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Review Paper

Culinary Influences on Mental Health: Findings from a Narrative Review

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ABSTRACT

Aim: This article investigates the role of nutrition in women's mental health and highlights the unique biological and psychological factors that affect it across different stages of life. By analysing the effects of key nutrients, dietary patterns, and gender-specific needs, this review aims to close the gap between nutrition and mental health. By examining evidence, this review addresses cultural and regional dietary practices and their implications for mental health. Efforts at international and national levels to improve women's nutritional status and mental health are also highlighted. Promoting global frameworks such as the SDGs and an integrated national initiative such as Mission Poshan 2.0 can help address the multifaceted challenges that women face. **Design:** Narrative review. **Data sources:** PubMed, ScienceDirect, and Google Scholar; policy and guideline documents from WHO/UN agencies and national portals; peer-reviewed online journals, reputable websites, and standard psychiatry textbooks. **Time frame:** Publications span 1972–2024, with primary emphasis on 2014–2024 (total span: 52 years). **Key findings:** The findings underscore that nutrition is a vital factor in supporting mental health, especially in women, who experience unique hormonal challenges and diverse social pressures across the life span. **Limitation:** This review might not capture all relevant studies, and the evidence is mixed; therefore, the findings should not be read as evidence of cause and effect. **Practice implication:** This review provides actionable insights for healthcare professionals, policymakers, and researchers, encouraging the integration of routine nutrition screening, brief counselling, and nutrition-focused strategies within women's mental healthcare pathways, particularly across reproductive life stages, to address modifiable dietary risks and support better outcomes.

Keywords: *Gender-Specific Needs, Nutrition, Women's Mental Health*

"*Women have the right to food and nutrition throughout their lives – a right that is enshrined in multiple international human right instruments. A woman's nutritional status is a powerful barometer of her well-being. A well-nourished woman has a strong immune system and nutrient reserves to buffer the effects of infection, while meeting her additional nutrient needs during pregnancy or breastfeeding. A well-nourished woman has the cognitive skills and physical strength to earn a good living and participate actively in family and public life. And a well-nourished woman is more likely to have well-nourished infants*

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and young children who join her on a path to good health and prosperity."- (UNICEF, 2023)

Mental health (MH) is affected by numerous aspects, including environment, genetic variation, personal experiences, (National Institute of Mental Health, 2024), and lifestyle choices. An association between nutrition has acquired significant importance in recent times, with research studies increasingly acknowledging the role of diet and nutrition in psychological well-being (Grajek et al., 2022; Jafari-Vayghan et al., 2023; Selhub, 2022). The brain functions as the control centre for the mind, and the mind's quality is directly influenced by the brain's condition (Hansotia, 2003). Given the brain's high metabolic rate, it requires a considerable portion of the daily intake of macro- and micronutrients to function effectively (Logan & Jacka, 2014). A nutrient-rich diet containing polyphenols, polyunsaturated fatty acids (PUFAs), and vitamins has been shown to influence MH positively. These benefits include improved mental functioning, enhanced emotional states, reduced response to stress, and decreased inflammatory response in the brain (Bazinet & Layé, 2014; Firth et al., 2018; McGrattan et al., 2019; Pusceddu et al., 2015; Rapaport et al., 2016). Women experience mood and anxiety disorders at rates that are up to twice as high as those in men, depending on the specific disorder (Kessler et al., 2005; Rainville & Hodes, 2019). Women face a greater risk of MH issues, often linked to their lower social status and gender-related challenges such as poverty, violence, and compromised physical health (Chandra et al., 2008). Women have unique vitamin and mineral requirements throughout various life stages, including pregnancy, breastfeeding, menopause, and hormonal fluctuations linked to the menstrual cycle (Rennó Jr. et al., 2020). For women, MH is influenced by a complicated interaction of cultural, social (Chandra et al., 2008), psychological, environmental, and biological factors, including hormonal fluctuations, societal expectations (BHB Hospital, 2024), and transitions across different life stages (Kedare et al., 2024). Women's nutritional demands and MH outcomes are shaped by these gender-specific characteristics, which is why a comprehensive approach to diet and MH is crucial. This review is important since gaps in our understanding of gender specific dietary needs and their impact on women's MH remain. Therefore, it draws together evidence on how biology, diet, and key nutrients relate to MH in women, and why this is important for care and policy. Moreover, it aims to discuss specific nutrients and dietary patterns, and outline practical implications for using nutrition in MH services. The following methodology was employed in order to address these aims.

METHODOLOGY

Time frame:

The time frame spans from the earliest year 1972 to the latest year 2024, covering 52 years in total. The primary period of interest was 2014 to 2024, which illustrated the decade during which the large number of studies on nutrition and MH of women have been published and developed.

