

## REVIEW ARTICLE

# The Role of Food for Sexual Health and Intimacy: A Scoping Review

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## ABSTRACT

Food plays a vital role in physiological and psychological well-being, particularly in intimacy and sexual health. This scoping review examines the relationship between food-based supplements, dietary variables, and sexual health outcomes. This review was conducted using PRISMA extension for scoping review. Publications were identified using electronic databases like PubMed, Cochrane, and Scopus from 2017 to 2024. Seven thousand and ninety studies were identified, and 20 studies were included in this review. Dietary interventions included vitamins, probiotics, Mediterranean diets, soy isoflavones, Omega-3, and natural extracts such as ashwagandha, which were identified to improve sexual health indicators, including sperm quality, erectile function, and female sexual well-being. Erectile function, sperm quality, sexual desire, lubrication, orgasm, and sexual satisfaction were the primary sexual health outcomes that were assessed. Antioxidants, omega-3, and probiotics showed potential benefits for reproductive health, though effects on fertility and libido were inconsistent. Future research should clarify dietary impacts on sexual health and intimacy.

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## INTRODUCTION

Sexual health profoundly influences the social and economic development of communities and nations by supporting the well-being of individuals, couples, and families. A positive approach to sexual health involves fostering respectful attitudes toward sexuality and sexual relationships, enabling safe and satisfying experiences without violence, prejudice, or coercion. In Malaysia, the crude birth rate per 1,000 population declined from 14.9 in 2020 to 12.9 in 2022 (1), indicating a trend that may benefit from targeted interventions. Dietary choices are among several key factors impacting intimacy and sexual health.

Nutritional intake plays a crucial role in maintaining hormonal balance, energy levels, and overall health, all of which support a healthy sex life and potentially foster closer intimacy and reproductive outcomes. Essential physiological functions like hormone balance,

vascular and metabolic health are also impacted. Multiple interrelated systems are at play in the intricate interaction between our diet and sexual health. A healthy diet maintains the hormonal balance of the body, which is necessary for sexual function and libido. For example, the building blocks for hormones like oestrogen and testosterone are provided by diets high in healthy fats, such as those found in nuts, seafood, and olive oil. While oestrogen is essential for preserving women's libido and vaginal health, testosterone, the primary sex hormone in men, is important for sexual desire and performance (2).

Furthermore, nutrition has the potential to affect mood, which is one of the psychological factors influencing sexual health, especially during sexual interaction. Dietary intake rich in vegetables, foods high in nutrients and low intake of processed foods may promote mental well-being, reduce stress, and elevate mood, strengthening close relationships between partners (3). A happier, more positive experience of sexual activity has been linked to better mood, as it increases sexual desire and arousal (3). This all-encompassing approach to sexual health emphasises how crucial it is to think about a diet as a possible instrument for improving both the physical and emotional aspects of sexual performance

in close relationships (4).

Additionally, studies show a dose-dependent relationship between better sexual function and Mediterranean diet (MD), which may be due to its high antioxidant content and low levels of refined carbohydrates and saturated fats. The MD focuses on the abundance of fruits, vegetables, whole grains, nuts, legumes, olive oil, and fish intake, which provide essential bioactive compounds that help in reducing oxidative stress and inflammation (3). These two factors are significantly associated with sexual dysfunction.

Sexual dysfunction, on the other hand, is associated with diets heavy in processed foods, refined carbs, and unhealthy fats. Sexual health is adversely affected by metabolic syndrome and cardiovascular disorders, which are caused by these dietary components. Metabolic syndrome is a cluster of conditions, including obesity, insulin resistance, high blood pressure, high blood sugar, and abnormal cholesterol or triglyceride levels (5). These conditions often stem from diets high in refined carbohydrates, saturated fats, and processed foods, and they collectively increase the risk of both type 2 diabetes and cardiovascular disease. The syndrome has a profound negative impact on sexual health for both men and women (6). In addition, sexual dysfunction can result from dietary deficiencies in vital nutrients. For instance, low zinc levels might influence testosterone synthesis, which in turn affects libido and male fertility. Likewise, insufficient vitamin and mineral levels can throw off hormonal balance, resulting in problems including decreased sexual desire and erectile dysfunction (3).

Current research on the relationship between nutrition and sexual health is marked by significant limitations and inconsistencies, reinforcing the need for a comprehensive scoping review. Much of the existing literature focuses on isolated nutrients, such as omega-3 fatty acids or specific vitamins, without considering the effects of broader dietary patterns on sexual health outcomes (7,8). This narrow focus risks overlooking the holistic influence of diet. Additionally, considerable variation in study designs, sample sizes, and methodologies further complicates the findings, leading to inconsistent conclusions (9,10).

Given these gaps, this review aims to investigate how foods, vitamins, and supplements can improve sexual performance and closeness in general, given the intricate relationships that exist between nutrition, sexual health, and intimacy. In order to lay the groundwork for future studies and possible dietary recommendations to enhance sexual well-being across communities, the review will analyse and integrate the body of existing literature to identify critical dietary components that can positively impact sexual health outcomes.

## METHODS

This study identified the assessing role of diet and nutrition on sexual health and intimacy using a scoping review study methodology. In this study, we conducted a scoping review following the PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) guidelines (11). A scoping review was chosen over a systematic review as it allows for a comprehensive mapping of the existing literature, particularly in areas where the evidence is heterogeneous and emerging. Unlike systematic reviews, which focus on a specific, well-defined question and often involve meta-analysis, scoping reviews are more suitable for identifying key concepts, research gaps, and the range of available evidence without restricting studies based on strict methodological criteria. Given the broad and exploratory nature of our research objective, a scoping review was deemed the most appropriate approach to systematically chart the existing knowledge and inform future research directions. Figure 1 illustrates the flow of articles from the search to its final selection using a flow diagram that adheres to the recommended reporting items for PRISMA-ScR.

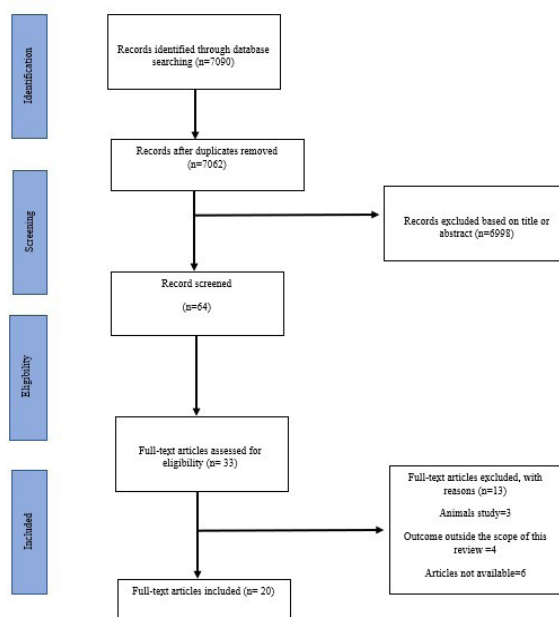


Figure 1: Flow chart of scoping review [based on the framework by Tricco et al. 2018]

### Determining the research questions

The following research questions were the main emphasis of the review: (1) Which foods or nutritional elements are linked to increases in intimacy and sexual health? (2) How do various diets or eating habits affect desire, sexual function, or reproductive health? (3) How may certain nutrients, dietary supplements, or other practices improve sexual well-being?

### Finding relevant studies

Electronic databases, including PubMed, Cochrane, and

SCOPUS, were used to conduct an electronic search. The full-text accessibility academic journals (in English) published between 2017 and 2024 and had anything to do with the subject were thoroughly searched. The search covered every study design, including retrospective, prospective, longitudinal, cross-sectional, randomised, case-control, and observational studies like cohorts.

