of clinical nutrition*, *115*(5), 1243-1254.

Hara, K. (2020). Waist to hip ratio. *Encyclopedia of behavioral medicine*, 2326-2327.

Harisha, R. P., & Ravikanth, G. (2021). Dependency and Economic Benefits of Use of Wild Food Plants use among Tribal Communities in Malai Madeshawara Hills Wildlife Sanctuary, Southern India. *Future of Food: Journal on Food, Agriculture and Society*, *9*(2).

Hasan, M. M., Ahmed, S., Soares Magalhaes, R. J., Fatima, Y., Biswas, T., & Mamun, A. A. (2022). Double burden of malnutrition among women of reproductive age in 55 low-and middle-income countries: progress achieved and opportunities for meeting the global target. *European journal of clinical nutrition*, *76*(2), 277-287.

Henderson, K., & Loreau, M. (2023). A model of Sustainable Development Goals: Challenges and opportunities in promoting human well-being and environmental sustainability. *Ecological Modelling*, *475*, 110164.

Hoppe, M., Brün, B., Larsson, M. P., Moraeus, L., & Hulthén, L. (2013). Heme iron-based dietary intervention for improvement of iron status in young women. *Nutrition*, *29*(1), 89-95.

Hummell, A. C., & Cummings, M. (2022). Role of the nutrition-focused physical examination in identifying malnutrition and its effectiveness. *Nutrition in Clinical Practice*, *37*(1), 41-49.

Ilhan, C. (2022). Serum levels of thyroid hormone, vitamin B12, vitamin D3, folic acid, and ferritin in chalazion. *Ocular Immunology and Inflammation*, *30*(4), 776-780.

Irfan, M., Hao, Y., Panjwani, M. K., Khan, D., Chandio, A. A., & Li, H. (2020). Competitive assessment of South Asia's wind power industry: SWOT analysis and value chain combined model. *Energy Strategy Reviews*, *32*, 100540.

Issahaku, I., & Alhassan, M. (2021). Nutrition knowledge, dietary practices and nutritional status of non-academic staff at the Tamale campus of University for Development Studies. *Heliyon*, *7*(4).

Jagati, P., Mahapatra, I., & Dash, D. (2021). Finger millet (Ragi) as an essential dietary supplement with key health benefits: a review. *International Journal of Home Science*, *7*(2), 94-100.

Jamale, S., Sahoo, A., Patil, S., & Jamdar, J. (2022). Formulation of ragi and whole wheat flour supplemented Nutri cookies.

Jayawardena, R., Jeyakumar, D. T., Gamage, M., Sooriyaarachchi, P., & Hills, A. P. (2020). Fruit and vegetable consumption among South Asians: A systematic review and meta-analysis. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *14*(6), 1791-1800.

Jeong, J. Y., Kim, D. H., Kim, K. Y., Ryu, S. Y., Lee, S. Y., & Park, Y. S. (2017). Accuracy of self-reported height, weight and body mass index in Community Health Survey in South Korea. *Journal of Health Informatics and Statistics*, *42*(3), 241-249.

Jha, A. B., Ashokkumar, K., Diapari, M., Ambrose, S. J., Zhang, H., Tar'an, B & Purves, R. W. (2015). Genetic diversity of folate profiles in seeds of common bean, lentil, chickpea and pea. *Journal of food composition and analysis*, *42*, 134-140.

John, A., Navya, C. J., & Joshy, V. M. (2020). Nutritional Assessment Using 24 Hour Dietary Recall Method, Anthropometry and Clinical Assessment among Young Adults Studying in a Private Medical College, Thrissur, Kerala. *Indian Journal of Public Health Research & Development*, *11*(7), 117-121.

Jumrani, J., & Rai, V. N. (2020). The unacceptable status quo: Malnutrition challenges of the developed and developing world. In *Wheat and Barley Grain Biofortification* (pp. 1-25). Woodhead Publishing.

Kamruzzaman, M. (2021). Is BMI associated with anemia and hemoglobin level of women and children in Bangladesh: A study with multiple statistical approaches. *PLoS One*, *16*(10), e0259116.

Kan, J., Ni, J., Xue, K., Wang, F., Zheng, J., Cheng, J & Du, J. (2022). Personalized nutrition intervention improves health status in overweight/obese chinese adults: a randomized controlled trial. *Frontiers in Nutrition*, *9*, 919882.

Kapil, U., & Bhadoria, A. S. (2014). National Iron-plus initiative guidelines for control of iron deficiency anaemia in India, 2013. *Natl Med J India*, *27*(1), 27-9.

Karbasi, S., Asadi, Z., Mohaghegh, Z., Saeedi, F., Ferns, G. A., & Bahrami, A. (2023). The relationship between dietary patterns and insomnia in young women. *Neuropsychopharmacology Reports*, *43*(2), 228-238.

Kaur, R., & Prasad, K. (2021). Technological, processing and nutritional aspects of chickpea (Cicer arietinum)-A review. *Trends in Food Science & Technology*, *109*, 448-463.

Kaur, S., Sharma, A., & Singh, H. J. (2015). Waist-related anthropometric measures: Simple and useful predictors of coronary heart disease in women. *National Journal of Physiology, Pharmacy and Pharmacology*, *5*(1), 60.

Kavyasri, S. J., & Vaijayanthi, P. (2022). Mcdonald's Entry into India. *Issue 2 Int'l JL Mgmt. & Human.*, *5*, 1346.

Keats, E. C., Das, J. K., Salam, R. A., Lassi, Z. S., Imdad, A., Black, R. E., & Bhutta, Z. A. (2021). Effective interventions to address maternal and child malnutrition: an update of the evidence. *The Lancet Child & Adolescent Health*, *5*(5), 367-384.

Khanna, D., Peltzer, C., Kahar, P., & Parmar, M. S. (2022). Body mass index (BMI): a screening tool analysis. *Cureus*, *14*(2).

Khosravinia, D., Shiraseb, F., Mirzababaei, A., Daneshzad, E., Jamili, S., Clark, C. C., & Mirzaei, K. (2022). The association of Carbohydrate Quality Index with cardiovascular disease risk factors among women with overweight and obesity: A cross-sectional study. *Frontiers in Nutrition*, *9*, 987190.

Köse, S., Sözlü, S., Bölükbaşi, H., Ünsal, N., & Gezmen-Karadağ, M. (2019). Obesity is associated with folate metabolism. *International Journal for Vitamin and Nutrition Research*.

Kozman, D., Mattox, S., & Singh, G. (2020). Serum folate of less than 7.0 ng/mL is a marker of malnutrition. *Laboratory Medicine*, *51*(5), 507-511.

Krishnan, R., & Meera, M. S. (2018). Pearl millet minerals: effect of processing on bioaccessibility. *Journal of food science and technology*, *55*, 3362-3372.

Kumar, A., Kaur, A., Gupta, K., Gat, Y., & Kumar, V. (2021). Assessment of germination time of finger millet for value addition in functional foods. *Current Science*, 406-413.

Kumar, N., Raghunathan, K., Quisumbing, A., Scott, S., Menon, P., Thai, G & WINGS study team. (2024). Women improving nutrition through self-help groups in India: Does nutrition information help? *Food Policy*, *128*, 102716.

Kumar, P., Chauhan, S., Patel, R., Srivastava, S., & Bansod, D. W. (2021). Prevalence and factors associated with triple burden of malnutrition among mother-child pairs in India: a study based on National Family Health Survey 2015–16. *BMC Public Health*, *21*, 1-12.

Kumar, P., Chauhan, S., Patel, R., Srivastava, S., & Bansod, D. W. (2021). Prevalence and factors associated with triple burden of malnutrition among mother-child pairs in India: a study based on National Family Health Survey 2015–16. *BMC Public Health*, *21*, 1-12.

Kumar, S. B., Arnipalli, S. R., Mehta, P., Carrau, S., & Ziouzenkova, O. (2022). Iron deficiency anemia: efficacy and limitations of nutritional and comprehensive mitigation strategies. *Nutrients*, *14*(14), 2976.

Kumari, V., Junuthula, S., & Mandapaka, M. R. T. (2023). Microgreens for Nutritional Security. Hyderabad: National Institute of Agricultural Extension Management (MANAGE)

Kupzyk, K. A., & Cohen, M. Z. (2015). Data validation and other strategies for data entry. *Western journal of nursing research*, *37*(4), 546-556.

Kushwaha, S., & Singh, U. Ragi (Finger Millet). *MILLETS: FORGOTTEN GRAINS REGAINING PROMINENCE*, 6.

Kutchi, I., Chellammal, P., & Akila, A. (2020). Maternal obesity and pregnancy outcome: in perspective of new Asian Indian guidelines. *The Journal of Obstetrics and Gynecology of India*, *70*, 138-144.

Kutikuppala, L. V., Kiran, A. S., & Suvvari, T. K. (2021). Knowledge, attitude, and practices toward the COVID-19 pandemic among the Indian general population: A cross-sectional survey. *Indian J Respir Care*, *10*(1), 88.

Lam, B. C. C., Koh, G. C. H., Chen, C., Wong, M. T. K., & Fallows, S. J. (2015). Comparison of body mass index (BMI), body adiposity index (BAI), waist circumference (WC), waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR) as predictors of cardiovascular disease risk factors in an adult population in Singapore. *PloS one*, *10*(4), e0122985.

