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Review

Exploring the Association Between of Food and Nutrition Literacy to Food Insecurity and Nutritional Status: A Scoping Review

Eksplorasi Hubungan antara Literasi Pangan dan Gizi terhadap Ketahanan Pangan dan Status Gizi: Tinjauan Skoping

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Abstract: *According to FAO data, by 2023, around 152 million people experienced food insecurity, and 733 million were undernourished. It is estimated that nearly 600 million people will still face hunger by 2030. This review aims to explore the association between nutrition and food literacy with food security and nutritional status. A scoping review was conducted using literature searches from Google Scholar, PubMed, and ScienceDirect. The inclusion criteria involved general population groups, with nutrition or food literacy as the exposure and food security or nutritional status as the outcome. A total of 293 studies were identified, and 11 met the inclusion criteria. Four studies demonstrated a direct association between nutrition or food literacy and food security, indicating that poor literacy was associated with higher food insecurity, especially among adolescents and adults. Among the eight studies examining the association with nutritional status, six found no significant association, while two showed a positive association. Results varied depending on the participant characteristics, study design, and measurement instruments. Several factors were identified as predictors of adequate food and nutrition literacy, such as urban residence, higher education level, working participants, number of children, having received nutrition education, and the presence of chronic diseases. Food and nutrition literacy is directly linked to food security and indirectly to nutritional status through improved dietary behaviors. This review supports future research and programs to strengthen food and nutrition literacy to enhance food security and nutritional outcomes.*

Key words: food literacy, food security, nutrition literacy, nutritional status, scoping review

1. INTRODUCTION

The problem of food security and malnutrition is still a global concern. According to FAO data, in 2023, there will be around 152 million people experiencing food insecurity and 733 million are undernourished compared to 2019 (1). The incidence continues to grow due to the COVID-19 pandemic, extreme weather changes, and the impact of the ongoing war in Russia and Ukraine, which has disrupted food supply chains. Low, middle, and high-income countries are currently experiencing food price inflation (2). The Sustainable Development Goals (SDGs) target of zero hunger by 2030 is becoming harder to achieve. It is estimated that nearly 600 million people will still face hunger by 2030. Food insecurity affects people, especially women living in rural areas, people with disabilities, and poor households. Moderate or severe levels of food insecurity affect lives in rural areas by 33.3 percent, in peripheral areas by 28.2 percent, and in urban areas by 26 percent in 2022 (3).

Food security consists of four dimensions: physical availability of food, economic, physical, and socio-cultural access to food, food utilization, and stability of these three dimensions over time (4). Establishing food security can be done through nutrition education, both formal and non-formal. Currently, people of all ages remain illiterate when it comes to food literacy and nutrition literacy. Food literacy is an effort to understand how food security is created (5). Food literacy can serve as a base for individuals, households, communities, or countries to defend food quality against change and strengthen food security over time. Food literacy consists of a collection of interconnected knowledge, skills, and behaviors required to plan, manage, select, prepare, and consume food to meet needs and determine intake (6). Meanwhile, with nutrition literacy, a person can make the right nutritional decisions (7).

Current studies show that poor food literacy (FL) and nutrition literacy (NL) in families are expected to result in poorer food security status within the household. Students with food insecurity were observed, and the results showed their low cooking skills and low cooking self-efficacy (8). Poor food literacy can exacerbate food insecurity. Conversely, food insecurity may limit an individual's ability to practice food literacy behaviors and achieve adequate diet quality (9). Improving food literacy in individuals has been identified as one of the strategies to reduce food insecurity (10).

Improving dietary patterns can be done by improving nutritional literacy. Better nutrition literacy can lead to better eating decisions (11). Eating habits are linked to socioeconomic factors in different walks of life. Data from a national health survey in the United States showed that the healthy eating index was 4 times higher among adults with higher education than those with lower education. Furthermore, the healthy eating index was found to be 2 times higher in adults with good food security compared to those who were food insecure (12). Food utilization is a key dimension of food security (13).

Currently, there is limited published research on how nutrition and food literacy concepts affect food security and nutritional status. The role of food literacy interventions in addressing food security remains unclear (14). However, in some studies, food literacy interventions have been shown to give people the skills to be healthier (14,15) (9). This scoping review aims to identify the role and influence of food literacy and nutrition literacy on food security and nutritional status. It also examines the factors that strengthen and hinder these associations.