Table 1. Summary of chronological distribution

Period	Description
1970s	Very few items; at least one in 1972
1980s–1990s	A few early key papers (1989, 1993, 1996, 1999)
2000s	Some growth in nutrition, women's health, and mental health work
2010–2013	Clear rise as diet–mental health links enter clinical and public health writing
2014–2019	Many studies and reviews on nutrients, life stages, and the gut–brain axis
2020–2024	Most entries cluster here, including major reviews and agency guidance

Population Coverage:
Human studies in English were taken into consideration with the main emphasis on women at major life phases (adolescence, reproductive years, pregnancy, postpartum, perimenopause, menopause). Studies involving the general population were taken into consideration when mechanisms or dietary patterns were applicable to women's MH.

Selection criteria:

- **Inclusion:** Human studies published in English; references that explicitly test the associations between nutrition (nutrients, eating patterns, mechanism) and MH; women-specific studies or general studies with available mechanisms/outcomes that can be generalised to women; and relevant policy and programme documents on nutrition and women's MH.
- **Exclusion:** Non-English publications; literature lacking an association between nutrition and MH; and animal or in vitro work, unless clearly fundamental to human mechanisms (generally not included).
- **Final Sample:** 108 sources passed these criteria.

Data Collection Process:
The major scholarly databases (such as PubMed, Google Scholar, and ScienceDirect) and online journals, as well as reputable websites and psychiatry textbooks, were identified as sources. Search terms included: "mental health", "nutrition and well-being", "nutrition and women's well-being", "nutrition and mental health", "nutrition and women's mental health", "global agenda and nutrition", "sustainable development goals (SDGs) and nutrition", national schemes and nutrition", "SABLA and nutrition", "Mission Poshan 2.0 and nutrition".

Screening Steps:
Titles were filtered based on relevance. Abstracts were evaluated with regard to fit with the inclusion criteria. Full texts were screened when abstracts showed direct relevance. Only those items that were consistent with the nutrition and mental health focus were kept to maintain consistency.

Synthesis Approach:
Since the review covers methodologically heterogeneous literature, diverse mechanisms (gut–brain axis, neuroendocrine changes), multiple nutrients and dietary patterns, life-stage factors unique to women, and real-world policy and programmes (SDGs, SABLA, Mission Poshan 2.0), that is why a narrative synthesis was employed, as it allows flexible yet transparent synthesis, the contextualisation of findings, and comparison of themes. Moreover, the goal of this review is to map concepts, connect ideas, and generate practice directions; hence a narrative design is methodologically appropriate.

Evidence Was Organised into Themes:
Global and national policy context (for example, SDGs; SABLA; Mission Poshan 2.0), reproductive physiology and hormonal influences on MH, gut–brain connectivity and neurotransmitter pathways, roles of specific nutrients, dietary patterns and MH outcomes, and interventions and practice (for example, nutrition counselling, mindful eating) alongside policy implications**.**
Findings were compared within each theme in terms of consistencies, differences, and practical relevance to women's MH.

Rationale for Scope:

The reason women have been targeted is that nutrition has a significant impact on women's MH at all stages of life, and there is a substantial body of literature available on this topic for synthesis. To relate the research to real-life practice, policy documents were included, as they demonstrate what governments and agencies are doing, how services are being provided, who is eligible, and how existing programmes (such as the SDGs, SABLA, and Mission Poshan 2.0) can transform evidence into practice.

Limitations:

The researchers acknowledge that the review might not have covered all the relevant studies, as additional literature may exist, and the evidence is mixed; therefore, the findings should not be read as evidence of cause and effect. Nevertheless, the review offers a well-organised and an updated overview of the literature on nutrition and MH in women and is useful in providing insights for researchers, policymakers, and public health officials.

Table 2. Summary of life-stage needs, key nutrients/diets, mechanisms, and mental health

Life stage	Key needs	Nutrients/diets	Mechanisms	MH outcomes
Adolescence	Rapid growth; menarche; stress and lifestyle changes	Iron, folate, B-vitamins; balanced pattern (Mediterranean-leaning)	Supports neurodevelopment, neurotransmission, energy metabolism	Adequate intake linked to better mood/cognition; deficiencies linked to fatigue, low mood
Reproductive years	Hormonal cycling; fertility; pregnancy planning	Omega-3 (EPA/DHA), iron, folate, B6/B12, magnesium; Mediterranean; limit Western	Serotonergic modulation (tryptophan/B6), anti-inflammatory effects (omega-3), haemoglobin/oxygen delivery (iron)	Improved mood/stress regulation; lower depressive/anxiety symptoms with nutrient-dense diets; higher symptoms with Western pattern
Pregnancy	Increased micronutrient demand; foetal development	Folate, iron, omega-3 (DHA), B-vitamins; balanced pattern	Neurodevelopment, prevention of anaemia; anti-inflammatory support	Lower risk of perinatal mood symptoms with sufficient intake; deficiencies worsen fatigue/low mood
Postpartum	Hormonal shifts; recovery; lactation demands	Omega-3 (EPA/DHA), iron, B-vitamins	Anti-inflammatory effects; neurotransmission; recovery from depletion	EPA/DHA supplementation may lessen depressive symptoms in some contexts

