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Association Between Food and Nutrition Literacy and Nutritional Status: A Systematic Review

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ABSTRACT

Background: Food and nutrition literacy constitutes an essential component of health literacy, encompassing an individual's capacity to access, interpret, evaluate, and apply information pertaining to food and nutrition. Enhanced literacy levels are hypothesized to influence dietary behaviors, and subsequently, to affect an individual's nutritional status.

Aims: This systematic review aims to examine the association between food and nutrition literacy and nutritional status across diverse populations.

Methods: This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A comprehensive literature search was performed across four electronic databases: PubMed, Scopus, Web of Science, and Google Scholar. Articles eligible for inclusion were those published within the previous ten years, written in either English or Indonesian, employing quantitative research designs, and available in full text.

Results: An initial search yielded 252 articles, of which 27 met the predefined inclusion criteria following a rigorous screening process and were subsequently included in the final analysis. The reviewed studies demonstrated that food and nutrition literacy could be assessed through a variety of validated instruments and that its relationship with nutritional status was reported across different population groups, health conditions, and age categories.

Conclusions: The association between food and nutrition literacy and nutritional status appears to be modulated by several intervening variables including age, health status, and socio-cultural factors. While numerous studies have reported a positive correlation between higher literacy levels and improved nutritional outcomes, others have observed no significant association. Furthermore, literacy-based educational interventions have demonstrated efficacy in mitigating risks associated with anemia, stunting, and obesity.

Keywords: Food Literacy; Nutrition Literacy; Nutritional Status.

Article Information



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1 INTRODUCTION

In developing countries, rapid population growth and constrained economic resources exert a profound impact on public health and national productivity.

Food literacy and nutrition literacy constitute more specialized and increasingly recognized dimensions of the broader construct of literacy focusing on the knowledge, skills, and competencies required to navigate food environments and make informed dietary decisions (Velardo, 2015; Krause *et al.*, 2016). Food and nutrition literacy has attracted considerable and growing scholarly interest, driven by the recognition that the escalating complexity of contemporary food environments demands considerable understanding of food systems, nutrient composition, and dietary behavior than has previously been required of the general population (Liu *et al.*, 2021). In this broader

conceptualization, food and nutrition literacy, does not only include the ability to comprehend food labels or interpret nutrition information panels, but extends to the capacity to critically evaluate food-related information, assess the food environment in which dietary choices are made, and translate this understanding into the practical selection of appropriate foods (Vidgen & Gallegos, 2014). Research conducted in Kansas, USA demonstrated that individuals with higher level of nutrition literacy exhibit a greater tendency to consume adhere to dietary patterns characterized by nutritional quality — most notably the Mediterranean dietary pattern — whilst individuals with lower nutrition literacy levels are more likely to select foods with high sodium content, elevated fat levels, and a high degree of processing (Taylor *et al.*, 2019). In a further study, a food literacy intervention was associated with a statistically significant reduction in body mass index (BMI) among adolescents, with

consequent implications for the reduction of overweight and obesity risk in this population group (Mancone *et al.*, 2024).

Indonesia confronts a complex and multifaceted nutritional burden that manifests across all age groups, from early childhood through to adulthood (Ministry of Health of the Republic of Indonesia, 2019, Ministry of Health of the Republic of Indonesia, 2023). Among children under five years of age, the prevalence of stunting, underweight, and wasting stands at 15.8%, 12.9%, and 6.4%, respectively (Ministry of Health of the Republic of Indonesia, 2023). Among school-age children (5–12 years) and adolescents (13–15 years), the combined prevalence of overweight and obesity reached 19.7% and 16.2%, respectively (Ministry of Health of the Republic of Indonesia, 2023). For individuals aged 15 years and above, central obesity affects 36.8% of the population (Ministry of Health of the Republic of Indonesia, 2023). These national figures are situated within a broader global context of persistent childhood undernutrition: according to global estimates for 2024, approximately 23.2% of children under five years of age — equivalent to 150.2 million children — were affected by stunting; 6.6% (42.8 million) were affected by wasting; and 5.5% (35.5 million) were classified as overweight (World Health Organization (WHO), 2025).