Table 1. Description of the framework theme

Theme	Sub-theme	Description
Food literacy	- Knowledge of the effects of food on personal health and well-being - Knowledge of food systems from production, access to waste - Knowledge of the broad context of food systems, including social, environmental, cultural, and political factors - Food skills and practices	A person's ability to understand food so that they can develop a positive association with food, including food skills and practices across the life span, to navigate, engage, and participate within a complex food system. Food literacy is the ability to make decisions to support the achievement of personal health and sustainable food systems by considering the social, economic, cultural, and political components (7,16,17).
Nutrition literacy	- Nutrition knowledge - Food skills - Eating behavior awareness - Functional nutrition literacy (FNL)	The capacity to obtain, process, and understand nutrition information and use it to make informed nutrition decisions. Nutrition literacy is divided into three domains: functional nutrition literacy (FNL), interactive nutrition literacy (INL), and

Theme	Sub-theme	Description
	- Interactive nutrition literacy (INL) - Critical nutrition literacy (CNL)	critical nutrition literacy (CNL). FNL is the ability to understand, obtain, and apply nutrition information or nutrition services. INL is the ability to interact with others or build environments in a social context and avoid poor dietary behaviors and unhealthy environments. CNL is the ability to critically appraise and reflect on nutrition information or dietary advice in terms of personal needs (7,16,17).

2. METHODS

Study design and inclusion criteria

This research was a scoping review with a study design referring to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol. The inclusion criteria in this review were papers published between 2015 and 2025; the type of research included was observational or experimental research. Articles were excluded if they were not open access, thesis or dissertation, or proceedings, and the outcome was not food security or nutritional status.

Searching Strategy

The literature search was conducted in three databases Google Scholar, PubMed, and ScienceDirect between March and May 2025. The search strategy followed Population, Intervention, Control, and Outcome *(PICO)* framework. The population comprised the general public without restrictions on age or health conditions. The intervention or exposure involved nutrition literacy or food literacy. No specific control group was defined. The primary outcomes were food security and nutritional status (including malnutrition).

To ensure comprehensive coverage, the keywords included both “nutrition status” and “nutrition outcomes” to capture studies using varied terminology for nutrition related measures, as well as “malnutrition” to include research addressing undernutrition or overnutrition conditions. Table 2 summarizes the search terms applied to each all database and the number of articles retrived.

All identified articles were sceened using Rayyan, and eligible studies were selected bases on predefines inclusion and exclusion criteria. The review aimed to answer two research question: (1) What is the association between nutrition literacy or food literacy and food security? (2) What is the association between nutrition literacy or food literacy and nutritional status? The selected articles were then extracted, and then synthesized the research results are listed in Table 3.

Table 2. Keyword search for articles in the database

No	Database	Keyword	Total articles
1	Google Scholar	"food literacy" AND "nutrition literacy" AND "food security" AND "malnutrition" AND "nutrition outcomes"	39
2	Pubmed	food literacy AND nutrition literacy AND food security AND nutrition outcome	19
3	Sciencedirect	food literacy AND nutrition literacy AND food security AND malnutrition AND nutrition outcome	235