Researchers separately carried out the data extraction procedure during the study selection process, and consensus was reached for all qualified studies. The reference lists of every retrieved article were manually examined for more relevant research. Before screening the abstracts, the study titles were examined. The search strategies included MeSH terms and keywords: (1) "Nutrition" AND "sexual health" OR "intimacy" OR "psychosexual" AND "wellbeing" OR "health"; (2) "Foods" OR "dietary" AND "sexual health" OR "intimacy" OR "psychosexual" AND "wellbeing" OR "health"; (3) "Foods" OR "dietary" OR "nutrition" AND "sexual health" OR "intimacy" OR "psychosexual" AND "wellbeing" OR "health". All of the studies that were pertinent to this first screening were read. Before being included in this evaluation, the researchers discussed and examined any issues that surfaced throughout the study selection process.

### Study selection

After thorough consideration, the reviewed studies were selected based on the following criteria to align with the focus on the role of foods in sexual health and intimacy: (1) participant characteristics, including age, gender, and health status; (2) the types of food or nutritional interventions, such as vitamins, dietary supplements, and specific food patterns; (3) assessments of sexual health and intimacy, including erectile function, libido, reproductive health, and hormonal analysis; and (4) the relationship between food intake or dietary interventions

and improvements in sexual health outcomes, such as fertility, sexual function, and sperm quality. Only studies that directly investigated the impact of food on sexual well-being, intimacy, or reproductive outcomes were included in this review. Any disagreements that emerged between two reviewers during the selection process were resolved by discussion or consultation with an additional or third reviewer.

### Data charting

Articles found in electronic databases were recorded and exported using the Rayyan application. The papers were then screened for duplication. The eligibility of the remaining complete articles was assessed. Establishing the inclusion and exclusion criteria is necessary in the eligibility process. Articles were included if they met the following criteria: (1) study focusing on how food or dietary elements affect intimacy or sexual wellness, (2) performed on human beings, (3) English-language publication, (4) Full-text access was provided, (5) Validated instruments assessed sexual health or well-being (e.g., the Female Sexual Function Index and the International Index of Erectile Function). Articles were excluded if: (1) Research involving animal models or cellular/biomarker investigations, (2) outcome outside the scope of this review which is regarding the roles of food on sexual health, (3) the remaining data were excluded in this scoping evaluation if the article was unavailable in full text.

### Gathering, compiling, and reporting

Table 1 of the findings summarises this review's important conclusions and information. The table has been modified to achieve the goals of the study. The data were distilled into information about the impact of diet and food on intimacy and sexual health. The table was created to aid the qualitative synthesis of the included studies.

**Table 1: Overview of the Role of Foods for Sexual Health and Intimacy**

No	Country/References	Study Design	Participant Characteristics (n, age, sex)	Food/Nutritional Assessment Tool	Sexual Health/Intimacy/Wellbeing purpose of study	Key Results
<b>Foods or Nutritional Elements Linked to Increases in Intimacy and Sexual Health</b>						
1.	Colombia/ (Duitama et al., 2018)	RCT <sup>1</sup>	n = 51 children (aged 2–9 years, boy and girl)	<ul style="list-style-type: none"> <li>Soy Protein Supplement (SPS): (45 g daily, isoflavones content 271.3 µg/g)</li> <li>Anthropometric Measurements: height, weight, and skinfold thickness</li> <li>Age and Gender.</li> <li>Isoflavone Quantification: performed using liquid chromatography–mass spectrometry (LC-MS/MS)</li> </ul>	<ul style="list-style-type: none"> <li>Tanner Stage Assessment</li> <li>Growth Velocity</li> <li>Bone Age Assessment</li> </ul>	<p>Height, BMI/A, Weight/A, and Height/A: Statistically significant differences (<math>P &lt; 0.05</math>) were observed at 12 months between the intervention and control groups, particularly in girls from the intervention group.</p> <p>Isoflavone Intake: On average, children consumed approximately 0.130 mg/kg body weight/day of isoflavones from the supplement, which <b>did not show significant differences in their sexual maturation.</b></p> <p>Supplement Dose: The recommended dose of the soy protein supplement was 45 g per day</p>

Continue

**Table I: Overview of the Role of Foods for Sexual Health and Intimacy (cont.)**

No	Country/References	Study Design	Participant Characteristics (n, age, sex)	Food/Nutritional Assessment Tool	Sexual Health/Intimacy/ Wellbeing purpose of study	Key Results
<b>Foods or Nutritional Elements Linked to Increases in Intimacy and Sexual Health</b>						
2.	Iran/ (Najafabadi et al., 2021)	A double-blind, placebo-controlled, randomized, clinical trial	n = 52 (mean age 41.18±6.59 years, male)	<ul style="list-style-type: none"> <li>• Combined supplement of Vitamin E (100 IU), Korean ginseng (67 mg) and Siberian ginseng (40 mg) taken once daily for 6 weeks</li> <li>• IIEF (International Index of Erectile Function)</li> <li>• Anthropometric measurements</li> </ul>	International Index of Erectile Function (IIEF) questionnaire focusing on erectile function, orgasmic function, sexual desire, intercourse satisfaction, and overall satisfaction	p-value = 0.033 Erectile function <b>significantly improved</b> in the supplement group compared to the placebo group.
3.	Iran/ (Mollahamdi et al., 2022)	RCT	n = 92 (mean aged 20-50 years, male)	<ul style="list-style-type: none"> <li>• Vit E (100mg), Omega 3 fatty acids (180mg EPA, 120 mg DHA)</li> <li>• ELISA (to analyse serum level of sex hormones)</li> </ul>	To investigate the effects of using the supplementations of vitamin E and Omega 3 fatty acids on reproductive indices among workers in an automobile parts manufacturing plant.	(B = -11.116, p=0.032) The simultaneous consumption of vitamin E + Omega 3 had <b>statistically significant effect</b> on sperm morphology and motility
4.	Italy/ (Maretti & Cavallini, 2017)	Pilot study	n = 41 (median age 37 years (range 32–42) in Flortec group, 36 years (range 30–43) in control group, male)	<ul style="list-style-type: none"> <li>• Probiotic and Prebiotic (Flortec, Bracco) – one sachet daily for 6 months. Each sachet contains:                             <ul style="list-style-type: none"> <li>• Lactobacillus paracasei (5 x 10<sup>9</sup> CFU)</li> <li>• Arabinogalactan (1243 mg)</li> <li>• Fructo-oligosaccharides (700 mg)</li> <li>• L-glutamine (500 mg)</li> <li>• Raspberry flavoring and non-soluble alimentary fiber (500 mg)</li> </ul> </li> <li>• Control substance: Alimentary starch (100 mg)</li> <li>• Tools: Semen analysis and hormonal assessment (FSH, LH, testosterone, estradiol, and prolactin) based on World Health Organization (2010) guidelines.<sup>1</sup></li> </ul>	To investigate improvement of sperm quality (concentration, motility, morphology) and quantity (ejaculate volume) in infertile patients with idiopathic oligoasthenoteratospermia (iOAT)	<b>Significant improvements</b> in sperm concentration (from 15.2 to 28.3 million/mL, p < 0.01), progressive motility (from 16.2% to 42.0%, p < 0.01), typical sperm forms (from 7% to 16.3%, p < 0.01), and ejaculate volume (from 2.4 to 3.1 mL, p < 0.01) in the Flortec group.  Increased levels of FSH, LH, and testosterone in the Flortec group, but <b>no significant changes</b> in estradiol or prolactin.  No significant changes in any parameters in the control group. No adverse effects were reported in either group
5.	Iran/ (Khanjari et al., 2022)	Double-blind, randomized controlled trial	n = 119 pregnant women (aged 18-42 years)	<ul style="list-style-type: none"> <li>• Omega-3 supplementation (300 mg/day)</li> <li>• Demographic questionnaire</li> <li>• Three 24-h dietary recall (24HR)</li> <li>• Female sexual function index (FSFI)</li> <li>• Van den Bergh Pregnancy-Related Anxiety Questionnaire (PRAQ)</li> </ul>	To evaluate the effect of omega-3 fatty acid supplementation on female sexual function during pregnancy.	Omega-3 supplementation <b>improved sexual function</b> at (P < 0.0001) and reduced pregnancy-related anxiety at n (P < 0.0001).  No improvement in pain during intercourse was noted.

