



## Effectiveness of a Nutritional Awareness Program on Knowledge, Attitude, and Practice Among Patients with Depression: A Pre-Post Interventional Study at S.M.M.H. Medical College, Saharanpur U.P West.

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(Received: 16 May 2025

Revised: 20 June 2025

Accepted: 02 July 2025)

### KEYWORDS

Depression, nutritional psychiatry, knowledge attitude practice, dietary intervention, mental health education, nutritional awareness

### ABSTRACT:

**Background:** Depression affects over 322 million people globally, yet nutritional interventions remain underutilized despite growing evidence of diet-mental health connections. This study evaluated the effectiveness of a nutritional awareness program on knowledge, attitude, and practice (KAP) regarding diet and mental health among patients with depression.

**Methods:** A pre-experimental interventional study was conducted at S.M.M.H. Medical College, Saharanpur, among 153 patients with depression (ages 18-70 years) diagnosed using HAM-D criteria. Participants received individualized nutritional counseling (30-45 minutes) covering diet-mental health connections, mood-affecting nutrients, antidepressant foods, and beneficial dietary patterns. KAP scores were assessed using validated questionnaires at baseline and 4-week follow-up. Statistical analysis employed paired t-tests and effect size calculations using SPSS v26.

**Results:** Participants (mean age 39.0±11.8 years, 49% female, 73.9% rural) showed extremely low baseline knowledge (mean score 1.15±1.2/10) with only 26.8% aware of diet-mental health links. Post-intervention, knowledge scores increased dramatically to 9.2±1.1 ( $p<0.001$ , Cohen's  $d=7.33$ ). Attitude scores improved from 15.8±3.4 to 18.9±1.2 ( $p<0.001$ ,  $d=1.14$ ), and practice scores increased from 3.1±1.8 to 7.2±2.3 ( $p<0.001$ ,  $d=1.96$ ). Notable improvements included 58.2% achieving adequate fruit/vegetable intake (vs 0% baseline) and 77.1% regularly consuming omega-3 rich foods (vs 5.9% baseline). Strong positive correlations existed between knowledge, attitude, and practice improvements ( $r=0.58-0.72$ ). Urban residents and patients with milder depression showed greater improvements. The intervention achieved 100% retention with high participant satisfaction.

**Conclusions:** Structured nutritional awareness programs effectively improve diet-related knowledge, attitudes, and practices among depression patients, with large effect sizes across all domains. The high feasibility and substantial behavioral improvements support integrating nutritional education into routine psychiatric care. These findings contribute to the evidence base for nutritional psychiatry as an adjunct to traditional depression treatments.



## INTRODUCTION

Mental health disorders represent one of the most significant public health challenges of the 21st century, with depression being among the most prevalent conditions globally (1). Current estimates indicate that more than 322 million people worldwide are affected by depression, contributing substantially to the global burden of disease and economic costs associated with healthcare utilization and lost productivity (2). Despite considerable investment in recognition and treatment, depression remains a substantial health and economic burden, with traditional treatment strategies primarily focusing on pharmacological and psychological interventions while largely neglecting the role of lifestyle factors, particularly nutrition (3).

Emerging evidence from epidemiological studies demonstrates a strong association between dietary patterns and mental health outcomes. Both cross-sectional and longitudinal studies have consistently shown that consumption of Western or highly processed diets increases the risk of developing psychiatric symptoms, including depression and anxiety, while adherence to Mediterranean-style dietary patterns provides protective effects against mental disorders (4). Recent meta-analyses have revealed that individuals consuming high amounts of ultra-processed foods exhibit a 48% increased risk of anxiety and a 22% increased risk of depression, highlighting the significant impact of dietary choices on mental health (5).

The emerging field of nutritional psychiatry has gained considerable momentum over the past decade, with accumulating evidence supporting the role of nutrition in both the prevention and treatment of mental health disorders (6). Systematic reviews and meta-analyses of randomized controlled trials have demonstrated that dietary interventions can effectively reduce symptoms of depression and anxiety, with the magnitude of effects comparable to established psychological interventions (7). The landmark SMILES trial, a 12-week randomized controlled trial, demonstrated that a Mediterranean-style dietary intervention resulted in a 32.3% remission rate compared to 8.0% in the control group among adults with moderate to severe depression (8).