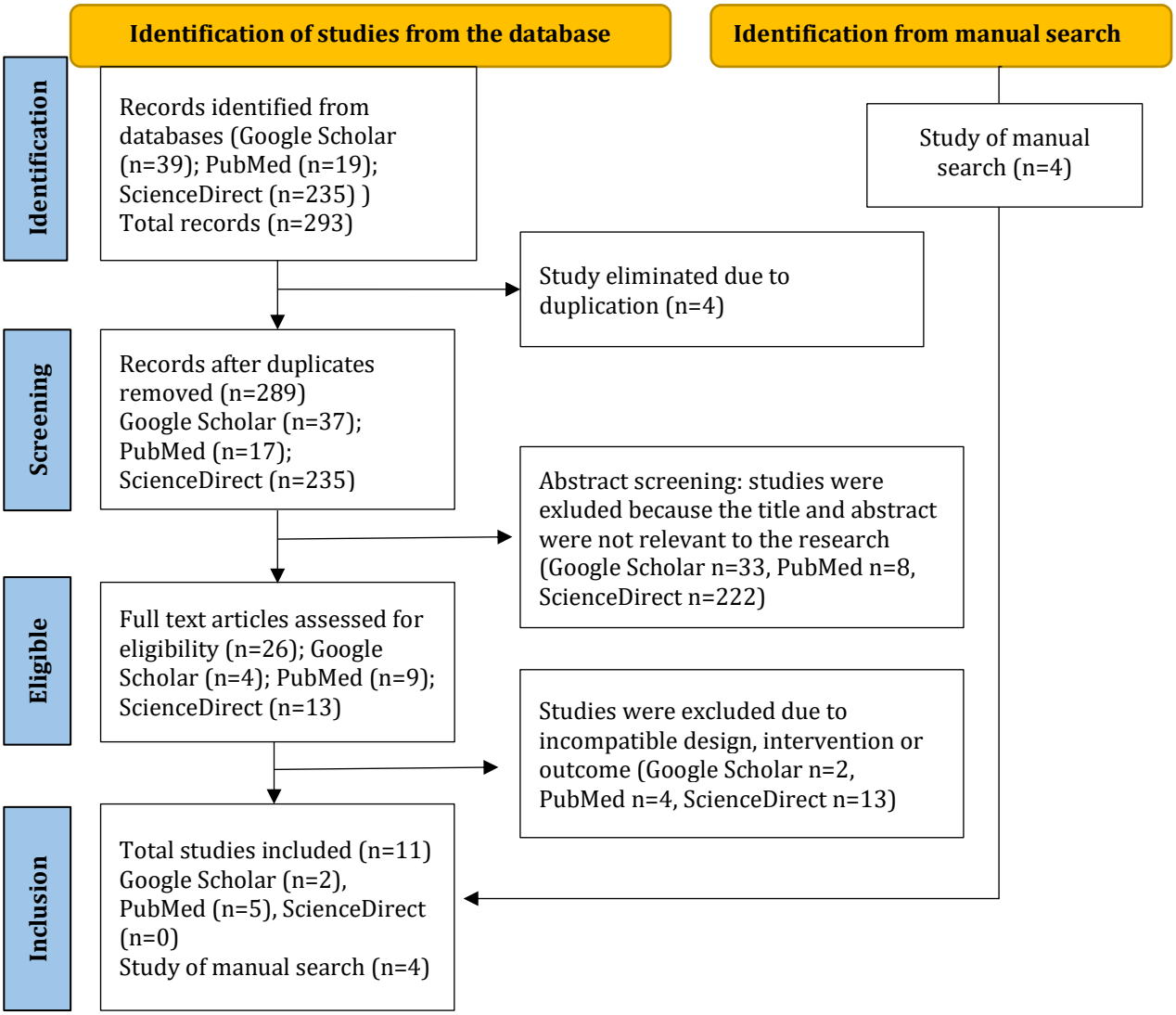

Figure 1. Literature search process using PRISMA protocol

3. RESULTS

The two hundred and ninety-three studies obtained from Google Scholar were 39 articles, PubMed 19 articles, and ScienceDirect 235 articles (see Figure 1). Seven studies were obtained that met the criteria, and then from the results of the literature search, as many as four studies, so the total was eleven studies. The results of the literature search that met the inclusion criteria were then extracted in Table 3.

Characteristics of Inclusion Studies

The research locations of the selected studies were Iran, Lebanon, Bahrain, Egypt, Jordan, Kuwait, Morocco, Palestine, Qatar, Saudi Arabia, the United Arab Emirates, Palestine, Italy, and the United States. The study designs used were cross-sectional (n=8), one-group pre-post survey (n=1), Randomized Controlled Trial (RCT) (n=1), and survey (n=1). The study subjects varied from children and adolescents to adults. However, there was one study where the sample was households. The age range of the subjects involved ranged from 9 years to 84 years.