Lawless, H. T., & Heymann, H. (2015). *Sensory evaluation of food: principles and practices*. Springer Science & Business Media.

Leonard, A. J., Chalmers, K. A., Collins, C. E., & Patterson, A. J. (2014). A study of the effects of latent iron deficiency on measures of cognition: a pilot randomised controlled trial of iron supplementation in young women. *Nutrients*, *6*(6), 2419-2435.

Li, L., Cuerden, M. S., Liu, B., Shariff, S., Jain, A. K., & Mazumdar, M. (2021). Three statistical approaches for assessment of intervention effects: a primer for practitioners. *Risk Management and Healthcare Policy*, 757-770.

Liew, S. C. (2016). Folic acid and diseases-supplement it or not?. *Revista da Associacao Medica Brasileira*, *62*, 90-100.

Lim, J., & Park, H. S. (2018). Trends in the prevalence of underweight, obesity, abdominal obesity and their related lifestyle factors in Korean young adults, 1998–2012. *Obesity research & clinical practice*, *12*(4), 358-364.

Lin, S. P., Fang, H. Y., & Li, M. C. (2023). Relationship between overweight and obesity and insufficient micronutrient intake: a nationwide study in Taiwan. *Journal of Nutritional Science*, *12*, e48.

Little, M., Humphries, S., Dodd, W., Patel, K., & Dewey, C. (2020). Socio-demographic patterning of the individual-level double burden of malnutrition in a rural population in South India: a cross-sectional study. *BMC Public Health*, *20*(1), 1-14.

Long, Q., Zhang, T., Chen, F., Wang, W., Chen, X., & Ma, M. (2021). Effectiveness of dietary interventions on weight outcomes in childhood: a systematic review meta-analysis of randomized controlled trials. *Translational Pediatrics*, *10*(4), 701.

Luhar, S., Timæus, I. M., Jones, R., Cunningham, S., Patel, S. A., Kinra, S., & Houben, R. (2020). Forecasting the prevalence of overweight and obesity in India to 2040. *PloS one*, *15*(2), e0229438.

Luna, P. (2022, May). Impact of Ingredients on Quality and Shelf Life of Gluten-Free Baked Brownies. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1024, No. 1, p. 012040). IOP Publishing.

MacKay, D., & Saylor, K. W. (2020). Four faces of fair subject selection. *The American Journal of Bioethics*, *20*(2), 5-19.

Madzorera, I., & Fawzi, W. (2020). Women empowerment is central to addressing the double burden of malnutrition. *EClinicalMedicine*, *20*.

MahalakshmiSangeetha, K., Ramaswamy, L., & Mathew, J. K. Nutrient Analysis and Shelf life Evaluation of Rice Flakes Incorporated Nutri Ball Formulated for Sports Persons.

Majumder, S. (2021). Socioeconomic status scales: Revised Kuppuswamy, BG Prasad, and Udai Pareekh's scale updated for 2021. *Journal of Family Medicine and Primary Care*, *10*(11), 3964.

Majumder, S. (2021). Socioeconomic status scales: Revised Kuppuswamy, BG Prasad, and Udai Pareekh's scale updated for 2021. *Journal of Family Medicine and Primary Care*, *10*(11), 3964-3967.

Majumder, S. (2021). Socioeconomic status scales: Revised Kuppuswamy, BG Prasad, and Udai Pareekh's scale updated for 2021. *Journal of Family Medicine and Primary Care*, *10*(11), 3964.

Manhas, J. (2017). Initial framework for website design and development. *International Journal of Information Technology*, *9*, 363-375.

Masih, J., Verbeke, W., Deutsch, J., Sharma, A., Sharma, A., Rajkumar, R., & Matharu, P. S. (2019). Big data study for gluten-free foods in India and USA using online reviews and social media.

Mason, J. B., & Margetts, B. M. (2017). Magic bullets vs community action: the trade-offs are real. *World Nutrition*, *8*(1), 5-25.

Mathew, J., & Joseph, M. K. (2022). International year of millets 2023: Millet promotion in India for food security. *Rajagiri Journal of Social Development*, *14*(2), 2-17.

Matikainen, N., Pekkarinen, T., Ryhänen, E. M., & Schalin-Jäntti, C. (2021). Physiology of calcium homeostasis: an overview. *Endocrinology and Metabolism Clinics*, *50*(4), 575-590.

Matthew Kadey, R. D. (2016). *Rocket Fuel: Power-Packed Food for Sports and Adventure*. VeloPress.

McCall, A. L., Lieb, D. C., Gianchandani, R., MacMaster, H., Maynard, G. A., Murad, M. H & Wiercioch, W. (2023). Management of individuals with diabetes at high risk for hypoglycemia: an endocrine society clinical practice guideline. *The Journal of Clinical Endocrinology & Metabolism*, *108*(3), 529-562.

Meenakshi, J. V. (2016). Trends and patterns in the triple burden of malnutrition in India. *Agricultural Economics*, *47*(S1), 115-134.

Melgar-Quiñonez, H. (2023). The Complex Relationship Between Food Insecurity and Malnutrition. In *Human Growth and Nutrition in Latin American and Caribbean Countries* (pp. 37-60). Cham: Springer International Publishing.

Menon, K. C., Skeaff, S. A., Thomson, C. D., Gray, A. R., Ferguson, E. L., Zodpey, S & Pandav, C. S. (2015). Concurrent micronutrient deficiencies are prevalent in nonpregnant rural and tribal women from central India. *Nutrition*, *27*(4), 496-502.

Meshram, I. I., Balakrishna, N., Sreeramakrishna, K., Rao, K. M., Kumar, R. H., Arlappa, N & Laxmaiah, A. (2016). Trends in nutritional status and nutrient intakes and correlates of overweight/obesity among rural adult women (≥ 18–60 years) in India: National Nutrition Monitoring Bureau (NNMB) national surveys. *Public Health Nutrition*, *19*(5), 767-776.

Mihafu, F. D., Issa, J. Y., & Kamiyango, M. W. (2020). Implication of sensory evaluation and quality assessment in food product development: A review. *Current Research in Nutrition and Food Science Journal*, *8*(3), 690-702.

Mishra, C. P. (2017). Malnutrition-free India: Dream or reality. *Indian Journal of Public Health*, *61*(3), 155-162.

Mishra, K., & Rampal, J. (2020). The COVID-19 pandemic and food insecurity: A viewpoint on India. *World Development*, *135*, 105068.

Mishra, K., & Rampal, J. (2020). The COVID-19 pandemic and food insecurity: A viewpoint on India. *World Development*, *135*, 105068.

Mlodzik-Czyzewska, M. A., Malinowska, A. M., & Chmurzynska, A. (2020). Low folate intake and serum levels are associated with higher body mass index and abdominal fat accumulation: a case control study. *Nutrition Journal*, *19*, 1-8.

Modi, B., Sheth, A., & Panchani, R. (2023). Decoding Malnutrition Trends in India: A Comprehensive Analysis Using National Family Health Survey Data for Informed Strategies and Interventions. *NMO Journal*, *17*(2), 68-71.

Mohite, B. V. (2011). Iron determination-a review of analytical methods. *Asian Journal of Research in Chemistry*, *4*(3), 348-361.

Mongraw-Chaffin, M., Beavers, D. P., & McClain, D. A. (2019). Hypoglycemic symptoms in the absence of diabetes: Pilot evidence of clinical hypoglycemia in young women. *Journal of clinical & translational endocrinology*, *18*, 100202.

Mora, T., & Lopez-Valcarcel, B. G. (2018). Breakfast choice: An experiment combining a nutritional training workshop targeting adolescents and the promotion of unhealthy products. *Health Economics*, *27*(2), 306-319.

Mukhamedzhanov, E., Tsitsurin, V., Zhakiyanova, Z., Akhmetova, B., & Tarjibayeva, S. (2023). The Effect of Nutrition Education on Nutritional Behavior, Academic and Sports Achievement and Attitudes. *International Journal of Education in Mathematics, Science and Technology*, *11*(2), 358-374.

Nangwasha, E. N. (2024). Understanding Anemia among Women of Reproductive Age and Children in Namibia: A Comprehensive Review. *Journal of Innovative Research*, *2*(1), 37-43.

Narayan, J., John, D., & Ramadas, N. (2019). Malnutrition in India: status and government initiatives. *Journal of public health policy*, *40*, 126-141.

Ngoma, C., & Mayimbo, S. (2017). The negative impact of poverty on the health of women and children. *Annals of Medical and Health Sciences Research*, *7*(6).

Nguyen, P. H., Scott, S., Headey, D., Singh, N., Tran, L. M., Menon, P., & Ruel, M. T. (2021). The double burden of malnutrition in India: Trends and inequalities (2006–2016). *Plos one*, *16*(2), e0247856.

Niharika, M., Sireesha, G., Madhavi, D., Bulah, A. M., & Vineela, P. P. DEVELOPMENT OF INSANT MUFFIN MIX ENRICHED WITH CALCIUM (CHICKEN EGG SHELL). *DEVELOPMENT*, *7*(05), 2020.

Nithya, D. J., & Bhavani, R. V. (2018). Dietary diversity and its relationship with nutritional status among adolescents and adults in rural India. *Journal of biosocial science*, *50*(3), 397-413.