Food and nutrition literacy plays a pivotal and well documented role in shaping dietary choices and food behaviors, which in turn exert a significant influence on individual and population nutritional status (Doustmohammadian *et al.*, 2020). As a construct, food and nutrition literacy encompasses an individual's knowledge, skills, and practical competencies in planning, managing, selecting, preparing, and consuming food in a manner that fulfils nutritional requirements and supports health (Vidgen & Gallegos, 2014). When parents and primary caregivers possess a strong foundation of food and nutrition literacy, they are better equipped to provide balanced and nutritionally adequate meals for their children, with consequent positive effects on child growth, development, and nutritional status (Gibbs *et al.*, 2016). The assessment and enhancement of food and nutrition literacy therefore represent critical priorities for nutrition research and public health intervention.

Against this background, the present systematic review aimed to synthesize the available evidence on the association between food and nutrition literacy and nutritional status across population groups. This review is intended to contribute to the advancement of nutrition science with respect to food and nutrition literacy, and to serve as a foundational reference for future research in community nutrition. The findings are additionally expected to provide an evidence base for the design and implementation of targeted interventions and strategies aimed at improving food

and nutrition literacy and, consequently, reducing the burden of malnutrition in its multiple forms — including the triple burden of malnutrition encompassing undernutrition, micronutrient deficiency, and overnutrition.

2 METHODS

2.1 Search Strategy

The present systematic review examined the association between food and nutrition literacy and nutritional status across diverse population groups. The review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines encompassing the sequential stages of identification, screening, eligibility assessment and inclusion of relevant studies. Literature searches were performed across four major academic databases: PubMed, Scopus, Web of Science, and Google Scholar. The search strategy employed the following controlled vocabulary and free-text terms: "food literacy", "nutrition literacy", and "nutritional status". These search terms were combined using Boolean operators as follows: ("food literacy" OR "nutrition literacy") AND "nutritional status". Article selection proceeded through the sequential stages of publication year restriction, title screening, abstract screening, and full-text eligibility assessment.

2.2 Eligibility Criteria

Studies were considered eligible for inclusion if they met all of the following predefined criteria: publication within the ten-year period from 2015 to 2025; publication in the English or Indonesian language, utilization of quantitative research design; and availability of the full text for retrieval and review. Eligible studies encompassed human participants drawn from all population groups in community settings and assessed the level of food and/or nutrition literacy with or without an associated intervention component. The inclusion of a comparator group was not a mandatory criterion for eligibility. The primary outcome of interest was the association between food and nutrition literacy and nutritional status, as assessed by any validated or standardized measurement instrument. Studies were excluded if they did not report a quantifiable measure of food or nutrition literacy, did not include a nutritional status outcome, or failed to meet the publication year, language, or full-text availability criteria.

2.3 Study Selection and Data Extraction

All records identified through the database searches were imported into Covidence (Veritas Health Innovation, Melbourne, Australia) for systematic management and screening. Duplicate records were automatically identified and removed by the software prior to screening. A single trained reviewer conducted the initial screening phase, which

involved the systematic evaluation of titles and abstracts of all retrieved records to identify studies potentially relevant to the review objective. Studies meeting the preliminary eligibility criteria at the title and abstract screening stage were subsequently retrieved in full text and assessed against the predefined inclusion and exclusion criteria.

Data extraction was performed manually by the primary author employing data extraction form developed for this review. For each included study, the following information was extracted: first author name, year of publication, study title, country of conduct, research methodology and study design, participant characteristics, measurement instruments employed to assess food and nutrition literacy and nutritional status, and the principal findings pertaining to the association between these variables.

2.4 Quality Assessment

The methodological quality and risk of bias of all included studies were appraised through the Joanna Briggs Institute (JBI) Critical Appraisal tools, selected and applied according

74%); and low quality with high risk of bias (0–49%). Full quality appraisal scores and ratings for each included study are presented in the [Supplementary Data](#).

3 RESULTS

3.1 Characteristics of Included Studies

The initial database search, conducted using the predefined keyword combinations, yielded a total of 252 records. Following the automated identification and removal of 83 duplicate records — facilitated by the deduplication tool within Covidence — 169 unique articles proceeded to the title and abstract screening stage. Application of the predefined inclusion and exclusion criteria at this stage resulted in the retrieval of 93 full-text articles for further eligibility assessment. Subsequent full-text review against the eligibility criteria resulted in the final inclusion of 27 articles in the present systematic review ([Figure 1](#)).