Table 3. Summary of extracted results from selected studies

No	Author, Year, Country	Study Design	The subject of the study	Measurement Instruments for NL or FL and Food Security	Major Finding
1	Chang et al., 2017 (18) United States	Survey	Household (N=4158)	The USDA's 30-day Adult Food Security scale	- The practice of nutrition literacy was negatively associated with food safety and very low food safety (-0.38 and -0.025) with a p-value <0.05. Whereas the application of nutrition literacy among respondents who received food aid was positively related (0.078 and 0.041) with a p-value <0.01.
2	Khorramouz et al., 2020 (19) Iran	Cross-sectional	Children (N=315, 9-12 years old)	The developed FNLIT questionnaire. HFIAS (The Household Food Insecurity Access Scale)	- Children living in food-insecure households had lower nutrition literacy scores than those in food-secure households (AOR=2.89; p=0.04).
3	Seyyedi et al., 2020 (20) Iran	RCT	Mothers of children under 3 years of age (N=100, mean age of mother 30 years, mean age of child 16.4 months)	Nutritional literacy instrument based on the recommendation World Health Organization.	- Children of mothers who received the nutrition literacy intervention using smartphones showed greater changes in nutrition indicators than controls (WHZ +0.34; p=0.011, WAZ +0.35; p=0.001, HAZ +0.34; p=0.002). Children showed significant recovery from underweight and wasting conditions.
4	Natour et al., 2021 (21) Palestine	Cross-sectional	Adults (N=101, mean age 22.7 years old)	NVS (The Newest Vital Sign), SFDHKS (Short Format of the Diet Health and Knowledge Survey), USDA Food Security Questionnaire	- Food security was associated with nutrition literacy score, but the value was not significant (coefficient beta=-0.15; p=0.079). - There was no association between nutrition literacy and BMI (obesity and undernutrition). However, adults who were obese tend to practice healthy eating habits, while undernourished adults tend not to practice healthy eating habits. - Living in an urban area (p=0.035) was a factor that could improve nutrition literacy.
5	Taleb & Itami, 2021 (22) Lebanon	Cross-sectional	Adolescent (N=189, 14-19 years old)	NLAI (The Nutrition Literacy Assessment Instrument)	- There was no association between all nutrition literacy components (Macronutrient (RR=1.049), Nutrition Health (RR=1.062), Household food measurement (RR=0.974), Food Label and Numeracy

No	Author, Year, Country	Study Design	The subject of the study	Measurement Instruments for NL or FL and Food Security	Major Finding
					(RR=0.974), and Food Group (RR=0.91)) and BMI category (normal vs overweight/obesity). These results remained even when adjusting for potential confounders. - Nutrition literacy acts as a mediator to improve behavior and diet quality.
6	Vettori et al., 2021 (23) Italy	Cross-Sectional	Adults (N=74, mean age=38.8 years)	Nutrition Literacy Assessment Instrument (NLit-IT)	- The scores of all sections of the NLit-IT combined showed no significant association with Body Mass Index (p≥0.05). However, in the Nutrition and Health sub-section, NLit-IT had a significant association with Body Mass Index (Rho=-0.26; p=0.024). - Education level may increase the NLit-IT score (p=0.005).
7	Hoteit et al., 2022 (24) Lebanon	Cross-sectional	Parent-adolescent pairs (N=450, Adolescents aged 10-19 years, parents aged 18-64 years)	ANLS (the Adolescent Nutrition Literacy Scale), SFLQ (Short Food Literacy Questionnaire), AFFSS (The Arab Family Food Security Scale), Adolescent-level food security scale self-reported	- Poor parental food literacy increases the risk of household food insecurity by 2.7 times (OR=2.7; p<0.001). Poor adolescent nutrition literacy increases the risk of food insecurity by 1.6 times (OR=1.6; p=0.02). - There is no effect of adolescent nutrition literacy and parental food literacy on nutritional status (stunting, underweight, overweight, obesity, anemia).
8	Doustmohammadian et al., 2022 (25) Iran	Cross-sectional	Elementary school student (N=803, Boys=419, Girls=384, age=10-12 years)	FNLIT (Food and Nutrition Literacy) questionnaire USDA's Household Food Security Survey Module	- Food and nutrition literacy (FNLIT) in primary school students showed no direct relationship with food insecurity. - Obese nutritional status is negatively affected by healthy eating behavior (-0.1). Healthy eating behavior is positively influenced by FNLIT (0.13). - Factors that can improve nutrition and food literacy include socioeconomic status (0.13), including public schools (-0.21), large families (-0.25), working mothers (0.44), and educated mothers (0.84).