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**Table 1: Overview of the Role of Foods for Sexual Health and Intimacy (cont.)**

No	Country/References	Study Design	Participant Characteristics (n, age, sex)	Food/Nutritional Assessment Tool	Sexual Health/Intimacy/Wellbeing purpose of study	Key Results
<b>Foods or Nutritional Elements Linked to Increases in Intimacy and Sexual Health</b>						
6.	India/ (Ajgaonkar et al., 2022)	Prospective, randomized, placebo-controlled study	n = 80 participants (aged 18–50 years, female)	<ul style="list-style-type: none"> <li>• Ashwagandha root extract (Withania somnifera), 300 mg twice daily</li> <li>• Female Sexual Function Index (FSFI)</li> <li>• Female Sexual Distress Scale (FSDS)</li> <li>• Satisfying Sexual Encounters (SSE)</li> <li>• General Health Questionnaire (GHQ-28)</li> </ul>	To evaluate the efficacy and safety of standardized Ashwagandha root extract in improving sexual function in healthy females.	<p>Significant improvement in FSFI scores across all subscales (desire, arousal, lubrication, orgasm, satisfaction, pain) with Ashwagandha compared to placebo at (p&lt;0.0001) FSDS scores showed a greater reduction with Ashwagandha.</p> <p>Increased number of satisfying sexual encounters with Ashwagandha at 4 and 8 weeks.</p> <p>No significant adverse events; Ashwagandha was well tolerated</p>
<b>Effects of Various Diets or Eating Habits on Desire, Sexual Function, and Reproductive Health</b>						
7.	Africa/ (Cutillas-Tolín et al., 2019)	Cross-sectional study	n = 209 (mean aged 18–23 years, male)	<ul style="list-style-type: none"> <li>• Asses DASH diet<sup>1</sup></li> <li>• FFQ</li> <li>• Three a priori-defined dietary indices (AHEI-2010 rMED and DASH)</li> </ul>	Associations DASH diet on semen parameters or male reproductive hormones	<p>Statistically significant positive associations between the DASH index and sperm concentration (P, trend = 0.04), total sperm count (P, trend = 0.04) and total motile sperm count (P, trend = 0.02).</p> <p>Suggest that greater adherence to the DASH may help improve sperm counts</p>
8.	Spain/ (Mateu-Fabregat et al., 2024)	Cross-Sectional study and Prospective Analysis within the FERT-INUTS Trial	n = 106 (mean aged 18–35 years, male)	<ul style="list-style-type: none"> <li>• Glycaemic index (GI) and glycaemic load (GL)</li> <li>• 3- days diet records (the Least Absolute Shrinkage Selection Operator (LASSO) approach was employed)</li> </ul>	Positive associations between GI and GL and total sperm count, sperm concentration, and total motility.	Suggest that GI may have adverse effects on several sperm quality parameters, the results were not consistently observed in the cross-sectional analysis. However, GL was consistently associated with better sperm quality in both analyses.
9.	Italy/ (De Cosmi et al., 2021)	Cross-sectional study analysis	n= 32739.3 years male	<ul style="list-style-type: none"> <li>• Antioxidant Vitamins and Carotenoids Intake</li> <li>• Standards questionnaire (supplementary materials)</li> <li>• FFQ</li> </ul>	Explore the relation between antioxidants intake and sperm parameters in sub-fertile couples referring to a Fertility centre.	<p>Vitamin D intake was linked to reduced semen volume (p = 0.002), low sperm concentrations of <math>\alpha</math>-carotene and lycopene (p = 0.05, and 0.007, respectively), and <math>\beta</math>-cryptoxanthins cause poor sperm motility. (p = 0.04), lutein (p = 0.03), and a low number of sperm overall with p = 0.017 and 0.056, respectively, for <math>\alpha</math>- and <math>\beta</math>-carotene, and with consumption of lycopene (p = 0.013).</p> <p>Higher intake of <math>\alpha</math>-carotene is positively, and lycopene level is negatively associated with sperm concentration and total count</p>
10.	Iraq/ (Al-Alousi et al., 2018)	Randomized double-blinded placebo-controlled clinical trial,	n=120; 60 subfertile women who received one capsule 1000mg omega-3 and Group B (placebo) includes 60 subfertile women who received a placebo contain Liquid Paraffin 500mg for eight weeks. (20-40 years, female)	<ul style="list-style-type: none"> <li>• Capsule omega-3 (1000mg)</li> <li>• Demographic Data Recording, Physical Examination, and Investigation</li> <li>• Hormonal Assays</li> <li>• Ovarian Stimulation Protocols</li> <li>• Ovum Pick Up (OPU)<sup>2</sup></li> </ul>	The role of planned omega 3 polyunsaturated fatty acid supplementation to improving the ratio of recovered ova to follicles, the rate of fertilisation, and the embryonic grade in female subfertiles undergoing intracytoplasmic sperm injection management procedures	Omega-3 FA supplements during IVF procedures may have a good impact on the reproductive sequel's outcome (p < 0.05).

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**Table I: Overview of the Role of Foods for Sexual Health and Intimacy (Cont.)**

No	Country/Refer-ences	Study Design	Participant Characteristics (n, age, sex)	Food/Nutritional Assessment Tool	Sexual Health/Intimacy/Wellbeing purpose of study	Key Results
<b>Effects of Various Diets or Eating Habits on Desire, Sexual Function, and Reproductive Health</b>						
11.	Iran (Shirani et al., 2020)	Cross-sectional study	n = 260 (aged 18–55 years, male)	<ul style="list-style-type: none"> <li>• Major Dietary Patterns and Dietary Diversity Score</li> <li>• Sperm concentration (SC)</li> <li>• Total sperm movement (TSM)</li> <li>• Normal sperm morphology (NSM)</li> <li>• Spermogram.</li> <li>• 168-FFQ</li> </ul>	Association was found between dietary diversity score and sperm quality parameters.	<p>The odds of abnormal concentration were 83% lower in the highest quartile of the traditional pattern than in the first quartile (OR=0.17, 95% CI: 0.04-0.73), but the odds of abnormal sperm volume were 2.69 times higher in the highest quartile of this pattern than in the first quartile (95%CI: 1.06-6.82).</p> <p>After controlling for relevant confounders, men in the second quartile of the cautious pattern had 4.36 greater chances of an aberrant sperm volume compared to the reference category (95%CI: 1.75-10.86).</p> <p>Comparing the mixed pattern to the first quartile, men in the second, third, and fourth quartiles had, respectively, 85 (5%CI: 0.03-0.76), 86 (95%CI: 0.02-0.75), and 83% (95%CI: 0.034-0.9) lower probabilities of abnormal concentration.</p> <p>Higher intake of the traditional diet was <b>linked to lower abnormal</b> semen concentration and poorer sperm volume. Also, the mixed diet was associated with reduced prevalence of abnormal semen concentration</p>
12.	Australia/ (Ognjenovic et al., 2019)	Observational cross-sectional study	n = 260 (mean aged 20.0 ± 0.4 years old years, male)	<ul style="list-style-type: none"> <li>• Dietary pattern</li> <li>• FFQ</li> <li>• Exploratory factor analysis (“Healthy” or “Western”)</li> <li>• Primary endpoints were testicular volume, total sperm per ejaculate, morning serum testosterone concentration.</li> <li>• Secondary endpoints were semen sample parameters</li> </ul>	Relationships between key food patterns and indicators of mature testicular function	<p>After controlling for BMI, varicocele, cryptorchidism, and sexual abstinence, serum oestradiol concentration was positively correlated with a “Western” dietary pattern (p = 0.007), while sperm concentration and DHT 3a-diol were negatively correlated with a higher z-score for the “Western” dietary pattern (p = 0.007 and p = 0.044, respectively).</p> <p>This research indicates There was evidence of a possible detrimental relationship between male reproductive health and a “Western” food pattern.</p>
13	Italy/ (Petre et al., 2023)	Observational Cross-Sectional Study	n = 300 (aged 18-45 years, male)	<ul style="list-style-type: none"> <li>• Mediterranean diet (MD)<sup>1</sup></li> <li>• Mediterranean Diet Adherence Screener (MEDAS)</li> <li>• BMI</li> </ul>	Relationship between Mediterranean diet adherence and sperm parameters,	<p>AUC = 0.096 (CI: 0.059–0.133; p &lt; 0.00)] The MEDAS value vs. seminal modifications ROC curve also revealed that 6.25 was the score threshold value below which altered sperm parameters were more likely to occur. Therefore, the likelihood of normozoospermia increases when the MD is followed with a MEDAS score of at least 6.26.</p> <p>Additionally, compared to patients who adhered more closely to the MD, those with a MEDAS value below 6.25 had an odds ratio of 6.28 (CI = 3.967–9.945) for having at least one changed sperm parameter.</p> <p>Higher adherence to the MD was positively correlated with better sperm parameters, indicating a potential link between diet and male reproductive health</p>