With respect to study design, the majority of included articles employed an observational methodology, with 23

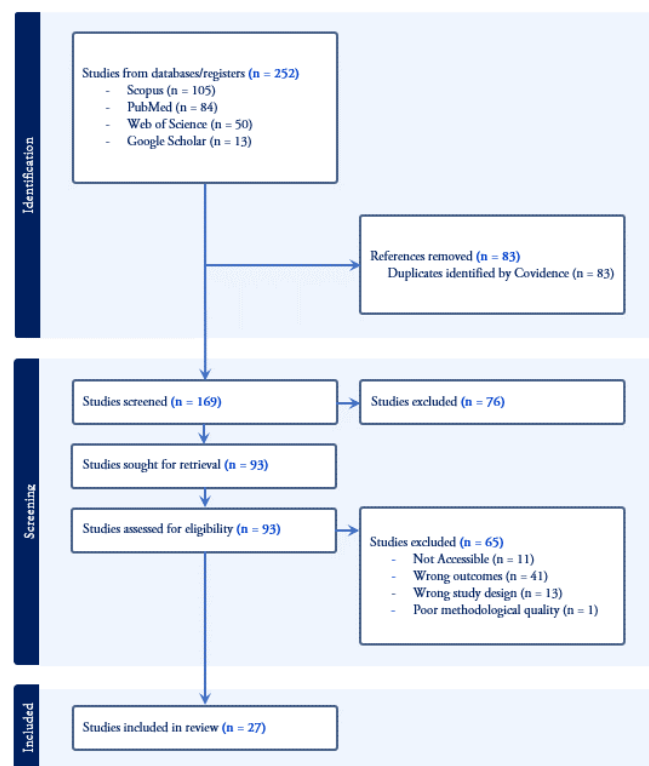


Figure 1. PRISMA Flow Chart Diagram

to the specific study design of each included article — encompassing cross-sectional, randomized controlled trial, and quasi-experimental designs ([Moola et al., 2020](#); [Barker et al., 2023, 2024](#)). Quality assessment scores were classified into three categories: high quality with low risk of bias (75–100%); moderate quality with moderate risk of bias (50–

74%); and low quality with high risk of bias (0–49%). The remaining four employed experimental or quasi-experimental designs, comprising one randomized controlled trial (RCT), one intervention study, one study with a pre-post-test design, and one intervention-based pilot study ([Table 1](#)). Across the 27 included articles reviewed, it was consistently observed that

food and nutrition literacy can be assessed using a diverse array of validated and non-validated instruments, and that associations between food and nutrition literacy and nutritional status manifest across a wide range of conditions and population age groups.

Nutritional status was assessed employing Body Mass Index (BMI) in adult populations and BMI-for-age in participants under 18 years of age. For child population, additional anthropometric indicators — including height-for-age, weight-for-age and weight-for-height z-scores — were regularly applied. In specific target populations, supplementary nutritional status indicators such as anemia status (assessed by hemoglobin concentration) and sarcopenia risk (through SARC-CALF screening tool) were additionally utilized (Du *et al.*, 2024; Sudaryati *et al.*, 2023; Tezol & Mammadova, 2023).

The study populations were highly diverse, encompassing adolescents — including secondary school students — university students, young adults, adults, older adults, pregnant women, mother of children under-five of age, parents and caregivers, as well as clinical populations including patients with inflammatory bowel disease, patients with breast cancer, and patients with prostate cancer (Hamilton-Reeves *et al.*, 2021; Tang *et al.*, 2023c; Yin *et al.*, 2023; Xia *et al.*, 2024). Several studies additionally included occupational populations, such as university staff and call center employees (Svendson *et al.*, 2021; Kocaay & Şanlıer, 2023).

The included studies were conducted across multiple countries spanning four continents. The largest concentration of studies was conducted in Turkey ($n = 7$), followed by China ($n = 5$), Indonesia ($n = 5$), Iran ($n = 3$), Lebanon ($n = 1$), Egypt ($n = 1$), Romania ($n = 1$), Norway ($n = 1$), Czech Republic ($n = 1$), Greece ($n = 1$), and the United States of America ($n = 1$).