Perimenopause	Fluctuating oestrogen; vasomotor symptoms	Phytoestrogens (isoflavones), vitamin D, calcium, magnesium; Mediterranean	Neuromodulation; bone and cardiovascular support; potential vasomotor relief	Potential reduction in vasomotor burden and improved mood/stress handling with supportive intake
Menopause	Low oestrogen; bone/cardiometabolic risk	Vitamin D, calcium, magnesium, phytoestrogens; Mediterranean; limit Western	Bone health; anti-inflammatory; lipid/glucose regulation	Better cognitive/emotional outcomes with nutrient-dense, anti-inflammatory pattern; Western diet associated with worse mood
Across life span	Brain's high metabolic needs; social pressures	Polyphenols, PUFAs, vitamins/minerals; Mediterranean; avoid Western	Reduced neuroinflammation; improved neurotransmission; gut–brain support	Nutrient-rich diets linked to improved mood, cognition, stress response; Western pattern linked to higher depressive/anxiety symptoms

Source: Developed from this review's narrative synthesis.

Transforming Women's Malnutrition Through Global Agenda and National Scheme

There are coordinated and comprehensive efforts at both global and national levels to promote the nutritional status and MH of women.

Global Agenda: Sustainable Development Goals

Nutrition is a cornerstone for achieving sustainable development. According to the 2017 Global Nutrition Report, nutrition impacts the five core areas of development, such as: sustainable food production, infrastructure, health systems, equity, and peace, that are central to the [Sustainable Development Goals (SDGs)] (United Nations, 2015; UNSCN, 2024). Addressing malnutrition enhances global health, productivity, and stability. SDG 2 (Zero Hunger) aims to end hunger and malnutrition by 2030, assuring safe, nutritious food for all, with a special focus on women, including adolescent girls, and pregnant and lactating mothers, alongside vulnerable groups and children under five (United Nations, 2015). Concurrently, SDG 3 (Good Health and Well-being) (United Nations, 2015) is supported by nutrition's role in preventing diseases like diabetes and cardiovascular conditions, while fostering mental and physical health at all ages (World Health Organization, 2024; Gheonea et al., 2023). Nutrition also intersects with SDG 5 (Gender Equality) (United Nations, 2015) by addressing women's distinct needs. Women's nutritional needs are distinct due to pregnancy (Naaz & Muneshwar, 2023), hormonal fluctuations, and social pressures (Coppi et al., 2024), which significantly influence their MH (Maynard et al., 2018). By addressing malnutrition, women can be empowered both physically and mentally (Moquette & Feutl Kent, 2021). Therefore, it is not incorrect to conclude that sustainable nutritional interventions drive health, equality, and resilience across the SDGs, offering a transformative pathway toward global well-being. Accordingly, Mission Poshan 2.0 aligns

with the Sustainable Development Goals, namely SDG 2 (Zero Hunger) (Ministry of Women and Child Development, Government of India, 2022).

National Schemes: Mission Poshan 2.0

Mission Poshan 2.0 is an Indian government integrated programme that puts nutrition at the heart of health, wellness, and immunity for women (during pregnancy and lactation) and for adolescent girls (Ministry of Women and Child Development, Government of India, 2022). This gender-sensitive scheme supports holistic growth and development during adolescence and motherhood, two key stages in female life that have long-term impacts on mental-health outcomes. (Coussons-Read, 2013; World Health Organization, 2024). Under Mission Poshan 2.0, priority is given to diet diversity and food fortification, with Anganwadi platforms promoting everyday use of wholesome local foods to raise intake of micronutrient-rich options such as green leafy vegetables, lentils, and vitamin C-rich fruits; these measures aim to lower malnutrition and anaemia in women linked to insufficient iron, folic acid, and vitamin B12 (Press Information Bureau, 2023). Inadequate nutrition early in girls' and women's lives can hinder cognitive development, heighten fertility and maternal health threats, and reduce overall efficiency (Oniang'o & Mukudi, 2002). This national initiative aims to build a foundation for healthier, more resilient women and adolescent girls and to foster physical and psychological well-being, empowering females to thrive in personal and social roles (Ministry of Women and Child Development, Government of India, 2022).