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**Table I: Overview of the Role of Foods for Sexual Health and Intimacy (Cont.)**

No	Country/References	Study Design	Participant Characteristics (n, age, sex)	Food/Nutritional Assessment Tool	Sexual Health/Intimacy/Wellbeing purpose of study	Key Results
<b>Improvement of Sexual Well-Being Through Nutrients, Supplements, or Other Practices</b>						
15.	Korea/ (Koh et al., 2022)	Retrospective observational study	n = 314 (aged 55.2 ± 8.6 years for non-flushers and 56.4 ± 10.3 years for flushers. Non-drinkers had an average age of 60.6 ± 8.7 years, male.)	<ul style="list-style-type: none"> <li>Alcohol consumption (one standard drink was 90 mL of 20% soju (1/4 bottle), 12 oz of beer (1 can, 355 mL), 45 mL of liquor (1 liquor drink), 150 mL of wine (one wine glass), or 300 mL of 6% makgeolli (one traditional drink))</li> <li>Electronic medical records; information on disease history, medication history and personal habits</li> <li>BMI</li> </ul>	Relationship between alcohol consumption and total testosterone deficiency based on facial flushing among Korean men.	<p>The risk of testosterone deficiency was <b>significantly higher</b> in heavy drinkers who flushed than in non-drinkers (odds ratio, 4.37; 95% confidence interval, 1.20–15.88; P=0.025). However, no significant difference was observed in the risk of testosterone deficiency in non-flushers, regardless of the amount of alcohol consumed.</p> <p>Study suggests that the risk of testosterone deficiency increases in heavy drinkers (&gt;8 drinks per week) who flush compared to that in non-drinkers</p>
16.	China/ (Hu et al., 2017)	RCT	n = 26 (mean aged 20-50 years, male)	<ul style="list-style-type: none"> <li>Amoxapine and vitamin B12</li> <li>International Index of Erectile Function (IIEF-5) questionnaire</li> </ul>	To compare the efficacy and safety of amoxapine and vitamin B12 for treating retrograde ejaculation (RE). <sup>1</sup>	<p>Success rate was higher for amoxapine than for vitamin B12 (80%, 20/25 vs 16%, 4/25; P&lt;0.0001).</p> <p>Amoxapine has a <b>significantly higher</b> efficacy than vitamin B12</p>
17.	Italy/ (Tirabassi et al., 2018)	Longitudinal Study	n = 114 (mean aged 64 years, male)	<ul style="list-style-type: none"> <li>Vitamin D (cholecalciferol (oral solution) at various dosages (50,000 or 100,000 IU) either weekly or every two or three weeks or monthly)</li> <li>ADVIA centaur XP immunoassay, Siemens Medical Solutions Diagnostics</li> <li>Blood sample</li> <li>BMI</li> <li>International Index of Erectile Function15 questionnaire (IIEF-15)</li> </ul>	To evaluate the possible association between vitamin D and sexual function and at assessing the influence of vitamin D administration on sexual function.	Greater levels of Δ-vitamin D were substantially linked to higher values of Δ-erectile function [odds ratio: 2.082 (95% CI 1.232–3.518); P = 0.006; model <b>significance</b> , P < 0.001].
18.	USA/ (Schisterman et al., 2020)	RCT	n=2,370 participants; 1,185 men randomized to the folic acid and zinc group and 1,185 men to the placebo group <sup>2</sup> . (mean age of 30.6 years (SD = 5.0) in the folic acid and zinc group and 30.8 years)	<ul style="list-style-type: none"> <li>Folic Acid(5mg) and Zinc Supplementation(30mg)</li> <li>Semen quality parameters (sperm concentration, motility, morphology, volume, DNA fragmentation) and live birth rates</li> </ul>	To determine the effect of daily folic acid and zinc supplementation on semen quality and live birth.	Folic acid and zinc supplementation <b>did not significantly improve</b> semen quality or live birth rates (p > 0.05), but increased DNA fragmentation (p = 0.03).
19.	Denmark/ (H Soyulu et al., 2018)	Cohort study	n = 7574 women (aged 20–29 years)	<ul style="list-style-type: none"> <li>Coffee, tea, caffeine intake (100 mg/daily)</li> <li>Food Frequency Questionnaire (FFQ)</li> </ul>	To examine into the potential effects of coffee, tea, and caffeine on women’s risk of primary infertility.	<p>Hazard ratio 1.00; 95% CI, 0.98–1.02</p> <p>No significant association between coffee, tea, or caffeine consumption and infertility</p>

Continue

**Table I: Overview of the Role of Foods for Sexual Health and Intimacy (cont.)**

No	Country/References	Study Design	Participant Characteristics (n, age, sex)	Food/Nutritional Assessment Tool	Sexual Health/Intimacy/Wellbeing purpose of study	Key Results
20.	Australia/ (Abbott et al., 2020)	Double-blind, randomized controlled trial	n = 61 participants (aged 18–70 years, 36% male)	<ul style="list-style-type: none"> <li>DHA-enriched fish oil supplementation (2x 1g DHA-enriched fish oil capsules/day delivering 860mg DHA and 120mg EPA/day)</li> <li>Self-administered questionnaire on socio-demographic data, medical history, dietary intake, and physical activity</li> <li>Anthropometric data; Height, weight, body composition (body fat %, skeletal muscle mass and fat free mass)</li> <li>Waist circumferences</li> <li>3-day weighed food record</li> <li>Circulating testosterone levels (LC-MS/MS technique)</li> <li>Homeostatic Model Assessment for Insulin Resistance (HOMA-IR)<sup>1</sup></li> </ul>	To determine whether testosterone levels change in response to a docosahexaenoic acid (DHA)-enriched fish oil intervention in overweight and obese participants	<p>Result of DHA-enriched fish oil consumption shows males had <b>significantly higher</b> levels of testosterone (15.8 ± 5.5 nmol/L vs 0.9 ± 0.3 nmol/L, p&lt;0.001)</p> <p>DHA-enriched fish oil increased testosterone levels in overweight and obese males but had no effect in females.</p> <p>Testosterone changes were associated with reductions in fasting insulin and HOMA-IR.</p>

**Study quality assessment**

The adapted version of the Newcastle-Ottawa Scale (NOS) for cross-sectional studies was used to assess the quality of this study (12) (Table II). The scale is developed to evaluate the quality of non-randomized studies such as cross-sectional and cohort studies. The NOS was chosen because it is widely used and adaptable for assessing the methodological quality of observational studies, allowing for a standard assessment across studies. Three domains are being used in the assessment tools to assess the quality and risk of bias in cross-sectional studies:

(1) selection, (2) comparability, and (3) outcome. The overall score for this tool ranges from 0 to 10, where 9-10 is the highest attainable score indicating very good studies, 7-8 indicate good studies, 5-6 show satisfactory studies, and 0-4 indicate unsatisfactory studies. Additionally, the Joanna Briggs Institute (JBI) critical appraisal tool was used to assess the methodological quality of the randomized controlled trial study design. Quantitative evidence assessment aims to determine how well the study addresses the potential for bias in its design, conduct and analysis (13) (Table II).