3.2 Association Between Food and Nutrition Literacy and Nutritional Status

The evidence on the relationship between food and nutrition literacy and nutritional status across the included studies yielded heterogeneous findings, with studies reporting both significant positive associations and no statistically significant relationships between these variables

A substantial proportion of the included studies identified statistically significant associations between improved food and nutrition literacy and favorable nutritional status outcomes (El-Ahmady & El-Wakeel, 2017; Syafei & Badriyah, 2019; Ashoori *et al.*, 2021; Costarelli *et al.*, 2022; Maheri *et al.*, 2022; Kocaay & Şanlıer, 2023; Papežová *et al.*, 2023; Yin *et al.*, 2023; Xia *et al.*, 2024; Zhixue *et al.*, 2024). One study identified a strong and statistically significant correlation between nutrition literacy and nutritional status

in adolescents ($r = 0.576$) (Syafei & Badriyah, 2019). A further study demonstrated that maternal nutrition literacy was significantly associated with child growth outcomes across multiple anthropometric indices, including weight-for-age, height-for-age, and weight-for-height z-scores (Maheri *et al.*, 2022). Additional investigation revealed that parents of children classified as obese exhibited significantly lower nutrition literacy scores compared to parents of children with underweight or normal weight status ($p = 0.002$) (Costarelli *et al.*, 2022), suggesting that parental nutritional literacy may exert a direct influence on children's dietary behaviors and contribute meaningfully to the emergence and perpetuation of childhood obesity. Additionally, individuals with normal nutritional status were found to achieved significantly higher food and nutrition literacy scores compared with those classified as underweight or overweight, further supporting the directionality of this association (Zhixue *et al.*, 2024). Two studies additionally reported a statistically significant negative correlation between food and nutrition literacy and nutritional status, whereby higher food and nutrition literacy scores were associated with a significantly lower probability of abnormal nutritional status classification (Du *et al.*, 2024; Uzdil *et al.*, 2024).

In contrast, a substantial number of the included studies reported no statistically significant association between nutrition literacy and nutritional status (Mahmudiono *et al.*, 2018; Ayer & Ergin, 2021; Svendsen *et al.*, 2021; Taleb & Itani, 2021; Depboylu *et al.*, 2023; Priambudi & Farapti, 2023; Tang *et al.*, 2023c; Tezol & Mammadova, 2023; Boariu *et al.*, 2024; Mostafazadeh *et al.*, 2024). Among secondary school students, no statistically significant correlation was identified between nutrition literacy and nutritional status ($p > 0.05$) (Priambudi & Farapti, 2023). Similarly, no significant association was observed between nutrition literacy and BMI among adolescents in Lebanon (Taleb & Itani, 2021), and food literacy was not significantly correlated with BMI or age among university students in Romania (Boariu *et al.*, 2024). A study conducted in Iran revealed no significant association between food and nutrition literacy and nutritional status; however, university students with higher literacy levels demonstrated healthier dietary practices and a lower estimated risk of obesity, (Mostafazadeh *et al.*, 2024).

The heterogeneity of findings across the included studies suggests that whilst food and nutrition literacy possess the potential to influence on nutritional status, the relationship between these variables is not direct or universal, and is likely modulated by additional contextual determinants — including established dietary habits, socioeconomic circumstances, cultural food norms, and lifestyle practices — that may exert a stronger or more proximal influence on nutritional outcomes in certain population groups (Tang *et al.*, 2023b).