Obeid, R., Oexle, K., Rißmann, A., Pietrzik, K., & Koletzko, B. (2016). Folate status and health: challenges and opportunities. *Journal of perinatal medicine*, *44*(3), 261-268.

Ohnishi, S. T. (1979). A method of estimating the amount of calcium bound to the metallochromic indicator arsenazo III. *Biochimica et Biophysica Acta (BBA)-General Subjects*, *586*(2), 217-230.

Orben, A., Tomova, L., & Blakemore, S. J. (2020). The effects of social deprivation on adolescent development and mental health. *The Lancet Child & Adolescent Health*, *4*(8), 634-640.

Ordovas, J. M., Ferguson, L. R., Tai, E. S., & Mathers, J. C. (2018). Personalised nutrition and health. *Bmj*, *361*.

Ordovas, J. M., Ferguson, L. R., Tai, E. S., & Mathers, J. C. (2018). Personalised nutrition and health. *Bmj*, *361*.

Osborn, A. J., Muhammad, G. M., Ravishankar, S. L., & Mathew, A. C. (2021). Prevalence and correlates of anemia among women in the reproductive age (15–49 years) in a rural area of Tamil Nadu: An exploratory study. *Journal of Education and Health Promotion*, *10*(1).

Owais, A., Merritt, C., Lee, C., & Bhutta, Z. A. (2021). Anemia among women of reproductive age: an overview of global burden, trends, determinants, and drivers of progress in low-and middle-income countries. *Nutrients*, *13*(8), 2745.

Panchal, P. D., Ravalia, A., Rana, R., Puthussery, S., Vaze, G., Mavlankar, D., & Menon, K. (2022). Impact of Nutrition Interventions for Reduction of Anemia in Women of Reproductive Age in Low-and Middle-Income Countries: A Meta-Review. *Current Developments in Nutrition*, *6*(12).

Patel, I., Patel, K., Pinto, S., & Patel, S. (2016). Ragi: a powerhouse of nutrients. *Res Rev J Dairy Sci Technol*, *5*, 36-47.

Patel, R., Srivastava, S., Kumar, P., & Chauhan, S. (2020). Factors associated with double burden of malnutrition among mother-child pairs in India: A study based on National Family Health Survey 2015–16. *Children and Youth Services Review*, *116*, 105256.

Péneau, S., Dauchet, L., Vergnaud, A. C., Estaquio, C., Kesse-Guyot, E., Bertrais, S. & Galan, P. (2018). Relationship between iron status and dietary fruit and vegetables based on their vitamin C and fiber content. *The American journal of clinical nutrition*, *87*(5), 1298-1305.

Pengpid, S., & Peltzer, K. (2019). Prevalence and correlates of underweight and overweight/obesity among women in India: results from the National Family Health Survey 2015–2016. *Diabetes, metabolic syndrome and obesity: targets and therapy*, 647-653.

Petersen, K. S., Kris-Etherton, P. M., McCabe, G. P., Raman, G., Miller, J. W., & Maki, K. C. (2021). Perspective: Planning and conducting statistical analyses for human nutrition randomized controlled trials: ensuring data quality and integrity. *Advances in Nutrition*, *12*(5), 1610-1624.

Phadke, M., Nair, R., Menon, P., & Singal, V. (2020). Evolution of anthropometry in malnutrition. *International Journal of Nutrition*, *4*(4), 25-35.

Pio Ávila, B., Cardozo, L. O., Alves, G. D., Gularte, M. A., Monks, J., & Elias, M. C. (2019). Consumers' sensory perception of food attributes: identifying the ideal formulation of gluten-and lactose-free brownie using sensory methodologies. *Journal of food science*, *84*(12), 3707-3716.

Piskin, E., Cianciosi, D., Gulec, S., Tomas, M., & Capanoglu, E. (2022). Iron absorption: factors, limitations, and improvement methods. *ACS omega*, *7*(24), 20441-20456.

Pramitha, J. L., Joel, A. J., Srinivas, S., Sreeja, R., Hossain, F., & Ravikesavan, R. (2020). Enumerating the phytic acid content in maize germplasm and formulation of

reference set to enhance the breeding for low phytic acid. *Physiology and molecular biology of plants*, *26*, 353-365.

Prasad, S. K., & Singh, M. K. (2015). Horse gram-an underutilized nutraceutical pulse crop: a review. *Journal of food science and technology*, *52*, 2489-2499.

Prasetyo, Y. B., Permatasari, P., & Susanti, H. D. (2023). The effect of mothers' nutritional education and knowledge on children's nutritional status: a systematic review. *International Journal of Child Care and Education Policy*, *17*(1), 11.

Prausmüller, S., Heitzinger, G., Pavo, N., Spinka, G., Goliasch, G., Arfsten, H & Bartko, P. E. (2022). Malnutrition outweighs the effect of the obesity paradox. *Journal of Cachexia, Sarcopenia and muscle*, *13*(3), 1477-1486.

Prentice, A. M. (2023). The triple burden of malnutrition in the era of globalization. *Intersections of Nutrition: Retracing Yesterday, Redefining Tomorrow*, *97*, 51-61.

Qu, Y., Lin, S., Zhuang, J., Bloom, M. S., Smith, M., Nie, Z & Liu, X. (2020). First-Trimester Maternal Folic Acid Supplementation Reduced Risks of Severe and Most Congenital Heart Diseases in Offspring: A Large Case-Control Study. *Journal of the American Heart Association*, *9*(13), e015652.

Rachwa-Rosiak, D., Nebesny, E., & Budryn, G. (2015). Chickpeas—composition, nutritional value, health benefits, application to bread and snacks: a review. *Critical reviews in food science and nutrition*, *55*(8), 1137-1145.

Raghunathan, K., Headey, D., & Herforth, A. (2021). Affordability of nutritious diets in rural India. *Food Policy*, *99*, 101982.

Rai, R. K., Fawzi, W. W., Barik, A., & Chowdhury, A. (2018). The burden of iron-deficiency anaemia among women in India: how have iron and folic acid interventions fared?. *WHO South-East Asia journal of public health*, *7*(1), 18-23.

Rajabi, H., Mirzahossein, H., Hosseinian, S. M., & Jin, X. (2024). Residential location choice: an investigation of transportation, public facilities, and social factors. *Computational Urban Science*, *4*(1), 2.

Rajwar, E., Parsekar, S. S., Venkatesh, B. T., & Sharma, Z. (2020). Effect of vitamin A, calcium and vitamin D fortification and supplementation on nutritional status of women: An overview of systematic reviews. *Systematic Reviews*, *9*, 1-11.

Rajwar, E., Parsekar, S. S., Venkatesh, B. T., & Sharma, Z. (2020). Effect of vitamin A, calcium and vitamin D fortification and supplementation on nutritional status of women: An overview of systematic reviews. *Systematic Reviews*, *9*(1), 1-11.

Ramasamy, S., Joseph, M., Jiwanmall, S. A., Kattula, D., Nandyal, M. B., Abraham, V& Kapoor, N. (2020). Obesity indicators and health-related quality of life–Insights from a cohort of morbidly obese, middle-aged South Indian Women. *European endocrinology*, *16*(2), 148.

Rao, G. P., & Singh, P. (2022). Value addition and fortification in non-centrifugal sugar (jaggery): A potential source of functional and nutraceutical foods. *Sugar Tech*, *24*(2), 387-396.

Rashidi, A. A., Bakavoli, A. R. H., Avan, A., Aghasizade, M., Ghazizadeh, H., Tayefi, M & Mobarhan, M. G. (2018). Dietary intake and its relationship to different body mass index categories: a population-based study. *Journal of research in health sciences*, *18*(4), e00426.

Reid, I. R., Bristow, S. M., & Bolland, M. J. (2015). Calcium supplements: benefits and risks. *Journal of internal medicine*, *278*(4), 354-368.

Riddle, A., Ramage, A., Kroeger, C. M., Bhutta, Z. A., Kristjansson, E., Taljaard, M & Wells, G. A. (2021). PROTOCOL: The effects of empowerment-based nutrition interventions on the nutritional status of women of reproductive age in low-and middle-income countries. *Campbell Systematic Reviews*, *17*(3), e1183.

Ritchie, H., & Roser, M. (2017). Micronutrient deficiency. *Our World in data*.

Ritchie, H., & Roser, M. (2024). Micronutrient deficiency. *Our World in data*.

Rosa-Sibakov, N., Re, M., Karsma, A., Laitila, A., & Nordlund, E. (2018). Phytic acid reduction by bioprocessing as a tool to improve the in vitro digestibility of faba bean protein. *Journal of Agricultural and Food Chemistry*, *66*(40), 10394-10399.

Ross, R., Neeland, I. J., Yamashita, S., Shai, I., Seidell, J., Magni, P & Després, J. P. (2020). Waist circumference as a vital sign in clinical practice: a Consensus Statement from the IAS and ICCR Working Group on Visceral Obesity. *Nature Reviews Endocrinology*, *16*(3), 177-189.

Rounsefell, K., Gibson, S., McLean, S., Blair, M., Molenaar, A., Brennan, L & McCaffrey, T. A. (2020). Social media, body image and food choices in healthy young adults: A mixed methods systematic review. *Nutrition & Dietetics*, *77*(1), 19-40.

Ruiz-Capillas, C., & Herrero, A. M. (2021). Sensory analysis and consumer research in new product development. *Foods*, *10*(3), 582.