Reproductive Physiology and Hormonal fluctuations: Gender-Specific Biological Factors

Women's MH requirements also vary across reproductive stages, including menstruation, pregnancy, postpartum, and menopause. Hormonal fluctuations across the menstrual period and key reproductive stages have been closely connected to mood variations, MH issues, and a higher susceptibility to psychotic episodes (Wieczorek et al., 2023). While menstruating, females frequently endure mental hardship, lower self-esteem, diminished social interaction, substance abuse, and personal harm, often associated with physical discomfort (Wieczorek et al., 2023). Throughout the fertile lifespan, from puberty until menopause, women's neurological makeup experiences rhythmic fluctuations in sex steroid balance during the menstrual cycle, which comprises the follicular phase (characterized by elevated oestrogen and low progesterone) and the luteal phase (characterized by low oestrogen and elevated progesterone). These hormonal shifts, particularly oestrogen withdrawal, are recognised as major risk factors for depression in women (Kundakovic & Rocks, 2022). Ovarian hormones, namely oestrogen and progesterone, exert powerful neuromodulatory effects and have been shown to influence female emotionality in research involving both humans and animals (Albert et al., 2015; Marrocco & McEwen, 2016; Young & Becker, 2009). Fluctuating hormone levels, while essential for reproductive function, significantly influence women's brain anatomy (Dubol et al., 2021; Woolley et al., 1990), function (Albert et al., 2015; Marrocco & McEwen, 2016; Sundstrom Poromaa & Gingnell, 2014), and neurochemistry (Barth et al., 2015). These fluctuations are presumed key contributors to the heightened risk of neuropsychiatric conditions like depression and anxiety disorders in women (Altemus et al., 2014; Deecher et al., 2008; Steiner et al., 2003) and can worsen symptoms, sustaining both depressive and anxiety-related symptoms (Kundakovic & Rocks, 2022). Postpartum depression (PPD) stands as one of the leading examples, linked to drastic declines in oestrogen (100-fold) and progesterone (10-fold) levels after childbirth, and is detected in up to 19% of people within the first year postpartum (Hahn-Holbrook et al., 2017; Wang et al., 2021; O'Hara & Swain, 1996). Premenopausal women often report mood changes associated with hormonal fluctuations

during their menstrual cycle, with 15% to 50% experiencing depressive symptoms during this phase (Toffol et al., 2015). These natural fluctuations in sex steroids in females have been linked to mood alterations and the onset of MH conditions (Wieczorek et al., 2023). Oestradiol, a steroid hormone, impacts the serotonergic, dopaminergic, and glutamatergic systems (Bendis et al., 2024).

Gut-Brain Connectivity

The network of communications connecting the gut and the brain is known as the gut-brain axis (GBA), which are linked through both physical and biochemical pathways (Robertson, 2023). The GBA facilitates bidirectional communication between the central nervous system and the enteric nervous system, connecting the emotional and cognitive areas of the brain with intestinal functions (Carabotti et al., 2015). The vagus nerve serves as an important connection between the brain and the gastrointestinal tract, transmitting information about the condition of internal organs to the brain via afferent fibres (Breit et al., 2018). The gut and brain communicate through chemical messengers known as neurotransmitters. A large number of these neurotransmitters are also generated by the cells in your gut and the trillions of microbes residing there (Robertson, 2023). Approximately 90% of the body's total serotonin is synthesised by argentaffin cells in the gastrointestinal tract (GIT), with only about 1% to 2% produced by serotonergic neurons in the brain (Bektaş et al., 2020). The gut microbiota is essential in producing neurotransmitters like serotonin, dopamine, gamma aminobutyric acid (GABA), and glutamate, which impact mood and brain function. These interactions, occurring via the gut-brain axis, are linked with different psychiatric disorders, such as depression, anxiety, schizophrenia, and autism spectrum disorder (ASD) (Mhanna et al., 2024).

Role of Specific Nutrition

Nutrients play a vital role in the creation and functioning of hormones and neurotransmitters, which are directly linked to the pathophysiology and aetiology of psychiatric dysfunction. As a result, they have the potential to help regulate certain brain functions (Yary et al., 2016). Specific nutrients, such as omega-3 fatty acids, calcium, and vitamin D, as well as foods like soy, have been correlated with positive health outcomes (Galvão et al., 2007). Nutrition is vital for health and development; it improves maternal, infant, and child health while reducing the risk of chronic diseases.The global burden of malnutrition impacts individuals, families, communities, and nations. Addressing nutrition is necessary for better health outcomes and sustainable development (World Health Organization, 2024).