**Table II: Results of the critical appraisal of the included studies**

Results of the critical appraisal of the included studies based on NOS (Cross-Sectional study, Observational study, Longitudinal study and Cohort study)									
Study (First Author)	Study Design	Selection			Ascertainment of exposure	Comparability Based on design and analysis	Outcome		Total points
		Representativeness of the sample	Sample Size	Non-Respondents			Assessment of outcome	Statistical test	
Cutillas-Tolin et al., 2019	Cross-Sectional study			+	++	+	++	+	7
Mateu Fabregat et al., 2024	Observational Prospective Cohort study				++	+	++	+	6
De Cosmi et al., 2021	Cross-Sectional study analysis			+	++	+	++	+	7
Shirani et al., 2020	Cross-Sectional study			+	++	+	++	+	7
Ognjenovic et al., 2019	Observational Cross-Sectional Study	+			++	+	++	+	7
Petre et al., 2023	Observational Cross-Sectional Study	+			++	+	++	+	7
Koh et al., 2022	Retrospective Observational study			+	++	+	++	+	7
Tirabassi et al., 2018	Longitudinal study	+	+	+	++	+	++	+	9
H Soylyu et al., 2018	Cohort study	+		+	++	++	++	+	8

Continue

**Table II: Results of the critical appraisal of the included studies (cont.)**

<b>Results of the critical appraisal of the included studies based on JBI (RCT study)</b>										
<b>Criteria</b>	Dui-tama et al., 2018	Najafabadi et al., 2021	Mohammadi et al., 2022	Maretti & Cavallini, 2017	Khanjari et al., 2022	Ajgaonkar et al., 2022	Al-Alousi et al., 2018	Hu et al., 2017	Schisterman et al., 2020	Abbott et al., 2020
<b>Bias related to selection and allocation</b>										
1. Was true randomization used for assignment of participants to treatment group?	1	1	1	1	1	1	1	1	1	1
2. Was allocation to treatment groups concealed?	0	1	1	1	1	1	1	1	1	1
3. Were treatment groups similar at baseline?	1	1	1	1	1	1	1	1	1	1
<b>Bias related to administration of intervention/ exposure</b>										
1. Were participants blind to treatment assignment?	1	1	1	1	1	1	0	0	1	1
2. Were those delivering the treatment blind to treatment assignment?	0	0	1	1	0	0	0	0	1	1
3. Were treatment groups treated identically other than the intervention of interest?	1	1	1	1	1	1	1	1	1	1
<b>Bias related to assessment, detection and measurement of the outcome</b>										
1. Were outcome assessors blind to treatment assignment?	0	1	0	1	1	1	0	0	1	1
2. Were outcomes measured in the same way for treatment groups?	1	1	1	1	1	1	1	1	1	1
3. Were outcomes measured in a reliable way	1	1	1	1	1	1	1	1	1	1
<b>Bias related to participant retention</b>										
1. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	1	1	1	1	1	1	1	1	1	1
<b>Statistical conclusion validity</b>										
1. Were participants analysed in the groups to which they were randomized?	1	1	1	1	1	1	1	0	1	1
2. Was appropriate statistical analysis used?	1	1	1	1	1	1	1	1	1	1
3. Was the trial design appropriate and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in the conduct and analysis of the trial?	1	1	1	1	1	1	1	1	1	1
<b>Total score</b>	10	12	12	13	12	12	10	9	13	13

Remarks critical appraisal scores for JBI: Yes- 1; No/ Unclear- 0; N/A- not applicable

Scoring:

- i) <7: High risk of bias
- ii) 7 – 10: Medium risk of bias
- iii) 11 – 14: Low risk of bias

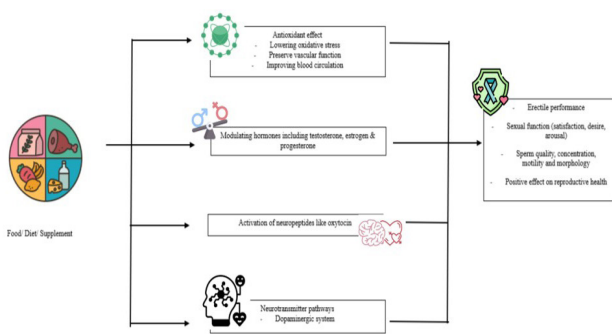
## RESULTS

Seven thousand sixty-two abstracts were found for potential inclusion out of the 7090 titles during the search. However, as illustrated in Fig. 1, 20 papers were chosen and added to the review's final screening phase. Randomised controlled trials made up the majority of the research (10 studies, 50%), followed by cross-sectional studies (7 studies, 35%), and cohort studies (3 studies, 15%). Both male and female participants aged 18 to 70 were included in this research, with

sample sizes ranging from 26 to 7,574 participants. This research concentrated on sperm quality, sexual function, hormone levels, and reproductive health, among other sexual health outcomes. Table I summarises the results of this study regarding the effects of food and diet on intimacy and sexual health and their relationship. Figure 2 illustrates the key mechanisms by which specific foods, diets, or supplements impact sexual health.

### Food and Nutrition Assessment Tools

This study evaluated a wide range of nutritional



**Figure 2: Key mechanisms of foods impact sexual health**

assessments used and their impacts on sexual health and intimacy. For instance, the impact of Soy Protein Supplement (SPS) intake was examined, with participants consuming 45 g per day of soy protein containing 271.3 µg/g of isoflavones. Anthropologists' measurements, including age, gender, height, weight, and skinfold thickness, were utilised to assess the effects of the supplementation. The quantification of isoflavones was performed using Liquid Chromatography–Mass Spectrometry (LC-MS/MS), a precise tool for measuring bioactive compounds (14).

Additionally, the study considered alcohol consumption, standardising intake to reflect typical beverages, such as 90 mL of 20% soju, 12 oz of beer, 45 mL of liquor, 150 mL of wine, or 300 mL of makgeolli. Electronic medical records were used to capture comprehensive health data, including past medical conditions, prescription drug use, personal habits, and BMI, to ensure accuracy. These elements combined provide a robust approach to evaluating the relationship between soy protein intake and health outcomes related to sexual health and intimacy (15).

Vitamin B12 levels ( $\leq 200$  mg/dL) were assessed in conjunction with the Sexual Health Inventory for Men (SHIM-5), a tool used to measure erectile function (3). Another study focused on the effects of a combined supplement of Vitamin E (100 IU), Korean ginseng (67 mg), and Siberian ginseng (40 mg) taken once daily for 6 weeks, using the International Index of Erectile Function (IIEF) alongside anthropometric measurements (16).

Furthermore, the role of Vitamin E (100 mg) and Omega-3 fatty acids (180 mg EPA, 120 mg DHA) was explored, where serum sex hormone levels were analysed using ELISA (17). Another intervention involved a probiotic and prebiotic combination (Flortec, Bracco) administered daily for six months, containing ingredients like *Lactobacillus paracasei* and arabinogalactan. This was evaluated through semen analysis and hormonal assessments (FSH, LH, testosterone, estradiol, and prolactin), following the WHO 2010 guidelines (18).

In another approach, amoxapine combined with Vitamin

B12 was assessed using the IIEF-5 questionnaire to determine its impact on erectile function (19). Similarly, Vitamin D (cholecalciferol) at varying doses was studied concerning its effect on sexual health, employing the ADVIA centaur XP immunoassay for blood analysis, BMI measurements, and the IIEF-15 questionnaire (20).

Dietary patterns were also explored, such as the DASH diet assessed through Food Frequency Questionnaires (FFQ) (21), alongside the analysis of glycaemic index and load using three-day diet records and the LASSO approach (22). A standardised supplementary questionnaire measured antioxidant vitamins and carotenoid intake (23). Omega-3 supplementation (1000 mg) was evaluated through demographic, hormonal, and ovarian stimulation data, focusing on ovum pick-up protocols (24).