Sahaya Rani, G., Swaminathan, A., & Vijayaraghavan, R. (2021). Effectiveness of Physical Activity and Finger Millet-Based Food Supplement on Biochemical Parameters and Bone Mineral Density among Premenopausal Women. *Evidence-Based Complementary and Alternative Medicine*, *2021*, 1-7.

Sayar, E. H., Orhaner, B. B., Sayar, E., NesrinTuran, F., & Küçük, M. (2020). The frequency of vitamin B12, iron, and folic acid deficiency in the neonatal period and infancy, and the relationship with maternal levels. *Turkish Archives of Pediatrics/Türk Pediatri Arşivi*, *55*(2), 139.

Schmidt, R. L. (2010). Impact of nutrition education on dietary habits of female high school students.

Selvakumaran, L., Shukri, R., Ramli, N. S., Dek, M. S. P., & Ibadullah, W. Z. W. (2019). Orange sweet potato (Ipomoea batatas) puree improved physicochemical properties and sensory acceptance of brownies. *Journal of the Saudi Society of Agricultural Sciences*, *18*(3), 332-336.

Sengupta, A., Angeli, F., Syamala, T. S., Dagnelie, P. C., & Van Schayck, C. P. (2015). Overweight and obesity prevalence among Indian women by place of residence and socio-economic status: contrasting patterns from 'underweight states' and 'overweight states' of India. *Social science & medicine*, *138*, 161-169.

Serbesa, M. L., Iffa, M. T., & Geleto, M. (2019). Factors associated with malnutrition among pregnant women and lactating mothers in Miesso Health Center, Ethiopia. *European Journal of Midwifery*, *3*.

Serón-Arbeloa, C., Labarta-Monzón, L., Puzo-Foncillas, J., Mallor-Bonet, T., Lafita-López, A., Bueno-Vidales, N., & Montoro-Huguet, M. (2022). Malnutrition screening and assessment. *Nutrients*, *14*(12), 2392.

Seth, P., & Jain, P. (2023). What are the Key Determinants of Child Malnutrition in India? Empirical Evidence from NFHS-4. *The Indian Economic Journal*, *71*(4), 729-747.

Sethi, V., de Wagt, A., Bhanot, A., Singh, K. D., Agarwal, P., Murira, Z. & Subramanian, S. V. (2020). Levels and determinants of malnutrition among India's urban poor women: An analysis of Demographic Health Surveys 2006 and 2016. *Maternal & Child Nutrition*, *16*(3), e12978.

Sewale, Y., & Zewudie, B. T. (2022). Overnutrition and its associated factors among adult human immunodeficiency virus positive patients on antiretroviral therapy, Northwest, Ethiopia. *African Health Sciences*, *22*(4), 452-460.

Shah, V. B., Shah, B. S., & Puranik, G. V. (2011). Evaluation of non cyanide methods for hemoglobin estimation. *Indian Journal of Pathology and Microbiology*, *54*(4), 764.

Shaikh, N. I., Frediani, J. K., Ramakrishnan, U., Patil, S. S., Yount, K. M., Martorell, R & Cunningham, S. A. (2017). Development and evaluation of a Nutrition Transition-FFQ for adolescents in South India. *Public health nutrition*, *20*(7), 1162-1172.

Sharan, P., & Sundar, A. S. (2015). Eating disorders in women. *Indian journal of psychiatry*, *57*(Suppl. 2), S286-S295.

Sharma, S., Akhtar, F., Singh, R. K., & Mehra, S. (2020). Dietary intake across reproductive life stages of women in India: a cross-sectional survey from 4 districts of India. *Journal of nutrition and metabolism*, *2020*.

Sheethal, H. V., Baruah, C., Subhash, K., Ananthan, R., & Longvah, T. (2022). Insights of nutritional and anti-nutritional retention in traditionally processed millets. *Frontiers in Sustainable Food Systems*, *5*, 735356.

Sheethal, H. V., Baruah, C., Subhash, K., Ananthan, R., & Longvah, T. (2022). Insights of nutritional and anti-nutritional retention in traditionally processed millets. *Frontiers in Sustainable Food Systems*, *5*, 735356.

Shenoy, S., Sharma, P., Rao, A., Aparna, N., Adenikinju, D., Iloegbu, C. & Peprah, E. (2023). Evidence-based interventions to reduce maternal malnutrition in low and middle-income countries: a systematic review. *Frontiers in Health Services*, *3*, 1155928.

Shlisky, J., Mandlik, R., Askari, S., Abrams, S., Belizan, J. M., Bourassa, M. W & Weaver, C. (2022). *Calcium deficiency worldwide: Prevalence of inadequate intakes and associated health outcomes* (Vol. 1512, No. 1, pp. 10-28).

Shlisky, J., Mandlik, R., Askari, S., Abrams, S., Belizan, J. M., Bourassa, M. W & Weaver, C. (2022). *Calcium deficiency worldwide: Prevalence of inadequate intakes and associated health outcomes* (Vol. 1512, No. 1, pp. 10-28).

Shukla, P., & Bhise, S. (2023). Mighty Millets: Bespoke for Multi Nutrients. *Current Journal of Applied Science and Technology*, *42*(32), 54-62.

Sibian, M. S., Saxena, D. C., & Riar, C. S. (2016). Effect of pre and post germination parameters on the chemical characteristics of Bengal gram (Cicer arietinum). *LWT-Food Science and Technology*, *65*, 783-790.

Siddiqui, M. Z., & Donato, R. (2017). Undernutrition among adults in India: the significance of individual-level and contextual factors impacting on the likelihood of underweight across sub-populations. *Public health nutrition*, *20*(1), 130-141.

Siddiqui, Md Zakaria, and Ronald Donato. "Undernutrition among adults in India: the significance of individual-level and contextual factors impacting on the likelihood of underweight across sub-populations." *Public health nutrition* 20, no. 1 (2017): 130-141.

Silva Neto, L. G. R., Santos Neto, J. E. D., Bueno, N. B., de Oliveira, S. L., & Ataide, T. D. R. (2019). Effects of iron supplementation versus dietary iron on the nutritional

iron status: Systematic review with meta-analysis of randomized controlled trials. *Critical reviews in food science and nutrition*, *59*(16), 2553-2561.

Singh, P. K., Anvikar, A., & Sinha, A. (2022). COVID-19 related knowledge, attitudes, and practices in Indian Population: An online national cross-sectional survey. *PloS one*, *17*(3), e0264752.

Singh, S., Geddam, J. J. B., Reddy, G. B., Pallepogula, D. R., Pant, H. B., Neogi, S. B & Murthy, G. V. S. (2017). Folate, vitamin B12, ferritin and haemoglobin levels among women of childbearing age from a rural district in South India. *BMC nutrition*, *3*, 1-9.

Singh, S., Geddam, J. J. B., Reddy, G. B., Pallepogula, D. R., Pant, H. B., Neogi, S. B.,& Murthy, G. V. S. (2017). Folate, vitamin B12, ferritin and haemoglobin levels among women of childbearing age from a rural district in South India. *BMC nutrition*, *3*(1), 1-9.

Skolmowska, D., & Głąbska, D. (2022). Effectiveness of Dietary Intervention with Iron and Vitamin C Administered Separately in Improving Iron Status in Young Women. *International Journal of Environmental Research and Public Health*, *19*(19), 11877.

Skolmowska, D., Głąbska, D., Kołota, A., & Guzek, D. (2022). Effectiveness of Dietary Interventions to Treat Iron-Deficiency Anemia in Women: A Systematic Review of Randomized Controlled Trials. *Nutrients*, *14*(13), 2724.

Sokolowski, C. M., Higgins, S., Vishwanathan, M., & Evans, E. M. (2020). The relationship between animal and plant protein intake and overall diet quality in young adults. *Clinical nutrition*, *39*(8), 2609-2616.

Song, J., Zhang, J., Fawzi, W., & Huang, Y. (2020). Double burden of malnutrition among Chinese women of reproductive age and their social determinants. *Nutrients*, *12*(10), 3102

Sood, P., Bindra, S., & Singh, P. (2023). Modified BG Prasad socioeconomic scale: 2022 update of India. *International Journal of Community Medicine and Public Health*, *10*(2), 821-3.

Sserwanja, Q., Mukunya, D., Kawuki, J., Mutisya, L. M., Musaba, M. W., Arinda, I. K & Ziaei, S. (2021). Over-nutrition and associated factors among 20 to 49-year-old women in Uganda: evidence from the 2016 Uganda demographic health survey. *Pan African Medical Journal*, *39*(1).

Stone, H., Bleibaum, R. N., & Thomas, H. A. (2020). *Sensory evaluation practices*. Academic press.

Sumarmi, S., Puspitasari, N., Handajani, R., & Wirjatmadi, B. (2016). Underweight as a risk factor for iron depletion and iron-deficient erythropoiesis among young women in rural areas of East Java, Indonesia. *Malaysian Journal of Nutrition*, *22*(2).

Swaminathan, S., Hemalatha, R., Pandey, A., Kassebaum, N. J., Laxmaiah, A., Longvah, T & Dandona, L. (2019). The burden of child and maternal malnutrition and trends in its indicators in the states of India: the Global Burden of Disease Study 1990–2017. *The Lancet Child & Adolescent Health*, *3*(12), 855-870.