Essential Amino Acid

Tryptophan is a crucial amino acid that must be acquired through diet to maintain adequate levels in the body. Foods such as turkey, bananas, cacao, nuts, and seeds are good sources of tryptophan, and consuming them may offer a modest mood-boosting effect. Moreover, antioxidant-rich foods may significantly influence the metabolism of tryptophan (Strasser et al., 2017). As the only precursor to serotonin, tryptophan is crucial for the production of this neurotransmitter in both the peripheral and central nervous systems (Richard et al., 2009). Serotonin, a neurotransmitter derived from tryptophan, plays a significant role in mood regulation, managing premenstrual symptoms and controlling appetite. Research suggests that serotonin may exhibit a cyclic pattern, contributing to variations in appetite and energy consumption commonly observed in women during the premenstrual phase (Rennó Jr. et al., 2020).

Omega-3 Fatty Acid

The importance of omega-3 polyunsaturated fatty acids (PUFAs) is widely recognised in physical health, and their significance in mental well-being is gaining recognition. Omega-3 fatty acids are fundamental for various physiological functions, including neurogenesis, neurotransmission, and neuroinflammation. As a result, they serve crucial roles in the maturation, performance, and ageing of the mind (Lange, 2020). DHA, the omega-3 fatty acid most prevalent in brain cell membranes (Crawford & Sinclair, 1972), cannot be generated efficiently by the human body and must primarily be sourced from the diet (Crawford et al., 1999). Nutritional deficiencies of omega-3 fatty acids in humans have been associated to a higher likelihood of developing several psychiatric conditions, such as depression, bipolar disorder, schizophrenia, dementia, attention-deficit/hyperactivity disorder (ADHD) and autism. Specifically, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) play a crucial role in maintaining MH, and their deficiencies are believed to contribute to the pathophysiology of these conditions (Lange, 2020). The primary food source of omega-3 polyunsaturated fatty acids is deep-water fish (Rennó Jr. et al., 2020). Population studies have highlighted that higher fish consumption is linked with a lower incidence of mental disorders, a relationship that has been attributed to the intake of omega-3 fatty acids (Van Dijk et al., 2015). Postpartum depression is a serious mood condition that develops within the first month after delivery and can continue for several months (Mann et al., 2010). Risk factors for postpartum depression include nutrient deficiencies, particularly in omega-3 fatty acids, which can result from insufficient intake or depletion during gestation and breastfeeding (Sontrop et al., 2008; Golding et al., 2009; Rees et al., 2009). A review of the accessible literature suggests that EPA-rich oil supplementation can help lessen depressive symptoms during pregnancy and the postpartum phase (Hsu et al., 2018). Long-term supplementation with DHA-rich oils has been proved to lower the risk of postpartum depression in healthy pregnant women, although this effect does not extend to lactating women (Hsu et al., 2018).

Iron

Numerous physiological functions, such as breathing, energy generation, Deoxyribonucleic acid (DNA) synthesis and restoration, myocyte activity, and cell division, depend on iron (Camaschella, 2015). Heavy menstrual bleeding affects nearly one-third of females of reproductive age, often resulting in iron insufficiency and, in extreme instances, iron deficiency anaemia. These issues can greatly influence the overall health and quality of life of those affected (Mansour et al., 2021). Women may also be at risk for low iron levels if they go through prolonged blood loss, such as menstruation lasting for more than seven days, or modest blood loss coupled with a diet lacking in iron, as is common among vegans and adolescents (Milman et al., 1993; UK National Health Service, 2020; Hercberg et al., 2001). Compared with women who experience normal blood loss, women who experience heavy menstrual bleeding (HMB) typically lose five to six times more iron throughout each menstrual cycle, which can lead to completely depleted iron stores (Napolitano et al., 2014). More than 60% of anaemia cases globally are caused by iron deficiency (ID), which is the most frequent cause of anaemia. Preschool-aged children, girls and women of childbearing age are most impacted (Kassebaum & GBD 2013 Anemia Collaborators, 2016; GBD 2015 Disease and Injury Incidence and Prevalence Collaborators, 2016). Iron deficiency (ID) and iron deficiency anaemia (IDA) occur in about 30% of women and adolescents with heavy menstrual bleeding (HMB) (Wang et al., 2013; Fraser et al., 2015). In adults' red blood cells (RBCs) and erythroid precursors, haemoglobin (Hb) binds more than two-thirds of the iron in the body (Andrews, 1999). Therefore, severe iron deficiency (ID) may result in a decrease in haemoglobin levels, affecting the synthesis of red blood cells and ultimately leading to