Sperm concentration, movement, and morphology were examined in relation to major dietary patterns using spermograms and FFQs (25). Furthermore, adherence to the Mediterranean diet was assessed via the Mediterranean Diet Adherence Screener (MEDAS) and BMI measurements (26,27). Folic acid (5 mg) and zinc supplementation (30 mg) were studied for their influence on semen quality and live birth rates (28). Additionally, the intake of coffee, tea, and caffeine (100 mg/day) was analysed through FFQs (29), while Omega-3 supplementation (300 mg/day) was linked to female sexual function using the FSFI and the Van den Bergh Pregnancy-Related Anxiety Questionnaire (PRAQ), (30). DHA-enriched fish oil supplementation was also explored, with detailed dietary, anthropometric, and biochemical assessments, including circulating testosterone levels and insulin measurements (31).

Lastly, Ashwagandha root extract (300 mg twice daily) was studied for female sexual health, using tools such as the FSFI, FSIDS, and SSE, alongside the General Health Questionnaire (GHQ-28) to evaluate overall well-being (32).

**Association between Food Nutrition and Sexual Health/Intimacy**

Nutrition is critical in sexual well-being, reproductive function, and hormonal balance. Evidence from 20 studies reviewed highlights the associations between specific foods, dietary patterns, and nutrients with sexual health outcomes. These studies underscore the importance of targeted nutrition for improving sexual function, fertility, and reproductive health.

Several studies focused on the enhancement of erectile function through nutrient supplementation. For example, supplementation with vitamin E, Korean ginseng, and Siberian ginseng showed significant improvements in erectile performance ( $p = 0.033$ ) (16). Similarly, higher vitamin D levels were associated with better erectile function scores, reinforcing the link between vitamin D

intake and sexual health (20,23).

Alcohol consumption also plays a role in hormonal health. One study found that heavy alcohol intake increased the risk of testosterone deficiency in men who experience facial flushing, with these drinkers showing a higher likelihood of testosterone deficiency compared to non-drinkers (15). Meanwhile, the role of vitamin B12 in sexual health was explored in one study, which found that 26.7% of men with sexual desire disorders had low B12 levels, though this was not statistically significant (3).

The benefits of omega-3 fatty acids for reproductive outcomes were highlighted across multiple studies. Omega-3 supplementation improved sperm motility and morphology (30) and enhanced fertilisation rates and ova recovery among women undergoing fertility treatments (17). Furthermore, omega-3 intake was shown to improve sexual function during pregnancy, though it did not alleviate intercourse-related pain (24). Consumption of DHA-enriched fish oil was linked to significantly increased testosterone levels in overweight males ( $p < 0.001$ ), further emphasising the role of fatty acids in hormone regulation (31).

Dietary patterns were also closely linked with sperm quality in six studies. Adherence to the DASH diet was associated with improved sperm concentration and motility (21). Similarly, individuals who followed the Mediterranean diet demonstrated better sperm parameters, with higher MEDAS scores correlating with increased normozoospermia (27). Conversely, a Western dietary pattern was negatively associated with sperm concentration and testosterone levels ( $p = 0.007$ ), suggesting that unhealthy dietary patterns impair reproductive health (26).

The review also explored the role of herbal supplementation in sexual health. A randomised trial revealed that Ashwagandha root extract significantly improved female sexual function, including desire, arousal, lubrication, and satisfaction, with no adverse effects reported ( $p < 0.0001$ ) (32). Other studies investigated the impact of specific supplements on reproductive outcomes. For instance, a study involving probiotics and prebiotics (Flortec) reported significant improvements in sperm concentration, motility, and morphology in infertile men ( $p < 0.01$ ) (18). Similarly, higher glycaemic load (GL) was associated with improved sperm quality, although the impact of glycaemic index (GI) varied across studies (22).

The role of antioxidants and carotenoids in sperm quality was also examined, with findings indicating that lower levels of these nutrients were associated with poor sperm motility and low sperm counts ( $p < 0.05$ ) (23). However, other dietary components did not show significant associations with reproductive outcomes. For example, a cohort study found no relationship between coffee,

tea, or caffeine consumption and primary infertility risk in women (HR = 1.00, CI 0.98–1.02) (29). Similarly, a randomised trial found that supplementation with folic acid and zinc did not significantly improve semen quality or live birth rates. However, it did increase DNA fragmentation ( $p = 0.03$ ) (28).

Finally, the review identified studies with more mixed findings. One study reported that soy protein supplementation had no significant effect on sexual maturation among children after 12 months (14). In a comparative study of retrograde ejaculation treatments, amoxapine was found to be more effective than vitamin B12, with an 80% success rate compared to 16% ( $p < 0.0001$ ) (3). A cross-sectional study on dietary diversity highlighted that individual with higher diversity had lower odds of abnormal sperm concentration, reinforcing the importance of varied eating habits for reproductive health (OR = 0.17, CI 0.04–0.73) (25).

### Effects of Specific Nutrients

Recent studies exploring the role of specific nutritional elements in sexual health indicate varied but promising effects on reproductive and sexual outcomes across diverse populations. Duitama et al. (2018) investigated the long-term consumption of soy protein supplements in prepubertal children, finding no significant impact on sexual maturation stages (14). However, improvements in nutritional status indicators, such as BMI and fat-free mass in girls, were observed, suggesting potential benefits in growth-associated parameters without influencing early sexual development. Similarly, Khanjari et al. (2022) examined the influence of omega-3 fatty acids on pregnant women's sexual function, revealing that daily supplementation significantly enhanced scores on the Female Sexual Function Index (FSFI) after eight weeks compared to placebo, particularly in reducing anxiety related to pregnancy (30). The outcomes highlight omega-3's potential to support sexual health during pregnancy, aligning with findings from Duitama et al. (2018) on the safety and beneficial aspects of dietary supplementation (14). In another study, Ajgaonkar et al. (2022) demonstrated that ashwagandha root extract significantly improved sexual satisfaction and overall quality of life in women experiencing hypoactive sexual desire, underscoring the adaptogenic properties of ashwagandha in enhancing sexual function and emotional well-being (32).

Several studies also assessed the effects of nutrient combinations on sexual and reproductive health, focusing on male populations. Najafabadi et al. (2021) conducted a clinical trial on a combined vitamin E and ginseng supplement for erectile dysfunction (ED) in men (16). After six weeks, a significant improvement in erectile function was observed compared to placebo, suggesting that antioxidants like vitamin E and ginseng may offer a natural alternative for ED management. This aligns with findings by Mohammadi et al. (2022),

who studied the co-administration of vitamin E and omega-3 fatty acids among male workers exposed to electromagnetic fields, reporting enhanced sperm morphology and motility after three months (17). These results point to the potential of antioxidant supplementation in mitigating adverse reproductive effects of environmental exposures. Maretti and Cavallini (2017) explored probiotics paired with prebiotics in men with idiopathic oligoasthenoteratospermia (IAOT), finding notable improvements in sperm parameters, including concentration, motility, and ejaculate volume, compared to a control (18). Together, these studies emphasise the multifaceted benefits of combined nutrient supplementation for male reproductive health, addressing issues like erectile function and sperm quality.

For women's sexual health, the impact of supplementation with specific nutrients such as omega-3 and ashwagandha continues to yield promising outcomes. Khanjari et al. (2022) observed that omega-3 supplementation improved sexual function scores and reduced gestational anxiety among pregnant women, underscoring omega-3's potential role in alleviating both psychological and physical symptoms impacting sexual health (30). In a similar vein, Ajaonkar et al. (2022) found ashwagandha supplementation to enhance several facets of female sexual function, including arousal, satisfaction, and lubrication, thereby improving overall quality of life (32). These findings are complemented by Mohammadi et al. (2022), whose work on vitamin E and omega-3 further supports the role of targeted nutrient supplementation in enhancing reproductive indices, specifically in populations exposed to environmental stressors (17). The studies suggest that omega-3 and adaptogenic herbs like ashwagandha could be valuable for supporting sexual health across various life stages and stress conditions.