Tang, A. M., Chung, M., Dong, K. R., Bahwere, P., Bose, K., Chakraborty, R & Maalouf-Manasseh, Z. (2020). Determining a global mid-upper arm circumference cut-off to assess underweight in adults (men and non-pregnant women). *Public Health Nutrition*, *23*(17), 3104-3113.

Tatsumi, Y., Higashiyama, A., Kubota, Y., Sugiyama, D., Nishida, Y., Hirata, T& Okamura, T. (2016). Underweight young women without later weight gain are at high risk for osteopenia after midlife: the KOBE study. *Journal of epidemiology*, *26*(11), 572-578.

Tektunalı Akman, C., Gönen Aydın, C., & Ersoy, G. (2024). The effect of nutrition education sessions on energy availability, body composition, eating attitude and sports nutrition knowledge in young female endurance athletes. *Frontiers in Public Health*, *12*, 1289448.

Thompson, F. E., Dixit-Joshi, S., Potischman, N., Dodd, K. W., Kirkpatrick, S. I., Kushi, L. H. & Subar, A. F. (2015). Comparison of interviewer-administered and automated self-administered 24-hour dietary recalls in 3 diverse integrated health systems. *American journal of epidemiology*, *181*(12), 970-978.

Tian, H., Zhou, W., Qiu, Y., & Zou, Z. (2022). The role of recreation specialization and self-efficacy on life satisfaction: the mediating effect of flow experience. *International Journal of Environmental Research and Public Health*, *19*(6), 3243.

Tijerina-Sáenz, A., Martínez-Garza, N. E., Ramírez-López, E., Solís-Pérez, E., & Martínez-Báez, A. Z. (2015). Iron status and dietary intakes of iron in normal-weight and obese young Mexican women. *Nutricion hospitalaria*, *31*(6), 2412-2418.

Tulchinsky, T. H. (2010). Micronutrient deficiency conditions: global health issues. *Public health reviews*, *32*, 243-255.

Vasanthakumari, P., Kumarakuru, K., & Yousuff, N. (2023). The Efficacy of Virtual-based Nutritional Interventions on Knowledge, Attitude, and Practices of Individuals with

Hypertension: A Comparative Study Analysis. *Journal of Mid-life Health*, *14*(3), 184-190.

Venkatrao, M., Nagarathna, R., Majumdar, V., Patil, S. S., Rathi, S., & Nagendra, H. (2020). Prevalence of obesity in India and its neurological implications: a multifactor analysis of a nationwide cross-sectional study. *Annals of Neurosciences*, *27*(3-4), 153-161.

Vijayakumar, A., Dubasi, H. B., Awasthi, A., & Jaacks, L. M. (2024). Development of an Indian Food Composition Database. *Current Developments in Nutrition*, 103790.

Vir, S. C. (2016). Improving women's nutrition imperative for rapid reduction of childhood stunting in South Asia: coupling of nutrition specific interventions with nutrition sensitive measures essential. *Maternal & child nutrition*, *12*, 72-90.

Vir, S. C., & Malik, R. (2015). Nutrition situation of women in India: current status, implications on child undernutrition and challenges ahead. *Stat Appl*, *13*(1-2), 71-84.

Wallace, T. C., Murray, R., & Zelman, K. M. (2016). The nutritional value and health benefits of chickpeas and hummus. *Nutrients*, *8*(12), 766.

Wang, D., Ma, C., Zou, Y., Yu, S., Li, H., Cheng, X & Xu, T. (2020). Gender and age-specific reference intervals of common biochemical analytes in Chinese population: Derivation using real laboratory data. *Journal of Medical Biochemistry*, *39*(3), 384.

Waters, L., George, A. S., Chey, T., & Bauman, A. (2012). Weight change in control group participants in behavioural weight loss interventions: a systematic review and meta-regression study. *BMC Medical Research Methodology*, *12*(1), 1-12.

Wells, J. C., Sawaya, A. L., Wibaek, R., Mwangome, M., Poullas, M. S., Yajnik, C. S., & Demaio, A. (2020). The double burden of malnutrition: aetiological pathways and consequences for health. *The Lancet*, *395*(10217), 75-88.

Wells, J. C., Wibaek, R., & Poullas, M. (2018). The dual burden of malnutrition increases the risk of cesarean delivery: evidence from India. *Frontiers in public health*, *6*, 292.

Wendt, A., Stephenson, R., Young, M., Webb-Girard, A., Hogue, C., Ramakrishnan, U., & Martorell, R. (2015). Individual and facility-level determinants of iron and folic acid receipt and adequate consumption among pregnant women in rural Bihar, India. *PloS one*, *10*(3), e0120404.

Widyasari, R. H. E., Nurdialy, M., & Fadhilah, J. (2022). Financial Feasibility Analysis of Product Modification Katuk and Spinach Brownies Tartlet as an Alternative

Breastfeeding Mother's Snack. In *E3S Web of Conferences* (Vol. 348, p. 00036). EDP Sciences.

Wolfe, R. R., Cifelli, A. M., Kostas, G., & Kim, I. Y. (2017). Optimizing protein intake in adults: interpretation and application of the recommended dietary allowance compared with the acceptable macronutrient distribution range. *Advances in Nutrition*, *8*(2), 266-275.

Yee, M. M. F., Chin, K. Y., Ima-Nirwana, S., & Wong, S. K. (2021). Vitamin A and bone health: a review on current evidence. *Molecules*, *26*(6), 1757.

Yingngam, B. (2024). Folic Acid Deficiency. In *Causes and Management of Nutritional Deficiency Disorders* (pp. 116-164). IGI Global.

Young, M. F., & Ramakrishnan, U. (2020). Maternal undernutrition before and during pregnancy and offspring health and development. *Annals of Nutrition and Metabolism*, *76*(3), 41-53.

Yousaf, M. A., Noreen, M., Saleem, T., & Yousaf, I. (2020). A cross-sectional survey of knowledge, attitude, and practices (KAP) toward pandemic COVID-19 among the general population of Jammu and Kashmir, India. *Social Work in Public Health*, *35*(7), 569-578.

Zaveri, A., Paul, P., Saha, J., Barman, B., & Chouhan, P. (2020). Maternal determinants of low birth weight among Indian children: Evidence from the National Family Health Survey-4, 2015-16. *PLoS One*, *15*(12), e0244562.

Zheng, L., Huang, J., Kong, H., Wang, F., Su, Y., & Xin, H. (2020). The effect of folic acid throughout pregnancy among pregnant women at high risk of pre-eclampsia: A randomized clinical trial. *Pregnancy hypertension*, *19*, 253-258.

Zheng, W., Li, W., Qi, H., Xiao, L., Sim, K., Ungvari, G. S & Xiang, Y. T. (2020). Adjunctive folate for major mental disorders: A systematic review. *Journal of affective disorders*, *267*, 123-130.

Zhu, Q., Huang, B., Li, Q., Huang, L., Shu, W., Xu, L & Liu, P. (2020). Body mass index and waist-to-hip ratio misclassification of overweight and obesity in Chinese military personnel. *Journal of physiological anthropology*, *39*(1), 1-12.

Zielińska, M., Łuszczki, E., & Dereń, K. (2023). Dietary nutrient deficiencies and risk of depression (Review Article 2018–2023). *Nutrients*, *15*(11), 243

ANNEXURE-I

CALICUT UNIVERSITY HUMAN ETHICAL COMMITTEE

University of Calicut, Malappuram - 673 635, Kerala, India

Ref. No:021/CUHEC/2023 **Date: 22.05.2023**

CERTIFICATE OF ETHICS CLEARANCE TO INVOLVE HUMAN PARTICIPANTS IN RESEARCH

CUEC Application no.: 021/CUHEC/2023-CU dated 01. 12. 2022

Protocol/ Project title/Ph.D topic: **"Situational Analysis of Triple Burden of Malnutrition and Impact of Personalized nutrition education on nutritional status of young adult women"**

Principal investigator/Research scholar: **Ms. Sai Gayathri H**

Name & Address of institution: Food Science & Nutrition, Avinashi lingam Institute for Home Science & Higher Education for Women, Coimbatore, Tamil Nadu 641043

✓ New review Revised review Expedited review

Date of review (D/M/Y): 22.05.2023

Decision of the CUEC:

✓ Recommended with suggestions Recommended

Revision Rejected

Suggestions/Reasons/Remarks (If any):

- Simplify the title of the research topic
- Classify socio economic profile and lifestyle pattern
- Include rural population in the study

Recommended for a period: Six months from the date of sanction by the funding agency

Reporting frequency:

Number of Samples:

Please note *
- Inform CUHEC in case of any change of study procedure, site and investigator.
- This permission is only for the period mentioned above
- Members of CUHEC have the right to monitor the trial with prior intimation.