No	Author, Year, Country	Study Design	The subject of the study	Measurement Instruments for NL or FL and Food Security	Major Finding
9	Hoteit et al., 2023 (26) Lebanon, Bahrain, Egypt, Jordan, Kuwait, Morocco, Palestine, Qatar, Saudi Arabia, United Arab Emirates	Cross-sectional	Parent-adolescent pairs (N=5401, Adolescent age 10-19 years, parent age 18-84 years)	ANLS (The Adolescent Nutrition Literacy Scale), SFLQ (Short Food Literacy Questionnaire),	- There was no correlation between adolescent nutritional status and total adolescent nutritional literacy (p=0.17). However, there were significant correlations between parents' nutritional status and adolescents' total nutritional literacy (p<0.001), FNL (p<0.001), INL (p=0.047), and CNL (p<0.001). - University education (AOR=4.5), late adolescence (AOR=1.6), parental nutritional status (overweight/obese) (AOR=1.5), adolescents working (AOR=1.5), adolescents receiving nutrition education in the school curriculum (AOR=1.3), parents not having chronic diseases (AOR=1.2), and adequate food literacy in parents (AOR=1.8).
10	Morgan et al., 2023 (27) United States	One group pre-post survey	College student (N=55, mean age 20,8 years)	Food literacy survey question Modified USDA Six-Item Food Security Short Form	- Food security indicators increased, but not significantly, after being provided with food literacy and skills (p>0.05).
11	Al Tell et al., 2023 (28) Palestine	Cross-sectional	Adults (N=149, age above 18 years)	Nutrition Literacy translated questionnaire	- Body Mass Index had a negative correlation with FNL and CNL (R2=-0.1 and -0.12) and a positive correlation with INL (R2=0.03), but the p-value was not significant.

4. DISCUSSION

The association of nutrition literacy or food literacy with food security or insecurity

Based on the results of six studies examining the association between nutrition literacy or food literacy and food insecurity or security, the results vary depending on the subjects studied, the research design, and the instruments used to measure food security (18,19,21,24,25,27). Poor literacy is associated with higher food insecurity, especially among adolescents and the elderly. Children living in food-insecure households had lower nutrition and food literacy scores than children living in food-secure households. They were also lower in nutrition knowledge, food selection literacy, and food label literacy. This indicates that household food insecurity can be a predictor of children's low nutrition literacy. However, this finding cannot be used as a causal association since the study was cross-sectional (19).

These findings highlight that household food insecurity and nutrition or food literacy are interconnected and mutually reinforcing. Poor literacy can increase the risk of food insecurity by limiting one's ability to plan, select, and manage food resources effectively, while persistent food insecurity can also hinder the development of nutrition literacy, especially among children and vulnerable groups(29). From a theoretical perspective, this pattern aligns with Nutbeam's model of health literacy, which distinguishes between functional, interactive, and critical literacy. Individuals with higher levels of literacy are better able to access, understand, and apply nutrition information to make informed dietary decisions(30). Similarly, the food choice process model proposed by Sobal and Bisogni (2009) explains that food-related behaviours are influenced by personal meaning systems, social context, and life course experiences(31). Thus, the interaction between food literacy and food insecurity operates within broader socioeconomic and cultural environments. Improving food literacy alone may not be sufficient unless it is supported by policies that enhance food access and affordability.

Among adolescent and elderly couples in Lebanon, poor literacy had a 1.6 times higher risk of food insecurity among adolescents and 2.7 times among the elderly (24). Meanwhile, students in the United States apply nutrition literacy, such as reading nutrition labels before buying food negatively correlated with the level of food insecurity. This means that the higher the nutritional literacy, the lower the level of food insecurity (27). Households receiving food assistance also showed a positive association between the application of nutrition literacy, namely reading food labels, and the level of food insecurity. Reading food labels can reduce the risk of food insecurity (18).

Different study results were found among adults in Palestine, where food security was associated with nutrition literacy scores, but the values were not significant. Food insecurity in Palestine is associated with poverty, not working, low education level, and having more than seven family members. While the subjects involved 93% had higher education (21). In primary school children in Iran, nutrition and food literacy scores showed no direct association with food insecurity. Food and nutrition literacy was directly related to children's eating habits and academic performance. Improved literacy effectively improved children's eating habits and increased academic performance. Meanwhile, food insecurity is directly influenced by socioeconomic conditions such as family size, parents' occupation, and education (25).

According to Lawlis T (2019), nutrition and food literacy affect pillar utilization. The existence of food literacy can provide opportunities to prioritize the consumption of nutritious food. Providing food literacy education should also include nutritional information with simple recipes and easily available ingredients (32). However, on the one hand, there are some conditions where families already have good food literacy, but food prices are so high that the family cannot buy healthy food. This certainly does not improve the status of food insecurity in the family. There are many uncontrollable factors, such as family income, infrastructure, housing, and education (24). Important to emphasize in food literacy are critical tools in food storage, practice in serving and cooking, and motivation to practice the nutritional information obtained when food sources are limited (33).

The review also found that factors that can improve nutrition and food literacy include urban residence, high education level, working subjects, number of children less than three, having received nutrition education, and the presence or absence of chronic diseases. These factors were statistically significant predictors of subjects with adequate food or nutrition literacy scores (21,23,25,26).