normocytic or microcytic hypochromic anaemia (Mansour et al., 2021). Iron deficiency anaemia (IDA) may result in diminished cognitive function and decreased job productivity (Schoep et al., 2019; Côté et al., 2002). In women, isolated iron deficiency (ID) has also been demonstrated to worsen tiredness and affect cognitive and physical function; iron treatment can correct these impairments (Bruner et al., 1996; Yokoi & Konomi, 2017). Iron intake can also be increased by dietary measures that promote the consumption of foods high in haem iron (Arab et al., 2023); seafood and lean meat are the diet's best sources of haem iron (Office of Dietary Supplements, 2024). The majority of the time, people get enough iron from their meals, although pregnant women, young children, teenage girls, infants, and premenopausal women may not get enough (Office of Dietary Supplements, 2024); therefore, dietary modification was advised only in combination with iron therapy (Mansour et al., 2021).

Phytoestrogens

Natural plant substances called phytoestrogens share structural and/or functional similarities with mammalian oestrogen and its active metabolites (Patisaul & Jefferson, 2010). A reduction in oestrogen during menopause causes the painful symptoms of vaginal dryness, hot flashes, night sweats, and disturbed sleep (Chen et al., 2015). Women's generally decreased well-being is correlated with the severity of their vasomotor complaints (Oldenhave et al., 1993). The most hormonally active phytoestrogen classes are phenolic compounds, of which isoflavones and coumestans are the most extensively researched groups. Isoflavones are found in soybeans and other legumes, but they are also detected in berries, wine, grains, nuts, and foods fortified with soy (Patisaul, 2017). Due in part to the fact that Asian women have vasomotor symptoms far less commonly than American or European women and to Asian cuisine being high in phytoestrogens, there is a lot of interest in using phytoestrogens to treat menopausal symptoms (Chen et al., 2015).

Magnesium

Research indicates that a magnesium deficiency may be crucial for women's health in several clinical conditions, such as polycystic ovary syndrome (PCOS), dysmenorrhoea, and premenstrual syndrome (O'Driscoll et al., 2013). Serum magnesium levels in women with PCOS are lower than those in healthy individuals (Parazzini et al., 2017). Supplementing with magnesium significantly improves the overall quality of life in women with PCOS (Jaripur et al., 2022). Menstrual discomfort and cramps can be alleviated with magnesium (Seifert et al., 1989). Women who experience hair loss may benefit from taking magnesium (Goluch-Koniuszy, 2016). For optimal health, magnesium is especially crucial, and it may even lessen the symptoms of menopause (Healthline, 2024). Women's health depends on magnesium, which supports cardiovascular function, bone health, and hormonal balance. Problems such as osteoporosis and cardiovascular diseases can result from deficiencies. It is crucial to include foods high in magnesium in the diet to avoid deficiencies and preserve general health (The Economic Times, 2024). It has been demonstrated that magnesium, particularly when paired with vitamin B6, may lessen the physical discomfort, anxiety, and irritability that accompany premenstrual syndrome (PMS) (The Economic Times, 2024), and its deficiency may contribute to stress and hormonal imbalances (Rennó Jr. et al., 2020).

Vitamin D and Calcium

In healthy females going through menopause, vitamin D deficiency is a prevalent but often ignored health issue. Genitourinary Syndrome of Menopause (GSM), diabetes, cardiovascular disease, skeletal muscle, and menopausal symptoms in women are all correlated with vitamin D levels (Mei et al., 2023). Studies show that there may be a slight

correlation between a decreased risk of early menopause and a high dietary intake of calcium and vitamin D (Purdue-Smithe et al., 2017). Both calcium and vitamin D seem to have an impact on fertility and have been linked to several gynaecological and reproductive disorders, such as polycystic ovary syndrome, endometriosis and premenstrual syndrome (Purdue-Smithe et al., 2017).

B-vitamin complex

Eight water-soluble vitamins make up the B vitamins, and their combined effects are noticeable in many areas of brain activity, such as energy production, deoxyribonucleic acid (DNA)/ribonucleic acid (RNA) synthesis and repair, genomic and non-genomic methylation, and the synthesis of different neurochemicals and signalling molecules (Kennedy, 2016). Neuronal function depends on the B vitamins, including folic acid, vitamin B12, and vitamin B6; and their severe deficiencies have been linked with higher probability of dementia, psychiatric illness, and neurodevelopmental abnormalities (Mitchell et al., 2014). Vitamin B6 increases serum progesterone during the mid-luteal phase, impacting serotonin, a neurotransmitter linked to mood and premenstrual symptoms. Serotonin's cyclic rhythm may affect appetite and energy fluctuations in the premenstrual phase (Rennó Jr. et al., 2020). A class of water-soluble substances, called folate, is essential for several processes in the central nervous system. As reported by research, a folate deficiency is connected with heightened susceptibility to depression, prolonged depressive episodes, and a greater chance of relapsing into depressive symptoms (Liwinski & Lang, 2023). Red blood cell synthesis, along with the growth and operation of healthy cells, rely on folate (vitamin B9). To lower the risk of brain and spinal birth anomalies, the vitamin is vital in the initial stages of gestation (Mayo Clinic, 2023). There is increasing findings that women's fertility may benefit from taking folate supplements (and perhaps vitamin B12), and there is some indication that B vitamin supplements could potentially be better for enhancing fertility well-being outcomes in women with PCOS (Thornburgh & Gaskins, 2022).