Signature of the Chairperson
Date: 22.05.2023

Signature of the Member Secretary
Date: 22.05.2023

CHAIRMAN
CALICUT UNIVERSITY
HUMAN ETHICAL COMMITTEE

DEPARTMENT OF ZOOLOGY
Date:.....
UNIVERSITY OF CALICUT

Address for Communication:
Head of the Department, Department of Zoology, University, of Calicut, Calicut University P.O., Malappuram - 673 635, Kerala, India | Telephone No: 0494- 2407420 | e-mail: zoohod@uos.ac.in

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women
(Deemed to be university under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956) Re-accredited with 'A^{++}' Grade by NAAC.
Recognised by UGC Under Section 12 B
Coimbatore- 641043, Tamil Nadu, India

06.02.2023

To
Ms. Sai Gayathri, H.
Department of Food Science and Nutrition
Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore- 641043

Dear Sai Gayathri,

Ref: Your proposal No. IHEC/22-23/FSN-3 entitled "Situational Analysis of Triple Burden of Malnutrition and Impact of Personalised Nutrition Education on Nutritional Status of Young Adult Women (18-21 years)" submitted for approval of IHEC 21.11.2022

The Institutional Human ethics Committee of our University hereby grants approval to your research proposal No. IHEC/22-23/ FSN-3 entitled "Situational Analysis of Triple Burden of Malnutrition and Impact of Personalised Nutrition Education on Nutritional Status of Young Adult Women (18-21 years)" submitted by you. The Approval number for the same is AUW/IHEC/FSN- 22-23/FHP-3.

We wish you all the best in your research endeavours.

Regards

6.2.23

Dr. A Thirumani Devi
Member Secretary

INSTITUTIONAL HUMAN ETHICS COMMITTEE

Avinashilingam

Institute for Home Science and Higher Education for Women
(Deemed to be University under Category 'A' by MHRD, Estd. u/s 3 of UGC Act 1956) Re-accredited with 'A++' Grade by NAAC.
Recognised by UGC Under Section 12 B
Coimbatore-641 043, Tamil Nadu, India

21st June 2022

To
Ms.Sai Gayathri.H
Department of Food Science and Nutrition
Avinashilingam Institute for Home Science and
Higher Education for Women
Coimbatore – 641 043

Dear Sai Gayathri.H,

Ref: Your presentation of the proposal No. IHEC/21-22/FSN-34 entitled "Situational Analysis of Triple Burden of Malnutrition and Impact of Personalized Nutritional Education on Nutritional Status of the Young Adult Women (18 -21 years)" submitted for approval to IHEC on 23.11.2022.

The Institutional Human Ethics Committee of our University hereby grants approval to your research proposal No. IHEC/21-22/FSM-34 entitled "Situational Analysis of Triple Burden of Malnutrition and Impact of Personalized Nutritional Education on Nutritional Status of the Young Adult Women (18 -21) years" submitted and presented by you. The Approval number for the same is AUW/IHEC/FSN-21-22/FHP-34.

We wish you all the best in your research endeavours.

Regards,

S. Uma Mageshwari

Dr.S.Uma Mageshwari
Member Secretary

Institutional Human Ethics Committee

CTRI No	**CTRI/2023/08/056062** [Registered on: 03/08/2023] **Trial Registered Prospectively**
Acknowledgement Number	REF/2023/05/067523
Last Modified On:	02/08/2023
Post Graduate Thesis	Yes
Type of Trial	Interventional
Type of Study	Other (Specify) [Food Product supplementation]
Study Design	Randomized, Parallel Group Trial
Public Title of Study	Personalised nutritional education for Triple burden of malnutrition
Scientific Title of Study Clarification(s) with Reply Modification(s)	Situational analysis of triple burden of malnutrition and impact of personalized nutrition education on nutritional status of the young adult women(18-21 years)
Trial Acronym	

Secondary IDs if Any

Secondary ID	Identifier
NIL	NIL

Details of Principal Investigator or overall Trial Coordinator (multi-center study) Clarification(s) with Reply Modification(s)

Name	Sai Gayathri H
Designation	Research Scholar
Affliation	Avinashilingam Institute for Home sciecnce and HIgher education for women
Address	Department of Food science and Nutrition, School of Home Science, Mettupalayam Road, Bharathi Park Road, Coimbatore, Tamil Nadu Coimbatore TAMIL NADU 641043 India
Phone	8848887946
Fax	
Email	saigayathrihnair@gmail.com

Details Contact Person Scientific Query Clarification(s) with Reply Modification(s)

Name	Dr A Thirumani Devi
Designation	Professor
Affliation	Avinashilingam Institute for Home sciecnce and HIgher education for women
Address	Department of Food science and Nutrition, School of Home Science, Mettupalayam Road, Bharathi Park Road, Coimbatore, Tamil Nadu Coimbatore TAMIL NADU 641043 India
Phone	9442425754
Fax	
Email	thirumanidevi_fsn@avinuty.ac.in

Details Contact Person Public Query Clarification(s) with

Name	Sai Gayathri H
Designation	Research Scholar
Affliation	Avinashilingam Institute for Home sciecnce and HIgher education for women

ANNEXURE II

QUESTIONNAIRE ON NUTRITIONAL ASSESSMENT

Dear respondent,

This questionnaire is part of a nutritional assessment survey and would take no more that 10 minutes of your time. Kindly provide your response to all the questions accurately to have an insightful assessment as part of the study. We assure you that this information will be confidential and will be held and used for purely academic purposes only.

A. Personal details

i. Name :
ii. e-mail :
iii. Weight :
iv. Height :
v. Age :
vi. Address :

B. Socio - economic details

For each of the questions given below please choose the option that is most relevant to you.

i. Area of residence
a. Urban b. Rural

ii. Type of family
a. Joint b. Nuclear

iii. Marital Status
a. Married b. Unmarried

iv Number of members in your family
a. 2 b. 3
c. 4 d. 5

v. Mother's educational qualification
a. Primary education b. High school
c. Under graduation d. Post-graduation
e. Others

vi. Father's educational qualification
a. Primary education b. High school
c. Under graduation d. Post-graduation
e. Others

vii. Mother's occupation
a. Govt. employee b. Private
c. Self employed d. Home maker
e. Others

viii. Father's occupation
a. Govt. employee b. Private
c. Self employed d. Others

ix Mother's annual income
a. Below 20000 b. 20,000-50,000
c. 50,000- 1lakh d. Above 1 lakh

x. Father's annual income

a. Below 20,000 b. 20,000-50,000
c. 50,000- 1lakh d. Above 1 lakh

xi. Socio- economic status:

a. High b. Medium
c. Low

xii. Ownership of house

a. Own b. Rented

xiii. Means of Transport

a. Public transport b. Cycle
c. Two- wheeler d. Car

C. Dietary details

i Are you a …

a. Vegetarian b. Non-Vegetarian
c. Vegan d. Ovo-Vegetarian

ii. Your diet…

a. is different every day b. is different only sometime during a week
c. Is different only during weekends

iii. How many meals do you consume per day?

a. 1 b. 2
c. 3 d. 4
e. 5

iv. Which beverage do you drink most?

a. Tea b. Coffee
c. Milk d. Fruit juice
e. Others

v. Source of drinking water:

a. Mineral water b. Boiled water
c. RO water d. Tap water

vi. Food frequency table

Food item	**Daily**	**Weekly**	**Monthly**	**Rarely**	**Never**
Rice					
Wheat					
Ragi					
Maize					
Refined wheat flour/ Maida					
Green gram					
Cow pea					
Rajma					
Dal					
Amaranths					
Drumstick leaves					

Coriander leaves					
Spinach leaves					
Fenugreek leaves					
Cauliflower					
Cluster beans					
Carrot					
Potato					
Cabbage					
Brinjal					
Ladies finger					
Onion					
Garlic					
Tomato					
Cucumber					
Apple					
Papaya					
Orange					
Papaya					
Banana					
Watermelon					
Guava					
Strawberry					
Musk melon					
Paneer					
Mushroom					
Fish					
Meat					
Egg					
Milk					
Cheese					
Sugar					

vii. 24- hours recall method

Meal time	**Menu**	**Ingredients**	**Amount**
Early morning			
Break fast			
Mid- morning			
Lunch			
Snack			
Dinner			
Bed time			

viii. Do you have any food allergies?

a. Yes b. No

c. If yes, specify

ix. From the list below which triggers you to eat

a) Availability of food b) Depression

c) Loneliness d) Boredom

e) Anxiety f) Anger

g) PMS h) Stress

x. Are you aware of the term personalized nutrition?

a) No b) Yes

xi. Do you take any supplements or multivitamin tablets?

a) No b) Yes

c) If yes, specify

xii. Are you aware of the term Triple burden of Malnutrition

a. Yes b. No

D. Medical History

i. Are you diagnosed with any of the following disease?

Disease	**Yes**	**No**
Diabetes		
Hypertension		
Cardiovascular diseases		
Epilepsy		
Allergies		
Asthma		
Sleep disorders		
Celiac disease		

ii. Are you having a past history of any of these?

Disease	**Yes**	**No**
Jaundice		
Anemia		
Tuberculosis		
Malaria		
Arthritis		
Head injury		
Fracture		
Surgery		
Blood transfusion		

iii. Do you have any micronutrient deficiency?

Nutrient	Yes	No
Iron		
Iodine		
Vitamin A		
Vitamin D		

Calcium		
Folic Acid		
Zinc		
Vitamin B12		
Vitamin B6		

iv. Have you taken the following vaccination?

Immunization	**Yes**	**No**
Tetanus		
Typhoid		
Cholera		
Hepatitis A		
Hepatitis B		
Polio		
Chicken pox		
Measles		

v. Are you taking any medication? If yes please specify the name and dosage.

E. Clinical Assessment

i. Do you have any of these signs and symptoms?