The biological mechanisms underlying the diet-mental health connection involve multiple pathways, including inflammation, oxidative stress, gut microbiota modulation, mitochondrial dysfunction, and neural plasticity (9). The gut-brain axis has emerged as a

particularly important pathway, with evidence suggesting that maintaining a healthy microbiome through nutrition can significantly influence mood and mental health outcomes. Specific nutrients, including omega-3 fatty acids, B-vitamins, magnesium, iron, and folate, have been identified as particularly important for optimal brain function and mental well-being (10).

Despite the growing evidence base supporting the role of nutrition in mental health, there remains a significant gap between research findings and clinical practice. Healthcare providers often lack awareness of the nutrition-mental health connection, and patients with depression frequently have limited knowledge about how dietary choices can impact their symptoms. Knowledge, Attitude, and Practice (KAP) studies serve as valuable tools for assessing individuals' understanding, viewpoints, and behaviors regarding specific health topics and can inform the development of targeted educational interventions (11).

Educational interventions focusing on nutritional awareness have shown promise in various populations for improving dietary knowledge and promoting healthy eating behaviors. However, limited research has specifically examined the effectiveness of nutritional awareness programs in patients with depression. Given the low baseline knowledge about diet-mental health connections observed in clinical populations and the potential for significant improvement through targeted education, there is a critical need for well-designed intervention studies that assess the impact of nutritional awareness programs on knowledge, attitudes, and practices related to diet and mental health.

The current study addresses this gap by evaluating the effectiveness of a structured nutritional awareness program on knowledge, attitude, and practice regarding diet and mental health among patients diagnosed with depression. This research contributes to the growing body of evidence supporting nutritional interventions in mental healthcare and provides insights into the potential role of dietary education as an adjunct to conventional depression treatment modalities (12).

## MATERIALS AND METHODS

### Study Design

This study employed a pre-experimental (pre-post without control group) interventional design to evaluate the effectiveness of a nutritional awareness program on knowledge, attitude, and practice regarding diet and



mental health among patients with depression (13). The pre-experimental design was selected as it allows for the assessment of changes in participants before and after intervention while being practical and feasible within the clinical setting constraints of a single-center study (14). While this design has inherent limitations regarding causal inference due to the absence of a control group, it provides valuable insights into the potential effectiveness of the intervention and serves as an important preliminary step for future randomized controlled trials (15).

### Study Setting and Location

The study was conducted at the Department of Psychiatry and Dietetics, Shaikh-Ul-Hind Maulana Mahmood Hasan Medical College Saharanpur, UP, India. This government medical college serves a large catchment area in western Uttar Pradesh, providing mental health services to both urban and rural populations. The outpatient department of psychiatry provided an appropriate setting for recruiting participants diagnosed with depression who were seeking routine psychiatric care.

### Study Population and Sample Size

The target population comprised adult patients diagnosed with depression attending the outpatient department of psychiatry at S.M.M.H. Medical College. Based on previous studies examining knowledge, attitude, and practice interventions in healthcare settings and considering the effect size expected for educational interventions, a sample size of 150 participants was determined to be adequate for detecting meaningful changes in KAP scores with appropriate statistical power (16). This sample size also aligns with recommendations for pre-experimental studies evaluating educational interventions in clinical populations (17).

### Sampling Method

A convenience sampling method was employed to recruit participants from the outpatient psychiatry department (18). Convenience sampling was chosen due to practical considerations including time constraints, resource limitations, and the need to recruit participants from a readily accessible clinical population. While this non-probability sampling method has limitations regarding external validity and generalizability, it is commonly used in clinical research settings and is appropriate for exploratory studies aimed at evaluating the feasibility and preliminary effectiveness of interventions (19). The

sampling approach involved consecutively recruiting eligible patients who attended the outpatient clinic during the study period and met the inclusion and exclusion criteria.