Diet and Women's Mental Health

A balanced diet is crucial for maintaining optimal health and nutrition (World Health Organization, 2024). Adjusting dietary intake or adding single or multiple vitamins and minerals to the diet may help resolve nutrient deficiencies that impact MH (Bodnar & Wisner, 2005). This article explores the nutritional properties of two different diets (Mediterranean and Western) and their impact on women's overall health, and MH in particular.

1. Mediterranean Diet

The Mediterranean diet (MD) is rooted in the heritage cuisines of nations that border the Mediterranean Sea, including France, Spain, Greece, and Italy (Gunnars & Ajmera, 2023). The MD has been associated with better cognitive function in older adults. Research indicates that it also positively affects conditions like diabetes, cancer, and obesity. Additionally, it has been shown to provide protective benefits against anxiety and mental stress (Grajek et al., 2022). A Mediterranean diet (MD) has been associated with reducing the probability of depression, and it may help in weight management and the improvement of MH (Radkhah et al., 2023). A defining feature of the Mediterranean diet is its focus son fish and olive oil, both highly valued for their health benefits. Olive oil is loaded with monounsaturated fats, particularly alpha-linolenic acid, an important omega-3 fatty acid. Similarly, fish and seafood are rich sources of omega-3 fatty acids, contributing significantly to overall health (Rishor-Olney & Hinson, 2023). Omega-3 fatty acids could potentially reduce the chances of certain cancers, like breast, colon, uterine and skin cancers, and may

also lower the likelihood of postpartum depression, bipolar disorder, dementia (such as Alzheimer's), hypertension, toxaemia, diabetes and age-related macular degeneration. Additionally, they could be beneficial in preventing premenstrual syndrome and alleviating postmenopausal hot flashes in women (Bourre, 2007).

2. Western Diet

The Western diet (WD), marked by high levels of processed foods, red meat, and saturated fats, alongside low fibre and vitamin intakes, is detrimental to both general health and MH. Its composition promotes chronic inflammation, contributing to mood disorders and neurodegenerative diseases by increasing inflammatory cytokines and macrophage activity, often triggered by intestinal impairment (Clemente-Suárez et al., 2023). A WD may elevate the risk of chronic conditions, including cancer and cardiovascular diseases (Clemente-Suárez et al., 2023). The WD, dominated by red meat, sugary foods, processed products, and refined grains, and deficient in essential nutrients, disrupts hormonal balance and impairs women's fertility. This highlights the profound impact of poor nutrition on reproductive health (Nazni, 2014). The Western diet, which promotes chronic inflammation, exacerbates mood-related disorders like depression, anxiety, and post-traumatic stress disorder (PTSD) in females (Clemente-Suárez et al., 2023). Since women are more prone to these conditions (Rainville & Hodes, 2019), the diet intensifies their frequency and severity, leading to a higher rate of mood disorders.

Interventions for Women's Mental Health Through Nutrition

Nutrition-focused interventions are crucial in addressing both physical health and MH of women. Women are already more susceptible to issues such as depression, anxiety, and eating disorders (National Institute of Mental Health, 2024), and additional nutrient deficiencies can worsen these conditions (Muscaritoli, 2021). But through nutrition-targeted interventions, these deficiencies can be addressed, MH symptoms can be alleviated, and the overall well-being of women can improve (Burrows et al., 2022; Montgomery et al., 2024; Rocks et al., 2022).