Signs/Symptoms	Yes	No
Bitot Spot in Eye		
Poor Eye Sight		
Bleeding Gums		
Bow shaped legs		
Fatigue/Tiredness		
Blotting/Constipation		
Poor blood clotting		
Hair Loss		
Swelling in throat		
Improper periods		
Reduced bone strength		

ii Will you give your consent to take blood sample for the study?

a. Yes b. No

ANNEXURE II

Questionnaire on Life Style Pattern

Dear respondent,

This questionnaire is part of a research study on Triple Burden of Malnutrition in Young Adult Women .Kindly provide your response to all the questions accurately to have an insightful assessment .We assure you that this information will be confidential.

Parameters		
1.Leisure and Recreation	Meditation	
	Solving Puzzles	
	Board games	
	Swimming	
	Reading	
	Dancing	
	Music	
2.Games or Exercise	0 hour	
	1hour	
	2 hours	
	3 hours	
3.Sleep pattern	2-4 hours	
	5-7 hours	
	8-10 hours	
4.Social Interaction	Family and friends	
	Social gathering	
	Shared activities	
	Spiritual and cultural activities	
5.Means of transport	Public	
	Cycle	
	Private	
6.Sun Exposure in the morning(7am-11am)	0 hour	
	1 hour	
	2 hours	
Social media usage	1-3 hours	
	4-6 hours	
	7-9 hours	

Annexure III

1. Haemoglobin Estimation-Non-cyanide method

0.02ml of the test sample was added to 5.0ml of sodium lauryl sulphate. The diluted sample was allowed to stand for 5 minutes, it was then transferred to a cuvette and the optical density was determined at 540nm against a blank of the SLS solution. The value of the sample was determined by interpolation from the graph which was obtained from the standard.

2. Serum Folic Acid Estimation-ECLIA

Blood is typically collected from a vein in the arm using standard venipuncture techniques. A sample volume of 200 to 400 µL is generally needed, depending on the specific assay being performed. After collection, the blood sample is allowed to clot if using serum, or it may be treated with anticoagulants like EDTA or heparin for plasma samples. The sample is then centrifuged to separate the serum or plasma from the cellular components. This step usually takes about 10-20 minutes at a speed of >2500 x g. After collection, the blood sample is allowed to clot if using serum, or it may be treated with anticoagulants like EDTA or heparin for plasma samples. The sample is then centrifuged to separate the serum or plasma from the cellular components. This step usually takes about 10-20 minutes at a speed of >2500 x g. The prepared sample is incubated with specific antibodies that are conjugated with a luminescent marker (often ruthenium) and a co-reactant.The antibodies bind to the target analyte (e.g., hormones, antibodies, or other biomarkers) present in the sample. The bound complexes are transferred to an ECLIA analyzer, where they are subjected to an electrochemical reaction that produces light. The intensity of this light emission is measured using photodetectors (like photomultiplier tubes), which correlates to the concentration of the target molecule in the sample.

3. Serum Calcium and Serum Iron-Spectrophotomtery

- Sample Preparation: Serum samples are prepared, often without the need for deproteinization or centrifugation.
- Reagent Addition: A color reagent (e.g., ferrozine) is added to the serum sample, which reacts with iron to form a colored complex.
- Incubation: The mixture is incubated (usually at around 42°C for about 20 minutes) to allow the reaction to complete.
- Measurement: The absorbance of the solution is measured at a specific wavelength (often around 562 nm for ferrozine) using a spectrophotometer.
- Calculation: The concentration of unbound iron is calculated based on the absorbance readings, often using a standard curve for quantification

ANNEXURE IV

Sensory Evaluation Score Card

Name:

Class:

Product code:

Product	Colour	Flavour	Texture	Taste	Appearance	Overall Acceptability

Like Extremely-9

Like Very Much-8

Like Moderately-7

Neither like Nor Dislike-6

Dislike Slightly-5

Dislike Moderately-4

Dislike Moderately-3

Dislike Very Much-2

Dislike Extremely-1

Annexure –V

1. **Determination of Energy by Bomb Calorimeter**
   - Using a device known as a bomb calorimeter, it is simple to determine the fuel value of food. A weighed sample of food is put in a "bomb," a large steel container.
   - The sample is lit after the bomb has been loaded with oxygen, and the heat is then transferred into a known amount of water surrounding the bomb.
   - One can determine the energy content of food by applying the definition of a calorie while recording the change in water temperature.

   Calories = (Mass of water in kg) X [(1 Calorie) / (1 kg) (1°C)] X (temp change in °C)

2. **Estimation of Dietary Fibre**
   - This method measures total dietary fiber (TDF) through an enzymatic-gravimetric approach.
   - Sample Preparation: The sample is dried and defatted if the fat content exceeds 10%.
   - Enzymatic Digestion: The sample is treated with heat-stable α-amylase to hydrolyze starch, followed by protease to solubilize proteins, and finally amyloglucosidase to further digest starch fragments.
   - Precipitation: Ethanol is added to precipitate soluble fiber while removing the solubilized protein and glucose.
   - Weighing: The residue is filtered, washed, dried, and weighed. The TDF is calculated by subtracting the weights of protein and ash from the total residue weight.
3. **Determination of folic acid/vitamin b9 by uv-vis spectrophotometry**

   Reagents

   1. Folic acid Standard Stock Solution:

      Accurately weighed Folic acid (10mg) was transferred in100 ml volumetric flask. The drug was dissolve in methanol with sonication and final volume was adjusted with methanol up to mark to prepare a100µg/ml stock solution.
   2. Folic acid Working Standard Solution:

      From the above stock solution (100µg/ml), an accurately measured 0.2, 0.4, 0.6, 0.8, 1.0 and 1.2 ml was transfer into separate 10 ml volumetric flask and final volume was adjusted with methanol up to mark to prepare 2-12µg/ml solutions.

   Procedure

   - Transfer powder sample, exactly equivalent to laboratory mixture containing 25 mg of Meclizine Hydrochloride and 2.5mg of Folic acid to a 100 ml volumetric flask. Add about 60 ml of methanol and sonicate for 15 minutes solution was

filtered through Whatmann No.1 filter paper. The residue was washed with 10ml methanol three times and make up volume with methanol. From this solution take 1ml and dilute up to 50ml with methanol. Again take 1ml and dilute up to 10ml with methanol.

- The absorbances of sample solution and standard solutions were recorded at 540.0nm against blank.

Calculation

Calculate the Vitamin B9 from the calibration curve of Folic acid

4. Phytic Acid

- Phytates, or phytic acid, are the primary storage form of phosphorus in many plants and can influence mineral bioavailability.

Reagent

1 0.5 M HNO3

2 Ferric ammonium sulphate

3 Isoamyl alcohol

4 Sodium phytate

- For plotting standard curve, varied concentration (0.4 to 1 ml) standard sodium phytate solution (80 to 200 µg phyticacid) was taken and made the volume to 1.4 ml with water.

Extraction

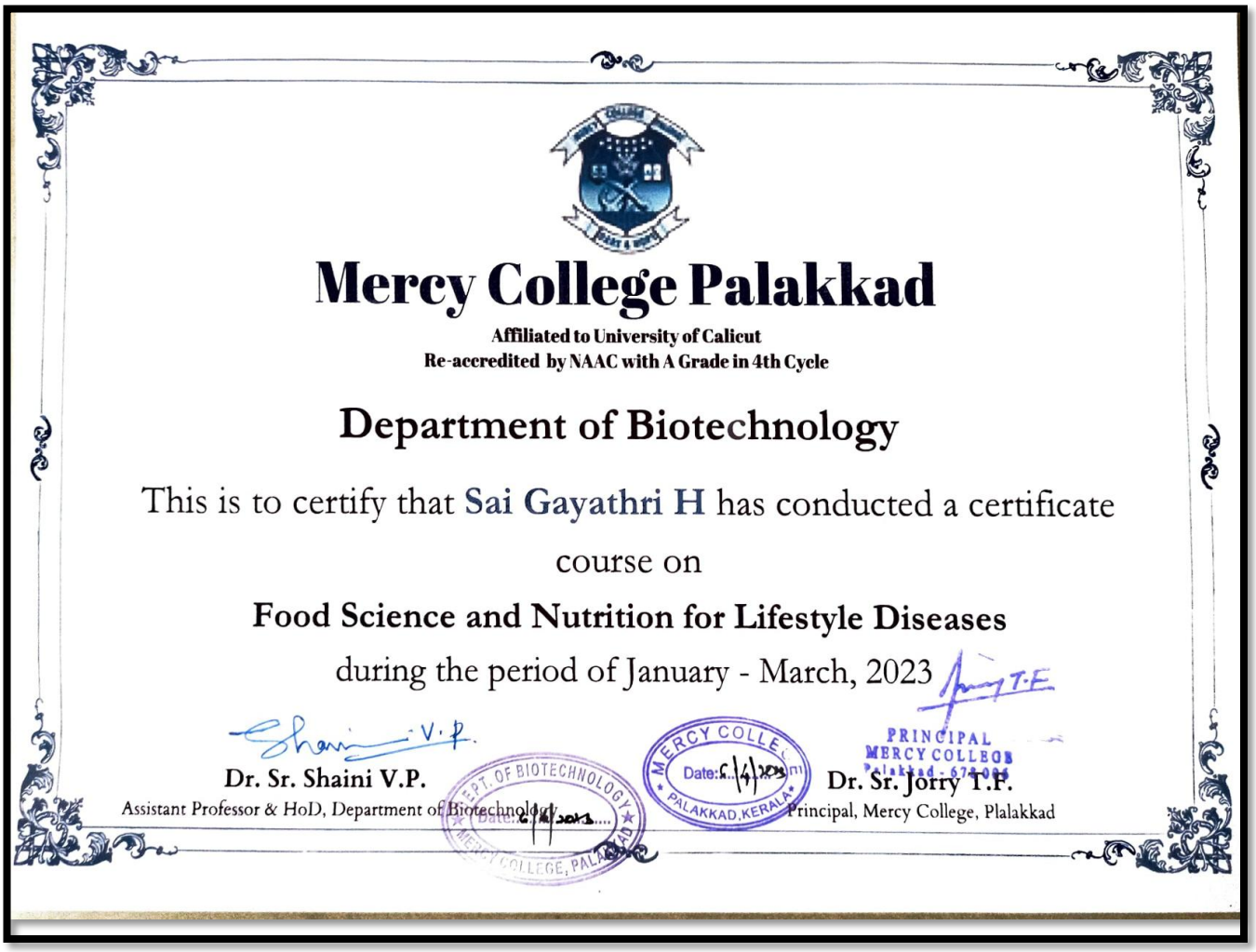
- Finely ground test sample (1g) was extracted with 25 ml of 0.5 N nitric acid for the period of 3 hours with continuous shaking. After shaking it was filtered through Whatman paper No.1.