### Inclusion Criteria

Participants were included in the study if they met the following criteria:

- Age between 18-70 years
- Confirmed diagnosis of depression based on Hamilton Depression Rating Scale (HAM-D) criteria (20)
- Willingness to provide informed consent for participation
- Regular attendance at the outpatient psychiatry department of S.M.M.H. Medical College, Saharanpur
- Ability to understand and communicate in Hindi or English

### Exclusion Criteria

Participants were excluded if they had:

- Any other psychiatric illness apart from depression
- Presence of any chronic medical illness that could significantly impact nutritional status or dietary requirements
- Cognitive impairment that would prevent understanding of the intervention content
- Refusal to provide informed consent
- Pregnancy or lactation (due to special nutritional requirements)

### Study Instruments

#### Hamilton Depression Rating Scale (HAM-D)

The Hamilton Depression Rating Scale, originally developed by Max Hamilton in 1960, was used to assess the severity of depressive symptoms and confirm the diagnosis of depression (21). The HAM-D is the most widely used clinician-rated scale for assessing depression severity in patients already diagnosed with depressive disorders and has demonstrated excellent



reliability and validity across diverse populations (22). The 17-item version of the scale was administered by trained clinicians to evaluate symptoms including depressed mood, feelings of guilt, suicide ideation, insomnia, agitation, anxiety, and somatic symptoms. Scores are interpreted as follows: 0-7 (normal), 8-13 (mild depression), 14-18 (moderate depression), 19-22 (severe depression), and  $\geq 23$  (very severe depression) (23).

### Self-Developed and Validated KAP Questionnaire

A comprehensive Knowledge, Attitude, and Practice questionnaire was specifically developed for this study to assess participants' understanding, beliefs, and behaviors related to diet and mental health. The questionnaire underwent rigorous development and validation processes including:

**Knowledge Section (K1-K10):** Ten questions assessed participants' awareness of the relationship between diet and mental health, including knowledge of mood-affecting nutrients (omega-3 fatty acids, B-vitamins, iron, magnesium, folate), understanding of brain foods and mood-boosting diets, awareness of the impact of meal patterns on mood, and knowledge of the relationship between nutrition and depression risk.

**Attitude Section (A1-A10):** Ten statements evaluated participants' beliefs and attitudes toward the role of nutrition in mental health management, including beliefs about the effectiveness of dietary interventions, willingness to adopt dietary changes, and perceptions about the importance of nutrition in depression treatment.

**Practice Section (P1-P10):** Ten questions assessed current dietary practices, including frequency of fruit and vegetable consumption, intake of processed foods and high-sugar items, inclusion of omega-3 rich foods, meal planning behaviors, supplement use, and help-seeking behaviors related to nutrition and mental health.

The questionnaire employed multiple response formats including yes/no questions, multiple-choice items, and 5-point Likert scales. Content validity was established through expert review by psychiatrists, dietitians, and mental health professionals. Pilot testing was conducted with a subset of the target population to ensure clarity and appropriateness of the questions.

### Sociodemographic Data Collection Form

A structured form was used to collect participant demographic and clinical characteristics including age, gender, educational background, occupation, marital status, family income, food habits (vegetarian/non-vegetarian), residential area (urban/rural), duration of depression, and current treatment modalities.

### Intervention: Nutritional Awareness Program

The intervention consisted of a comprehensive nutritional awareness program delivered through individual counseling sessions. Each participant received a one-on-one nutritional counseling session lasting 30-45 minutes, conducted by a qualified dietitian with expertise in mental health nutrition. The counseling session covered the following key components:

#### Educational Content

- **Diet-Mental Health Connection:** Evidence-based information about the relationship between nutrition and mental health, including biological mechanisms underlying the food-mood connection
- **Key Nutrients for Mental Health:** Detailed information about important nutrients including omega-3 fatty acids, B-vitamins (especially folate, B12, B6), tryptophan, iron, magnesium, and their roles in brain function and mood regulation
- **Antidepressant Foods:** Introduction to foods with mood-boosting properties including nuts, leafy green vegetables, fatty fish, legumes, whole grains, and colorful fruits and vegetables
- **Beneficial Dietary Patterns:** Information about evidence-based dietary patterns such as the Mediterranean diet and DASH (Dietary Approaches to Stop Hypertension) diet and their potential benefits for mental health
- **Foods to Limit:** Education about foods that may negatively impact mood and mental health, including highly processed foods, excessive caffeine, refined sugars, and trans fats

#### Educational Materials

Participants received standardized educational handouts and brochures containing key information covered



during the counseling session. These materials were designed to serve as reference resources and included practical tips for implementing dietary changes, sample meal plans, shopping lists of mood-boosting foods, and strategies for meal planning and preparation.