Table 1. Summary of Data Extraction

Author, publication year	Methodology	Participants	Food and nutrition literacy instruments & nutritional status measurement	Results
Ashoori <i>et al.</i> (2021)	Cross-sectional	626 high school students in Tehran, Iran	A validated self-administered questionnaire to assess Food and Nutrition Literacy (FNL) and its components (knowledge, functional skills, interactive, advocacy, critical analysis of information, and food label reading skills); BMI-for-age	Food and nutrition literacy (FNL) score of students was low (52.1 ± 10.96 out of a range of 0-100). FNL scores had a very low association ($r < 0.1$) with BMI-for-age Z-score.
Zhixue <i>et al.</i> (2024)	Cross-sectional	5,390 young adults	Food and Nutrition Literacy Questionnaire for Chinese Adults (FNLQ); BMI	NL scores are higher in people with normal nutritional status compared to those who are thin and overweight. Adequate NL scores are associated with people with normal nutritional status
Boariu <i>et al.</i> (2024)	Cross-sectional (pilot study)	120 students in Romania	Food literacy scale; BMI	There is no relationship between food literacy and BMI.
Uzdil <i>et al.</i> (2024)	Cross-sectional	551 adult respondents	Short Food Literacy Questionnaire (SFLQ); neck circumference, waist circumference, hip circumference, waist to hip ratio, waist to height ratio, BMI	Respondents with higher nutritional status, such as overweight and obesity, had lower food and nutrition literacy (SFLQ) scores. There was a significant negative correlation between SFLQ scores and nutritional status indicators such as neck, waist and hip circumference, as well as WHR, WHtR and BMI ratios, indicating that the higher the nutritional status, the lower the level of food and nutrition literacy.
Sudaryati, Zуска and Masthalina (2023)	Behavior changes intervention with Social Cognitive Theory	30 pregnant women from families experiencing food insecurity and earning less than the minimum wage	Behavior change intervention with Social Cognitive Theory is carried out with visits for 6 weeks according to the module.	The intervention related to local food literacy reduced the prevalence of anemia from 63.3% to 13.3% after the intervention in the pregnant women group.
Yin <i>et al.</i> (2023)	Cross-sectional	372 inflammatory bowel disease patients	Food Literacy Evaluation Questionnaire Chinese version; BMI	Food literacy has a very low relationship with BMI as shown by the value of $r = 0.02$
Kocay and Şanlıer (2023)	Cross-sectional	545 call center employees	Perceived Food Literacy Scale; BMI	There was a significant difference between BMI and PFLS groups. Employees with overweight nutritional status have the lowest food literacy score among others.
Ayer and Ergin (2021)	Cross-sectional	523 9 th grade teenagers in Turkey	Adolescent Nutrition Literacy Scale (ANLS); BMI-for-age	There was no significant difference ($p = 0.93$) in NL scores in each nutritional status category (underweight, healthy weight, overweight and obese).
Depboylu <i>et al.</i> (2023)	Cross-sectional	1,074 secondary school students in Izmir, Turkey	Adolescent Nutrition Literacy Scale; BMI-for-age	Higher nutritional literacy was associated with a better Mediterranean diet, higher water consumption, and less fast-food consumption. No significant association with BMI ($p=0.945$)
Priambudi and Farapti (2023)	Cross-sectional	168 high school students	Nutrition literacy questionnaire including functional nutrition literacy, interactive nutrition literacy, and critical nutrition literacy; BMI-for-age	There is no association between nutritional literacy and nutritional status ($p>0.05$)

Table 1. (Continued)

Author, publication year	Methodology	Participants	Food and nutrition literacy instruments & nutritional status measurement	Results
Syafei and Badriyah (2019)	Cross-sectional	148 high school students	Nutrition literacy questionnaire indicators consist of nutrition and health, energy sources in food, food labeling and calculation of nutritional value, household food measurement (URT), food groups, and consumption of food skills; BMI	Strong and significant relationship between nutritional literacy and nutritional status ($r = 0.576$)
Taleb and Itani (2021)	Cross-sectional	189 adolescents (14-19 years old) in Tripoli, Lebanon	Nutrition Literacy Assessment Instrument (NLAI); BMI-for-age	There is no association between nutritional literacy and BMI. There was a significant difference in BMI in the male group before and after the intervention ($p = <0.001$), BMI for age men decreased after the intervention. While in the female group there was no significant difference during the intervention ($p = 0.913$).
Bozkurt and Yildiran (2024)	Pre-test post-test design	132 adolescents aged 11 - 15 years	Adolescent Nutrition Literacy Scale; BMI-for-age	There was a positive correlation between nutrition literacy and healthy eating habits ($r=0.73$) and health performance ($r = 0.32$). Health performance here includes BMI category.
El-Ahmady and El-Wakeel (2017)	Cross-sectional	423 pharmacy students in Egypt	Questionnaire included basic nutrition knowledge and concepts, health awareness, nutritional habits, health related performance; self-reported BMI	There is no statistically significant relationship between food and nutrition literacy and nutritional status ($p = 0.356$). The "r" value of -0.062 indicates a very weak negative relationship between nutrition literacy and BMI.
Mostafazadeh et al. (2024)	Cross-sectional	224 nursing students	Nutritional Literacy Self-Assessment Questionnaire for Students (NL-SF12); BMI	BMI above 25 is not associated with nutrition literacy functional skill scores (knowing and understanding healthy eating patterns).
Svendsen et al. (2021)	Cross-sectional	414 students and 112 employees	Functional and critical nutrition literacy questionnaire; BMI	BMI is negatively associated with nutrition literacy ($r = -0.174$)
Sanlier et al. (2024)	Cross-sectional	1,600 adults	Evaluation Instrument of Nutrition Literacy on Adults; BMI	Nutritional literacy and the likelihood of sarcopenia have a negative correlation where the higher the nutritional literacy, the lower the likelihood of sarcopenia.
Du et al. (2024)	Cross-sectional	1,338 older adults	short-form Nutrition Literacy scale and SARC-CALF to identify sarcopenia	Pregnant women with underweight and extremely obese nutritional status had poorer nutritional literacy compared to pregnant women with normal, overweight and obese nutritional status.
Papežová et al. (2023)	Cross-sectional	401 pregnant women in the Czech Republic	Questionnaire on nutrition knowledge; BMI	Maternal nutrition literacy intervention had an effect on variations in nutritional status based on HAZ ($p < 0.05$) in all groups.
Sirajuddin et al. (2021)	RCT	85 mothers of infants aged 0 - 6 months (43 in the intervention group and 42 in the control group)	Interventions included educational classes, stimulation classes, home visits two times per month for a total of 15 visits, monitoring child growth and hand sanitation.	