Estimation

- Filtrate (0.2 to 1 ml) was taken in different test tubes and were diluted with distilled water to 1.4 ml. To each tube an ml of ferric ammonium sulphate solution was added and positioned in water bath (20 minutes). Test tubes were chilled to the 28°C under running tap water. 5 ml of isoamly alcohol was added and tubes were mixed by inversion method.(0.1 ml) ammonium thiocyanate solution was then added, shaken and centrifuged at 2000 rpm for 10 minutes.
- After incubation (15 min), 0.1 ml of ammonium thiocyanate was added and the tubes were measured at 465nm for their colour intensity, using isoamyl alcohol as blank. The extinction at 465 nm in isoamly alcohol was inversely proportional to phytic acid concentration.

ANNEXURE VI

Certificate for conducting certificate course on 'Food Science and Nutrition for Lifestyle Diseases



Mercy College Palakkad

Affiliated to University of Calicut
Re-accredited by NAAC with A Grade in 4th Cycle

Department of Biotechnology

This is to certify that **Sai Gayathri H** has conducted a certificate course on

Food Science and Nutrition for Lifestyle Diseases

during the period of January - March, 2023

Dr. Sr. Shaini V.P.
Assistant Professor & HoD, Department of Biotechnology

Dr. Sr. Jorry T.P.
Principal, Mercy College, Plalakkad

ANNEXURE VII

Diet Charts

Diet Chart for subjects with Iron deficiency

Meal Time	Menu	Amount
Early Morning	Dosa/Poori/Idly (or) Poha Vegetable Curry/Sambar Fruit Ragi Porridge	3 in number 100 grams 150ml 1 in number 250ml
Mid-morning(11.00am)	Dry fruits laddu/Chikki Beetroot Juice	1 in number 250 ml
Lunch	Rice (or) Chapathi Spinach dal Cauliflower/Mushroom fry Salads Curd Egg/Fish/Meat (optional)	50g/2in number 250 ml 100g 100g 250 ml 1 in number
Snack	Horse gram Sundal Guava juice	100 g 250 ml
Dinner	Bajra Chapathi Chutney	2 in number 100 ml
Bed Time	Milk with dates syrup or Almond milk	100ml/1 in number

PS: Include any kind of green leafy vegetable (ie) spinach, fenugreek leaves, etc in your diet plan which are rich in Iron. You can also include cauliflower, broccoli, beetroot etc to the meal to increase the iron intake.

Try to avoid consuming tea or coffee soon after the meal as if inhibits the absorption of iron. You can consume it after 1 hr of your meal.

Try consuming Vitamin C rich foods (ie) lemon, orange, gooseberry, guava with your meals to increase the absorption of Iron.

Try consuming 5 -10 dry fruits as they are good in Iron. You can even incorporate it in the food in the form of almond milk or adding dates syrup to your milk to consume the dry fruits.

Diet Chart for subjects with Folic Acid deficiency

Meal Time	Menu	Amount
Early Morning	Dosa/Poori/Idly (or) Upma/Pongal Vegetable Curry/Sambar Papaya Milk/Porridge	3 in number 300 grams 150ml 30 g 250ml
Mid-morning(11.00am)	Any nuts or seeds(cashew, almonds, ground nuts, pumpkin seed, flax seeds, etc)	5 in number
Lunch	Rice/Chapathi Any green leafy Dal Any one vegetable curry. Salads Curd Egg/Fish/Meat (optional)	50g/2in number 250 ml 100g 100g 250 ml 1 in number
Snack	Sprouts Milk	100g 250ml
Dinner	Spinach/Drumstick leaf chapathi Any vegetable curry	2 in number 250 ml
Bed Time	Milk/Fruit(optional)	100ml/1 in number

PS: Include any kind of green leafy vegetable (ie) spinach, fenugreek leaves, etc in your diet plan which are rich in Folic Acid. You can also include cauliflower, broccoli, beetroot etc to the meal to increase the folic acid intake.

Try to avoid consuming tea or coffee soon after the meal as if inhibits the absorption of folic acid. You can consume it after 1 hr of your meal.

Try consuming at least 1 fruit a day.

Try taking up few seeds (ie) Flax seed, Pumpkin seeds etc which are good in folic acid.

Diet Chart for Underweight subjects

Meal Time	Menu	Amount
Early Morning	Ada Dosa/Poori Chuteny Fruit Almond milk	3 in number 150ml 1 in number 250ml
Mid-morning(11.00am)	Banana Smoothie with dry fruits	250 ml
Lunch	Rice/Chapathi with ghee Any vegetable curry Fruits Salads Egg/Fish/Meat(fried)	50g/2in number 250 ml 200g 1 in number
Snack	Paneer sandwich Milk/Tea/Coffee	2 in number 250 ml
Dinner	Ragi dosa with ghee Sambhar	2 in number 200 ml
Bed Time	Milk/Fruit(optional)	250ml/1 in number

ANNEXURE VIII

KAP Survey

Dear respondent,

This questionnaire is part of a nutritional assessment survey and would take no more than 10 minutes of your time. Kindly provide your response to all the questions accurately to have an insightful assessment as part of the study. We assure you that this information will be confidential and will be held and used for purely academic purposes only.

I.Knowledge

Questions	Yes	No
1.Meaning of Macro and Micro Nutrients		
2.Meaning of Malnutrition		
3.Meaning of balanced diet		
4.Meaning of Dual/Double Burden of Malnutrition		
5.Meaning of Triple Burden of Malnutrition		
6.Balanced diet promotes health status		
7.Meaning of Life style related diseases		
8.Types of deficiency diseases		
9.Meaning of Spina Bifida		
10.Meaning of Osteopenia		

2. Attitude

Questions	Yes	No
1.Skipping any meal of the day		
2.Preference for drinking boiled water		
3.Consumption of breakfast everyday		
4.Preference for drinking protein shakes		
5.Stress Eating		
6.Consumption of raw vegetables and fruits		
7.Consumption of Sprouts		
8.Consumption of Instant foods(Instant Upma, Biryani etc)		
9.Change in lifestyle can bring down occurrence of diseases		
10.Malnutrition is always associated only with under nutrition		

3. Practice

Questions	Yes	No
1.Preference for eating in restaurant more frequently		
2.Preference for consuming probiotic products		
3.Consumption of multivitamin tablets		
4.Consumption of flax seeds to cure period’s cramps		
5.Binge eating		
6.Following a diet prescribed by a dietician		
7.Exercise for healthy living		
8.Nutrition Intervention will promotes healthy living		
9.Consumption of junk foods		
10.Skipping of food to reduces body weight		

Avinashilingam Institute for Home Science and Higher Education for Women
(Deemed to be University Estd. u/s 3 of UGC Act 1956, Category A by MHRD)
Re-accredited with 'A++' Grade by NAAC.CGPA 3.65/4, Category I by UGC
Coimbatore – 641 043, Tamil Nadu, India

PLAGIARISM CHECK REPORT (THESES)

1.	Name of the Research Scholar	Sai Gayathri H
2.	Roll No. and Year of Registration	19PHFNF005, 2020
3.	Department	Food Science and Nutrition
4.	Name of the Research Guide	Dr. A. Thirumani Devi
5.	Title of the Thesis / Dissertation	Triple Burden of Malnutrition in Young Adult Women (18-21years) and the Effect of Nutrition Interventions on their Nutritional status and Nutritional Knowledge
6.	Similarity Content (%) Identified	**7%**
7.	Software Used	Turnitin
8.	Date of Verification	18-11-2024

Note : The report is excluding 14 Consecutive words, Review of Literature and Quoted Materials.

Checked by :

18/11/24
Information Scientist

18/11/24
Research Scholar

18.11.24
Assistant Librarian

19.11.24
Research Guide

Date: 18-11-2024