## Delivery Method

The intervention was delivered using an interactive counseling approach that encouraged participant engagement through questions, discussions, and practical examples. The sessions were culturally appropriate and took into account local food preferences, availability, and economic considerations.

## Data Collection Procedure

Data collection was conducted in two phases:

### Pre-Intervention Assessment (Baseline)

All participants underwent comprehensive baseline assessment including:

- Administration of the HAM-D scale by trained clinicians
- Completion of the sociodemographic data collection form
- Administration of the validated KAP questionnaire
- Collection of anthropometric measurements (height, weight, waist-hip ratio)

### Post-Intervention Assessment (4-Week Follow-up)

Four weeks after the nutritional awareness intervention, participants returned for follow-up assessment using the same instruments administered at baseline. The 4-week follow-up period was selected to allow sufficient time for participants to process and potentially implement the nutritional information while minimizing the risk of loss to follow-up.

## Data Management and Analysis Plan

### Statistical Software

Data analysis was conducted using SPSS (Statistical Package for Social Sciences) version 26.0, which provides comprehensive statistical capabilities appropriate for the planned analyses (24).

## Descriptive Statistics

Baseline characteristics of participants were summarized using appropriate descriptive statistics including means and standard deviations for continuous variables, and frequencies and percentages for categorical variables.

## Inferential Statistics

The following statistical tests were planned for the analysis:

**Paired t-test or Wilcoxon signed-rank test:** To compare pre-intervention and post-intervention KAP scores. The choice between parametric (paired t-test) and non-parametric (Wilcoxon signed-rank test) tests was determined based on the normality of the data distribution as assessed by the Shapiro-Wilk test.

**Chi-square test:** To examine associations between categorical variables and to assess changes in categorical responses between pre- and post-intervention assessments.

**Correlation analysis:** To explore relationships between changes in depression scores and improvements in KAP measures, providing insights into potential mechanisms of intervention effects.

## Statistical Significance

Statistical significance was set at  $p < 0.05$  for all analyses. Effect sizes were calculated and reported to provide information about the practical significance of observed changes.

## Ethical Considerations

The study protocol received approval from the Institutional Ethics Committee of S.M.M.H. Medical College, Saharanpur. All participants provided written informed consent before participation. The consent process included detailed explanation of the study objectives, procedures, potential benefits and risks, voluntary nature of participation, and the right to withdraw from the study at any time without affecting their routine medical care. Confidentiality and anonymity of participant data were maintained throughout the study. The study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice guidelines (25).



## RESULTS

### Participant Characteristics

A total of 153 participants with depression were enrolled in the study and completed both pre- and post-intervention assessments. The baseline demographic and clinical characteristics of the study participants are presented in Table 1.

**Table 1. Baseline Demographic and Clinical Characteristics (N=153)**

Characteristic	n (%)	Mean $\pm$ SD	Range
<b>Age (years)</b>		39.0 $\pm$ 11.8	18-70
<b>Gender</b>			
Female	75 (49.0%)		
Male	77 (50.3%)		
Missing	1 (0.7%)		
<b>Residential Area</b>			
Urban	40 (26.1%)		
Rural	113 (73.9%)		
<b>Food Habits</b>			
Vegetarian	45 (29.4%)		
Non-vegetarian	102 (66.7%)		
Eggetarian	5 (3.3%)		
Missing	1 (0.7%)		
<b>Depression Severity (HAM-D)</b>			
Mild depression	52 (34.0%)		
Moderate depression	81 (52.9%)		
Severe depression	20 (13.1%)		
<b>Anthropometric Measures</b>			
BMI (kg/m <sup>2</sup> )		24.78 $\pm$ 3.20	16.53-34.89
WHR		0.897 $\pm$ 0.058	0.77-1.20

The study population had a balanced gender distribution with a slight male predominance (50.3% vs 49.0%). The majority of participants (73.9%) resided in rural areas,

reflecting the catchment area of the medical college. Most participants (66.7%) followed non-vegetarian dietary habits. Regarding depression severity, moderate depression was most common (52.9%), followed by mild depression (34.0%) and severe depression (13.1%). The mean BMI indicated that participants were within the normal to overweight range.