### Effects of Dietary Patterns

The influence of dietary patterns on reproductive health, specifically semen quality and sperm parameters, has been a topic of increasing interest in recent years. Several studies indicate that adherence to structured, health-promoting diets such as the Dietary Approaches to Stop Hypertension (DASH) and the Mediterranean Diet (MD) may positively affect male reproductive health. Cutillas-Tolín et al. (2019) examined the impact of the DASH diet on semen quality in young men. They found a significant correlation between higher DASH adherence and improved sperm count, concentration, and motility (21). These findings underscore the potential of nutrient-rich diets to enhance reproductive health, particularly in populations where male infertility is a concern.

Similarly, Petre et al. (2023) highlighted that adherence to the MD was significantly associated with higher sperm quality parameters, including sperm count, motility, and morphology, independent of body mass index

(BMI) and age (27). The study showed that men with a Mediterranean Diet Adherence Screener (MEDAS) score of 6.26 or higher had a greater likelihood of normozoospermia, suggesting that dietary quality and specific dietary patterns can serve as modifiable factors to support fertility. Ognjenovic et al. (2019) provided additional insights by examining the relationship between "Western" dietary patterns, characterised by high intake of processed foods and sugars, and markers of testicular function. Their findings revealed negative associations between the Western diet and sperm concentration, indicating that healthier dietary practices may counteract reproductive health issues potentially exacerbated by poor dietary habits (26).

The role of dietary glycaemic index (GI) and glycaemic load (GL) in reproductive health was explored by Mateu-Fabregat et al. (2024) in the FERTINUTS trial. Their analysis suggested that while higher GI levels were linked to adverse effects on sperm parameters such as motility and concentration, GL showed more consistent positive associations with sperm quality measures, including vitality and total sperm count (22). This distinction emphasises the complexity of carbohydrate intake and its implications for male fertility, where the quality and quantity of carbohydrates consumed may play unique roles. Al-Alousi et al. (2018) also investigated the relationship between dietary fats, specifically omega-3 polyunsaturated fatty acids (PUFAs), and reproductive outcomes among women undergoing assisted reproduction techniques (ART) (24). Their findings revealed that higher serum levels of long-chain omega-3 PUFA were positively associated with clinical pregnancy and live birth rates, suggesting that dietary fat composition may also be an influential factor in female reproductive outcomes. Both studies highlight the importance of considering dietary composition and metabolic factors in fertility, with specific dietary components potentially contributing to improved reproductive potential.

Antioxidant intake and its effects on semen quality have also been a focal point in dietary studies on reproductive health. De Cosmi et al. (2021) explored the impact of antioxidant vitamins and carotenoids on sperm parameters in a cohort of sub-fertile men attending a fertility clinic (23). Their findings indicated that higher levels of  $\alpha$ -carotene and  $\beta$ -carotene were associated with a lower risk of poor sperm quality, including reduced sperm concentration and total sperm count. Conversely, lycopene intake was associated with an increased risk of poor semen parameters, underscoring that while some antioxidants may benefit male fertility, others might have neutral or even adverse effects. In addition, Al-Alousi et al. (2018) emphasised the role of omega-3 PUFAs as antioxidants, further linking these nutrients to positive reproductive outcomes among ART patients, as previously noted (24). These studies collectively suggest that targeted dietary intake, particularly of antioxidants,

can positively modulate semen quality and reproductive health. However, the specific effects may vary depending on the type of antioxidant consumed.

### **Gender-Specific Outcomes**

Recent research highlights the complex relationships between various nutrients, supplements, and lifestyle practices in enhancing sexual well-being, with a particular focus on testosterone levels and reproductive health outcomes. Koh et al. (2022) examined the impact of alcohol consumption on testosterone levels, emphasising the increased risk of testosterone deficiency among heavy drinkers who exhibit facial flushing (15). These findings suggest a compounded effect of high alcohol intake and specific physiological reactions, which may exacerbate hormonal imbalances detrimental to sexual health. Similarly, Abbott et al. (2020) investigated the effect of docosahexaenoic acid (DHA)-enriched fish oil supplementation on testosterone levels in overweight and obese men, revealing a positive correlation between DHA intake and increased testosterone (31). This study further demonstrated that the rise in testosterone levels was associated with changes in omega-3 and omega-6 polyunsaturated fatty acids (PUFAs) in erythrocyte membranes, suggesting that omega-3 supplementation could be beneficial in addressing hormonal deficiencies linked to metabolic issues. The interplay between lifestyle factors and nutritional interventions, as shown by Koh et al. (2022) and Abbott et al. (2020), supports the potential of targeted nutrient intake in modulating testosterone levels and enhancing male sexual health outcomes (15,31).

The role of vitamins and minerals in reproductive health has also been extensively studied, particularly concerning male sexual function. Hu et al. (2017) compared the effects of amoxapine and vitamin B12 on retrograde ejaculation (RE) in a randomised crossover trial, finding that amoxapine was significantly more effective than vitamin B12 in restoring antegrade ejaculation (19). This finding highlights the potential for specific pharmacological and nutritional interventions in managing complex ejaculatory disorders, especially when standard treatments are ineffective. Tirabassi et al. (2018) further explored the impact of vitamin D on male sexual function, demonstrating that vitamin D supplementation was positively associated with improvements in erectile function and testosterone levels (20). The longitudinal aspect of this study provided insights into the sustained benefits of vitamin D, emphasising its role in maintaining sexual function over time. Schisterman et al. (2020) assessed the combined supplementation of folic acid and zinc in men undergoing infertility treatment, concluding that, despite initial assumptions, these supplements did not significantly improve semen quality or live birth rates (28). Although folic acid and zinc are commonly included in male fertility supplements, Schisterman et al.'s (2020) findings suggest further research to clarify

the efficacy of such treatments in clinical contexts (28). Together, these studies underscore the nuanced effects of vitamins and minerals on sexual health, indicating that some nutrients may offer targeted benefits for specific sexual dysfunctions. In contrast, others may require more robust evidence.

In women, the relationship between caffeine consumption and fertility outcomes has been a focus of reproductive health research. Soylu et al. (2018) conducted a large cohort study examining the effects of coffee, tea, and overall caffeine intake on primary infertility risk among Danish women (29). Their analysis revealed no significant association between caffeine intake and primary infertility, suggesting that moderate caffeine consumption may not pose a risk to female reproductive health in the general population. However, in the context of broader dietary and lifestyle modifications, these findings highlight the importance of considering individual variability in response to certain stimulants. Tirabassi et al. (2018) also addressed female reproductive health, focusing on the potential benefits of vitamin D for hormonal balance and its implications for sexual function (20). The study's findings pointed to vitamin D's ability to positively influence reproductive hormones, suggesting that vitamin D supplementation could be beneficial in supporting sexual health for women experiencing hormonal fluctuations. These insights underscore the diverse roles that nutrients and lifestyle factors may play in female sexual health, as well as the importance of personalised dietary recommendations to enhance reproductive outcomes.

### **DISCUSSION**

This scoping review highlights nutrition's essential role in sexual health and intimacy by exploring the relationships between specific nutrients, dietary patterns, and reproductive outcomes. Good nutrition is crucial for maintaining sexual well-being, as it supports reproductive functions, hormonal balance, and psychological satisfaction, which are all vital components of intimate relationships. Nutritional deficiencies, poor dietary habits, and inadequate intake of specific nutrients can impair sexual function, reduce fertility, and lead to sexual dissatisfaction, negatively affecting overall quality of life.