Table 1. (Continued)

Author, publication year	Methodology	Participants	Food and nutrition literacy instruments & nutritional status measurement	Results
Mahmudiono <i>et al.</i> (2018)	Cross-sectional	685 mother and toddler pairs	Nutrition literacy consists macronutrients, household food measures and food groups; BMI and height-for age	Households with overweight mothers and stunted toddlers (SCWOT) have lower maternal nutrition literacy. than in NM and OWT households.
Maheri <i>et al.</i> (2022)	Cross-sectional	405 mothers of toddlers	Evaluation Instrument of Nutrition Literacy on Adults Persian version; Z-Score of weight-for-age (WAZ), height-for age (HAZ) and weight-for-height (WHZ)	A significant relationship between maternal nutritional literacy and weight-for-age, height-for-age and weight-for-height.
Tezol and Mammadova (2023)	Cross-sectional	90 mother-child pairs aged 24 - 59 months	Evaluation Instrument of Nutrition Literacy on Adults; hemoglobin, Weight-for-age, height-for-age, and weight-for-height z-scores	No difference in maternal nutrition literacy between ID/IDA and anemia groups, the percentage of wasting was higher in families with borderline nutritional literacy than those with adequate nutritional literacy.
Costarelli <i>et al.</i> (2022)	Cross-sectional	402 parents in Greece	Greek version of the Nutrition Literacy Scale; BMI and IOTF for children status	Parents of obese children had lower NL scores, compared to parents of thin and healthy children ($p = 0.002$)
Xia <i>et al.</i> (2024)	Cross-sectional	1,552 women cancer survivors	Nutrition Literacy Assessment Scale for cancer survivors; BMI	A significant relationship between nutritional status based on BMI and the level of nutritional literacy in breast cancer survivors ($p = 0.012$)
Tang <i>et al.</i> (2023c)	Cross-sectional	326 breast cancer patients	Nutrition Literacy Measurement Scale for Chinese Adult; BMI	No significant relationship between nutrition literacy and nutritional status of breast cancer patients ($p = 0.294$). Nutrition literacy scores are higher in underweight patients.
Hamilton-Reeves <i>et al.</i> (2021)	Quasi-experiment (pilot study)	20 men scheduled for prostatectomy, 15 in intervention group, 5 in non-intervention group	Weight loss intervention for 16 weeks prior to prostatectomy. Nutrition Literacy Assessments; BMI	The intervention led to significant reductions in body weight and BMI (-5.55 kg; $p = 0.01$), body fat, and waist circumference. However, nutritional literacy did not significantly improve (NLit score change $p = 0.12$), indicating that improved nutritional status was not accompanied by improved nutritional understanding.

4 DISCUSSION

The findings of the present systematic review reveal considerable heterogeneity in the nature and strength of the association between food and nutrition literacy and nutritional status across the included studies. While several studies identified statistically significant associations between higher food and nutrition literacy and more favorable nutritional outcomes, a comparable number reported no meaningful association between these variables. This inconsistency is likely attributable to several factors, most notably the considerable variability in the conceptualization and operationalization of food and nutrition literacy as a construct. As a relatively emerging and evolving field, food and nutrition literacy has not yet attained a standardized consensus with respect to its operational definition, constituent measurement domains, or scoring procedures, resulting in considerable methodological variation across studies and limiting the comparability of findings. Moreover, the included studies involved respondents from diverse backgrounds, spanning a wide range of age groups, socioeconomic conditions, cultural contexts, and food environments, all of which may influence both literacy levels and nutritional status outcomes.