Nutritional Counselling and Mental Health Support

Nutrition counselling involves a collaborative process in which a patient and a healthcare team member analyse the findings of a nutritional evaluation, pinpoint the patient's dietary issues, requirements, and objectives, explore strategies to achieve these aims, and establish a plan for follow-up and the monitoring frequency. In most cases, nutrition counsellors are either nutritionists or dietitians (Vasiloglou et al., 2019). The primary goal of nutrition counselling is to educate patients about how nutrition affects their health and to emphasise practical steps to address their nutritional requirements (Vasiloglou et al., 2019). Undernutrition can be improved by including nutritional counselling as part of regular check-ups (Alum et al., 2023). Patients with mental disorders commonly face food-related challenges and a diminished quality of life, highlighting the need for nutritional counselling (Koshimoto et al., 2023). Nutrition counselling plays a vital role in supporting women's MH, especially during pregnancy and lactation, when increased nutrient demands may not be met through typical diets or maternal reserves. Correcting nutrient deficiencies through dietary adjustments or supplementation with key vitamins and minerals can effectively enhance MH outcomes (Bodnar & Wisner, 2005). Nutrition counselling, endorsed by the World Health Organization (WHO) as part of antenatal care, promotes maternal health and positive pregnancy outcomes. Two-way interactive counselling, which emphasises shared decision-making, has demonstrated benefits for certain mother and infant health effects (Dewidar et al., 2023). Nutritional counselling and social support can work synergistically to foster

women's MH by addressing both physical and emotional needs. Nutritional counselling helps to correct nutritional deficiencies that contribute to poor MH (Bodnar & Wisner, 2005), while social support provides the emotional foundation necessary for effective behaviour change. Research shows that strong social support reduces the likelihood of adverse MH outcomes and mitigates the impact of stressors like intimate partner violence (Srivastava, 2012). Together, these approaches can serve as comprehensive interventions to improve MH outcomes in women, particularly those facing nutritional and emotional challenges.

Mindful Eating

Mindful eating (ME) involves paying full attention to the sensory experience of food without judgement, focusing on the moment rather than calorie counting. Its goal is to enhance enjoyment and presence during meals, promoting healthier eating choices and potentially weight loss. The approach is process-oriented and encourages individuals to choose what and how much to eat based on personal experience rather than external rules (Nelson, 2017). The 'mindful eating' program may gradually foster deeper changes in individuals' relationships with food and their intake behaviours, potentially leading to more consequential long-term outcomes (Morillo-Sarto et al., 2023). Research suggests that Mindfulness-Based Eating Awareness Training (MB-EAT) helps reduce binge-eating episodes, boosts self-control around food, and lessens symptoms of depression (Kristeller & Wolever, 2011). ME, particularly through Mindfulness-Based Eating Awareness Training (MB-EAT), can improve women's MH by addressing both binge-eating and depression. Since women are more likely to experience Binge Eating Disorder (BED) (Lydecker & Grilo, 2018) and depression (Salk et al., 2017). By improving eating habits and emotional regulation, ME helps women manage both their eating behaviours and MH.

CONCLUSION

The comprehensive approach to nutrition and MH has uncovered the interrelated nature of diet, biological processes, and psychological well-being. Addressing the distinct nutritional needs of women is vital for supporting their psychological health. Due to urbanisation and globalisation, changes in the food sector, and changes in people's lifestyles and eating preferences, the association between nutrition and MH have become more significant. Despite substantial evidence linking nutrition to MH, more holistic, gender-specific research is essential to explore the unique nutritional needs of women. More gender- and culturally sensitive longitudinal studies, examining the impact of diet and nutrition across different stages of life, would enhance our insight into how nutrition can support MH in women worldwide, and this will create opportunities for psychodietetics and nutripsychiatry to formulate and implement new and effective interventions. Lastly, the findings of this review emphasise the transformative potential of sustainable nutritional interventions for advancing women's MH.

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Conflict of Interest

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Abbreviations:

1. PUFAs – Polyunsaturated Fatty Acids
2. GBA – Gut-Brain Axis
3. GIT – Gastrointestinal Tract
4. ASD – Autism Spectrum Disorder
5. GABA – Gamma-Aminobutyric Acid
6. ADHD – Attention-Deficit/Hyperactivity Disorder
7. EPA – Eicosapentaenoic Acid
8. DHA – Docosahexaenoic Acid
9. DNA – Deoxyribonucleic Acid
10. ID – Iron Deficiency
11. HMB – Heavy Menstrual Bleeding
12. IDA – Iron Deficiency Anaemia
13. RBCs – Adult Red Blood Cells
14. Hb – Haemoglobin
15. PCOS – Polycystic Ovary Syndrome

16. GSM – Genitourinary Syndrome of Menopause
17. RNA – Ribonucleic Acid
18. PMS – Premenstrual Syndrome
19. MD – Mediterranean Diet
20. PTSD – Post-Traumatic Stress Disorder
21. WHO – World Health Organisation
22. BED – Binge Eating Disorder
23. MB-EAT – Mindfulness-Based Eating Awareness Training
24. SDGs – Sustainable Development Goals
25. RGSEAG – Rajiv Gandhi Scheme for Empowerment of Adolescent Girls
26. WD – Western Diet
27. ME – Mindful Eating