The association of nutrition or food literacy with nutritional status

The eight studies that discussed the effect of nutrition literacy on nutritional status showed that six studies showed no association between nutrition literacy and food literacy, while two studies showed an association between nutrition literacy and nutritional status (13,20–24,26,28). The study that showed no association mentioned that for all components of nutrition literacy, there was no influence on the Body Mass Index (BMI) of adults. Even after considering confounding variables, the results remained the same. However, a Palestinian study found that adults with an obese nutritional status tended to practice healthy eating habits, while adults with poor nutritional status tended not to practice healthy eating habits. Nutrition literacy acts as a mediator to improve behavior and diet quality (21–23).

In adolescent subjects, there was also no correlation between the nutrition literacy of adolescents and parents on nutritional status, whether underweight, overweight, or obese. The effect of adolescent nutrition literacy on nutritional status is that adolescents become more focused on avoiding anemia. On the contrary, adolescents who have a high nutrition literacy score, but in their daily practice do not buy healthy lunches or snacks in the canteen (24,26). In the study of children in primary schools, it was found that the nutritional status of obesity was influenced by healthy eating behavior. Healthy eating behavior is influenced by nutrition and food literacy scores (25). This suggests that nutrition education at this stage can have a positive impact on healthier food choices. Nutrition literacy is an indirect factor that affects nutritional status.

A study showed that an association was found in children of mothers who were given a nutrition literacy intervention using smartphones in Iran. There were significant improvements in child nutrition indicators. Children showed recovery from underweight and wasting to good nutrition (20). The Palestinian study on adults also showed similar results, where BMI had a negative correlation with FNL and CL scores, but the value was not significant (28). From the findings of this study, it can be seen that the association between nutrition literacy and BMI is inconsistent, which may be due to differences in age, gender, and region, as well as the study design and instruments used in the research.

The association between nutrition and food literacy with food security and nutritional status, and the predictors that increase nutrition and food literacy scores (see Figure 2). Nutrition and food literacy studies in Indonesia are relatively limited. The findings of this study may serve as a reference for strengthening food security and nutrition initiatives in Indonesia. This study was a scoping review, so the association between the two literacies with food security or nutritional status was exploratory. The authors have not separated whether the intervention or exposure is just one of the literacies, nutrition, or food literacy, or a combination of both.

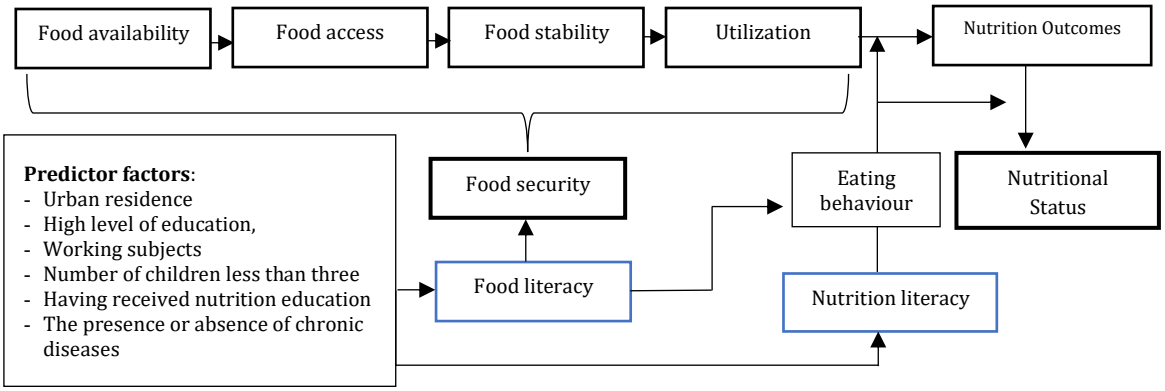

Figure 2. Schematic of the association between nutrition literacy, food security, and nutritional status from this study

5. CONCLUSION

Food and nutrition literacy was directly related to food security, while nutritional status shows an indirect association by improving healthier food choices and good eating habits. Several factors were identified as predictors of adequate food literacy or nutrition literacy, such as urban residence, higher education level, working participants, number of children less than three, having received nutrition education, and the presence or absence of chronic diseases. This review can serve as a reference for developing research and programs to enhance food security and nutritional status. Future studies may consider employing more specific measurement instruments and targeting defined population groups to yield clearer and more robust associations.

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