Several studies in this review demonstrated that supplementation with key nutrients improves erectile function, a core aspect of sexual health. For example, the combination of vitamin E, Korean ginseng, and Siberian ginseng led to significant improvements in erectile function, orgasmic function, and overall sexual satisfaction ( $p = 0.033$ ) (16). Another study found that vitamin D supplementation positively influenced erectile function, indicating a strong association between optimal vitamin D levels and sexual performance (20,23). Vitamins C and E are antioxidants important in

lowering oxidative stress, which is necessary to preserve vascular function. By aiding in the scavenging of reactive oxygen species (ROS), they maintain the health of endothelial cells by preventing oxidative damage. Since nitric oxide (NO) is essential for getting and keeping an erection, increasing nitric oxide synthesis with antioxidant vitamins is especially pertinent to erectile function. Therefore, enhanced endothelial function by antioxidants may benefit sexual health (33). Additionally, the NO bioavailability increases through the consumption of watermelon (*Citrullus lanatus*), which is a vital vasoactive molecule that is essential for maintaining vascular health, including vasodilation, endothelial function, reduction of arterial stiffness, and improvement of blood pressure. In short, foods that enhance NO may help improve sexual health by promoting better blood flow, which is essential for sexual functioning.

The review also highlighted the adverse effects of alcohol consumption on hormonal balance. A study on Korean men found that heavy alcohol intake increased the risk of testosterone deficiency in those experiencing facial flushing, with drinkers showing a higher risk compared to non-drinkers ( $p = 0.025$ ) (15). Drinking alcohol interferes with the hypothalamus's ability to release gonadotropin-releasing hormone (GnRH). Follicle-stimulating hormone (FSH) and luteinising hormone (LH), both necessary for testosterone synthesis in the testes, are produced by the pituitary gland in response to GnRH. Studies have demonstrated that long-term alcohol consumption lowers circulating testosterone levels, with heavy drinkers showing a considerable decrease in both total and free testosterone concentrations (34). Furthermore, vitamin B12 deficiency was identified in 26.7% of men with sexual desire disorders compared to 17.4% of those without, indicating a potential link between B12 levels and sexual function. However, the association was not statistically significant (3).

Dietary patterns also play a significant role in reproductive health through modulating hormones including testosterone, estrogen, and progesterone. This review found that adherence to the DASH diet was associated with improved sperm concentration, motility, and total sperm count ( $p < 0.04$ ) (21). Similarly, higher adherence to the Mediterranean diet was correlated with better sperm quality, with individuals scoring above 6.25 on the Mediterranean Diet Adherence Screener (MEDAS) having a higher chance of normozoospermia (27). By lowering oxidative stress and enhancing hormonal balance, diets high in antioxidants, fibre, and healthy fats are essential for boosting fertility. According to Łakoma et al. (2023), antioxidants shield cells from free radical damage, which might harm reproductive health (35). They aid in reducing oxidative stress, a disorder that has been connected to infertility in both men and women. Conversely, a Western dietary pattern characterised by processed foods and high sugar intake was linked to

decreased sperm concentration and testosterone levels ( $p = 0.007$ ) (26). This underscores the negative impact of unhealthy dietary patterns on reproductive outcomes.

Omega-3 fatty acids were beneficial across multiple studies, improving sperm motility, morphology, and fertilisation rates. For example, omega-3 supplementation enhanced sperm quality in male workers ( $p = 0.032$ ) (17) and positively influenced fertilisation outcomes in women undergoing fertility treatments ( $p < 0.05$ ) (24). According to studies, sperm plasma membranes can be shielded from oxidative damage by diets high in omega-3 fatty acids, maintaining their structural integrity and functionality (36). Additionally, DHA-enriched fish oil supplementation was associated with increased testosterone levels in overweight males ( $p < 0.001$ ), highlighting the importance of essential fatty acids in hormonal regulation (31).

Herbal supplements were also found to enhance sexual function. Sexual functioning is a complex process of physiological and psychological that is regulated by several systems, including the central nervous system (CNS) and neuroendocrine axis. Sexual desire, arousal, and performance are all significantly influenced by neuropeptides like oxytocin, hormonal balance, and neurotransmitter pathways, especially the dopaminergic system. Ashwagandha root extract improved female sexual function, increasing desire, arousal, lubrication, and satisfaction, with participants experiencing fewer symptoms of sexual distress ( $p < 0.0001$ ) (32). Ashwagandha has mood-boosting qualities that encourage relaxation and a sense of well-being. Given that chronic stress is associated with lower levels of genital arousal, this mood boost may result in enhanced sexual desire and enjoyment (37).

Apart from that, a contemporary review of evidence stated that Panax Ginseng and Tribulus Terrestris have a pivotal role in female sexual functioning and treating dysfunction. The potential impact of Panax Ginseng and Tribulus Terrestris on enhancing female sexual dysfunction was facilitated by a variety of mechanisms, including vascular protection by improving blood circulation (through anti-oxidative process); activation of neuropeptides like oxytocin; hormonal functioning like estrogen and testosterone and modulation of dopaminergic system (38). The mesolimbic dopamine pathway, specifically the ventral tegmental area (VTA), plays a crucial role in sexual drive and pleasure (39). Dopaminergic activity is affected by the dietary components that modulate neurotransmitter synthesis and receptor sensitivity. Furthermore, probiotic and prebiotic supplementation with Flortec significantly improved sperm quality, including concentration, motility, and morphology, in men with infertility issues ( $p < 0.01$ ) (18). This highlights the emerging role of gut health in reproductive function.

While several nutritional interventions were effective, some yielded insignificant results. For instance, soy protein supplementation had no impact on sexual maturation in children, suggesting that isoflavone-rich diets may not directly influence puberty or sexual health (14). Similarly, a randomised trial on folic acid and zinc supplementation found no improvement in semen quality or live birth rates but reported increased DNA fragmentation ( $p = 0.03$ ) (28). These findings indicate that not all nutrients influence reproductive health uniformly and highlight the need for more targeted interventions.

This review also explored the relationship between glycaemic control and reproductive health. Higher glycaemic load (GL) was consistently associated with better sperm quality, including improved concentration and motility. However, the glycaemic index (GI) effects were inconsistent across analyses (22). These findings suggest that maintaining stable blood sugar levels may contribute to optimal reproductive outcomes by reducing oxidative stress and inflammation. In contrast, a cohort study found no significant association between caffeine consumption and primary infertility (HR = 1.00, CI 0.98–1.02), indicating that moderate caffeine intake does not impair fertility (29).

Furthermore, this study acknowledges some limitations that arise due to some factors. One of the factors is the heterogeneity in the nutrition and dietary interventions such as differences in nutrient composition, duration, and adherence to the intervention, which may contribute to inconsistent results. Additionally, variations in terms of the study designs, assessment tools, and analytical approaches may complicate the comparison across different studies. However, to address these limitations, future research should develop standardized dietary intervention protocols and assessment methods that could help reduce variability and enhance comparability across studies. Furthermore, multi-center trials and meta-analyses may provide more comprehensive insight into the effectiveness of dietary interventions, increasing the evidence of this area of study.

## CONCLUSION

In conclusion, the findings from this scoping review provide a comprehensive summary of the relationship between food, nutrition, and sexual health and intimacy. Nutritional screening and dietary interventions are crucial in addressing sexual health concerns, as deficiencies in critical nutrients such as vitamin B12 and omega-3 fatty acids were associated with sexual dysfunction and poor reproductive outcomes. Additionally, the evidence suggests that specific nutrients, dietary patterns, and supplements (e.g., soy protein supplement, vitamin E, Ginseng, Omega-3FA, etc) significantly improve sexual function, reproductive outcomes, and hormonal balance. Healthy dietary patterns, such as the DASH and Mediterranean diets, were consistently associated with

better sperm quality, improved fertility, and enhanced sexual performance. In contrast, unhealthy dietary patterns, including consumption of processed food, were linked to adverse reproductive outcomes, such as reduced sperm concentration and testosterone levels. Thus, adopting healthier eating patterns and using targeted supplements could serve as crucial strategies for enhancing sexual health, reproductive function, and emotional intimacy. Furthermore, future studies are needed to identify effective nutrient combinations and to understand the specific dietary factors that may enhance reproductive health across different populations and individual health profiles.

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