The overall strength and quality of the evidence must additionally be appraised with appropriate critical rigor. The majority of included studies employed cross-sectional designs, which, by their inherent nature, limit the establishment of causal or temporal directionality in the relationship between food and nutrition literacy and nutritional status. Several studies additionally relied upon self-reported questionnaires to assess literacy levels, dietary behavior, and food selection practices, rendering the resulting data susceptible to recall bias and social desirability bias. Variability in the nutritional status indicators employed across studies — including BMI, age- and sex-specific BMI z-scores, or additional anthropometric measures — may further contribute to heterogeneity across studies. Furthermore, not all included studies adequately controlled for potential confounding factors, such as educational attainment, household income, food security status, health literacy, and access to nutritional information and health services. Notwithstanding these limitations, the available evidence collectively suggests that food and nutrition literacy may represent a meaningful contributor to healthier dietary behavior and more favorable nutritional outcomes across diverse population groups.

4.1 Food and Nutrition Literacy and Nutritional Status Across the Life Course

Analysis of the evidence stratified by life course stage revealed that the association between food and nutrition literacy and nutritional status varied according to age group and developmental context. Within the pediatric and

adolescent populations, one study identified a strong and statistically significant positive correlation between nutrition literacy and adolescent nutritional status ($r = 0.576$), suggesting that adolescents with higher levels of nutrition literacy tend to exhibit more favorable nutritional status profiles (Syafei & Badriyah, 2019). However, a number of studies failed to identify a statistically significant correlation between these variables in adolescent population. Among secondary school students, nutrition literacy was not directly correlated with nutritional status ($p > 0.05$) (Priambudi & Farapti, 2023), suggesting that additional mediating variables — dietary habits, social behavior patterns, family circumstances, peer influences, and psychological factors — may be of greater proximal importance in determining nutritional outcomes during adolescence.

Notably, one study demonstrated that adolescents with higher levels of nutrition literacy were more likely to adhere to the Mediterranean dietary pattern, increase water consumption, and reduce fast food intake; however, no statistically significant correlation with BMI was identified (Depboylyu *et al.*, 2023). This finding implies that the influence of nutrition literacy on nutritional status may be mediated through dietary behavior rather than directly reflected in anthropometric outcomes. A further study conducted in Iran reported that food and nutrition literacy scores among secondary school students were notably low and exhibited only a minimal association with BMI-for-age z-scores ($r < 0.1$) (Ashoori *et al.*, 2021). Multi-strategy educational interventions targeting adolescents have also displayed heterogeneous results, with one study demonstrating significant reductions in BMI-for-age among male adolescents but no statistically significant effect in female adolescents (Bozkurt & Yildiran, 2024), indicating that the responsiveness of nutritional outcomes to nutrition literacy interventions may vary by sex and warrants further investigation.

In the pregnant women population, the evidence suggests that nutritional status is associated with the breadth and depth of specific nutritional knowledge. Pregnant women classified as underweight or obese were found to exhibit lower nutrition literacy pertaining to iron, omega-3 fatty acids, iodine, macronutrients, and dietary recommendations compared to pregnant women with normal nutritional status (Papežová *et al.*, 2023). Furthermore, maternal nutrition literacy among overweight mothers with stunted children was identified to be lower compared with that of normal weight mothers with stunted children and of overweight or obese mothers without stunted children (Mahmudiono *et al.*, 2018). These findings indicate that inadequate food and nutrition literacy may contribute to the emergence and persistence of the household-level double burden of malnutrition, in which maternal overnutrition and child undernutrition coexist within the same family unit.

4.2 Food and Nutrition Literacy and Nutritional Status in the Context of Specific Health Conditions

A number of included studies examined the correlation between food literacy and nutrition knowledge in the context to specific clinical conditions, including oncological and chronic inflammatory diseases. One study demonstrated that enhanced nutritional literacy was positively associated with improved dietary practices among patient with cancer, with consequent beneficial effects on BMI (Tang *et al.*, 2023). A further study reported that patients with breast cancer exhibiting higher nutritional literacy are characterized by improved nutritional status as assessed by BMI suggesting that nutrition knowledge may facilitate dietary adaptation in response to cancer treatment-related physiological changes, including treatment side effects and heightened awareness of the importance of weight management during cancer care (Xia *et al.*, 2024).

In the context of inflammatory bowel disease (IBD), dietary literacy demonstrated a negligible correlation with BMI (0.02), suggesting that in this population, the influence of food literacy on dietary selection is substantially overshadowed by disease-specific factors — including gastrointestinal pathophysiology, nutrient malabsorption, and pharmacological therapies — that more powerfully determine nutritional status (Yin *et al.*, 2023). This observation underscores the importance of considering disease context when interpreting associations between literacy and nutritional outcomes in clinical populations. Moreover, in an intervention study involving patient with post-prostatectomy, no significant improvement in nutritional literacy was observed despite weight reduction (Hamilton-Reeves *et al.*, 2021), suggesting that changes in anthropometric nutritional status do not necessarily reflect concurrent improvements in nutritional knowledge or literacy, and vice versa.

4.3 Food and Nutrition Literacy and Nutrition-Related Health Indicators

In the context of adult and older adult population, nutritional literacy has been identified as a potentially important determinant of the prevention of both degenerative and deficiency-related nutritional conditions. Increased nutritional literacy has been identified to be inversely associated with the risk of sarcopenia, suggesting that individuals with a more comprehensive understanding of nutritional principles — including adequate protein intake, resistance exercise, and micronutrient requirements — may be better equipped to preserve skeletal muscle mass and functional capacity as they age (Du *et al.*, 2024).

With respect to anemia, the available evidence suggests a meaningful role for food literacy-based interventions in reducing its prevalence. A community-based study demonstrated that a structured local food literacy-based intervention can effectively reduce the prevalence of anemia among pregnant women, with the proportion affected declining from 63.3% to 13.3% in the intervention group ($n = 30$) (Sudaryati *et al.*, 2023). Whilst one study reported no statistically significant difference in maternal nutrition literacy between groups of mothers whose children were anemic and those whose children exhibited normal iron status, children of mothers with lower nutrition literacy displayed a higher prevalence of wasting (Tezol & Mammadova, 2023). Collectively, these findings indicate that maternal nutrition literacy may exert a substantial influence not only on maternal health outcomes but also on the nutritional status and health of children, particularly with respect to iron nutritional adequacy and the prevention of wasting.

4.4 Food and Nutrition Literacy and Nutritional Status Among Occupational Populations

A number of studies examined the association between food and nutrition literacy and nutritional status in occupational populations, yielding findings of practical relevance to workplace health promotion. Employees classified as overweight were identified to exhibit significantly lower food literacy scores relative to their counterparts with normal or underweight nutritional status (Kocaay & Şanlıer, 2023). This finding implies that an enhanced comprehension of nutritional principles within the working population may facilitate more effective dietary self-management and body weight regulation strategies among the workforce. In addition. Additionally, age and BMI were reported to be inversely associated with nutritional literacy in adult populations, suggesting that older individuals tend to exhibit lower levels of nutritional literacy — a pattern that may contribute to an increased long-term risk of overweight, obesity, and associated metabolic disorders if not addressed through targeted health promotion activities (Sanlier *et al.*, 2024). These findings collectively highlight the potential value of implementing structured nutrition education programs within occupational settings as an evidence-based approach to improving employee nutritional health and reducing the burden of nutrition-related chronic disease in the workforce.

The principal strength of the present systematic review lies in its broad scope of literature covering a wide range of age groups, population settings, and nutritional status indicators, thus enabling a comprehensive examination of the association between food and nutrition literacy and nutritional outcomes. However, several methodological limitations must be acknowledged. The reliance of a

considerable number of included studies on self-reported data introduces the risk of respondent bias, including both recall and social desirability bias. The considerable variability in the instruments employed for measuring food and nutrition literacy across included studies — in the context of limited international standardization of measurement tool — represents a further significant source of heterogeneity and limits the comparability and synthesis of findings across studies.

5 CONCLUSIONS

Food and nutrition literacy constitutes a crucial and potentially modifiable determinant of nutritional status across diverse demographic groups and life course stages. Individuals with high levels of nutrition literacy generally exhibit healthier dietary behavior and reduced vulnerability to both undernutrition and diet-related non-communicable diseases, although the magnitude and significance of this association are modulated by additional factors including socioeconomic conditions, cultural food norms, health status, and access to nutritious food. Furthermore, nutrition literacy has been associated with specific clinical nutritional indicators — including the risk of anemia and sarcopenia — suggesting that a well-founded understanding of nutritional principles may contribute to the prevention of these conditions in susceptible populations. These findings collectively emphasize the necessity for the development and implementation of comprehensive, community-based nutrition education interventions designed to improve food and nutrition literacy and thereby promote optimal nutritional status across all population groups.

For future research, a critical priority is the development and international validation of a standardized, cross-culturally applicable instrument for the assessment of food and nutrition literacy, which would substantially enhance the comparability of findings across studies and facilitate a more robust and generalizable analysis of the global evidence base on the relationship between food and nutrition literacy and nutritional health outcomes.

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