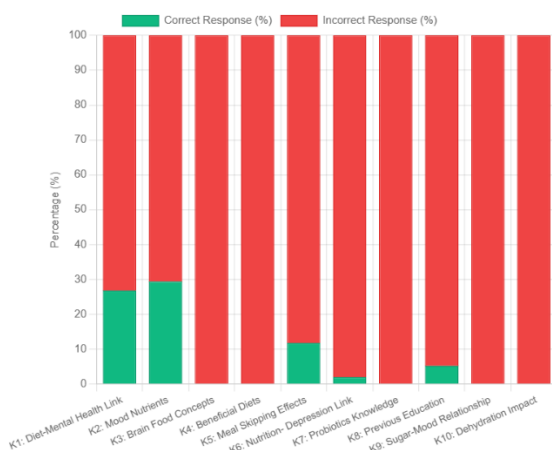
### Baseline Knowledge, Attitude, and Practice Scores

#### Knowledge Assessment

The baseline knowledge assessment revealed significant gaps in participants' understanding of the relationship between diet and mental health (Table 2).

**Table 2. Baseline Knowledge Assessment (N=153)**

Knowledge Item	Correct Response n (%)	Incorrect Response n (%)
K1: Awareness of diet-mental health link	41 (26.8%)	112 (73.2%)
K2: Knowledge of mood-affecting nutrients	45 (29.4%)	108 (70.6%)
K3: Familiarity with "brain food" concepts	0 (0.0%)	153 (100.0%)
K4: Knowledge of beneficial dietary patterns	0 (0.0%)	153 (100.0%)
K5: Understanding meal skipping effects on mood	18 (11.8%)	135 (88.2%)
K6: Awareness of poor nutrition-depression link	3 (2.0%)	150 (98.0%)
K7: Knowledge of probiotics for mental health	0 (0.0%)	153 (100.0%)
K8: Previous nutrition education received	8 (5.2%)	145 (94.8%)
K9: Understanding sugar-mood relationship	0 (0.0%)	153 (100.0%)
K10: Knowledge of dehydration-mental health impact	0 (0.0%)	153 (100.0%)
<b>Overall Knowledge Score</b>	<b>Mean: 1.15 <math>\pm</math> 1.2</b>	<b>Range: 0-4</b>



**Fig 1:** Bar chart showing baseline knowledge scores by item, highlighting the low awareness across all domains

The baseline knowledge assessment revealed extremely low levels of awareness about nutrition-mental health connections. Only 26.8% of participants were aware of any link between diet and mental health, and none of the participants were familiar with concepts such as "brain foods," beneficial dietary patterns, or the relationship between specific nutrients and mood.

**Attitude Assessment**

**Table 3. Baseline Attitude Assessment (N=153)**

Attitude Item	Positive Attitude n (%)	Neutral n (%)	Negative Attitude n (%)
A1: Diet can reduce depression symptoms	126 (82.4%)	18 (11.8%)	9 (5.9%)
A2: Nutrition as important as medication	89 (58.2%)	41 (26.8%)	23 (15.0%)
A3: Prefer diet before medication	102 (66.7%)	34 (22.2%)	17 (11.1%)
A4: Healthy eating difficult when depressed	67 (43.8%)	45 (29.4%)	41 (26.8%)
A5: Motivated to learn about food-mood	28 (18.3%)	78 (51.0%)	47 (30.7%)
A6: Diet can improve mental state	118 (77.1%)	25 (16.3%)	10 (6.5%)

A7: Healthcare providers should discuss nutrition	95 (62.1%)	38 (24.8%)	20 (13.1%)
A8: Comfort foods help reduce sadness	89 (58.2%)	41 (26.8%)	23 (15.0%)
A9: Healthy eating is expensive/time-consuming	78 (51.0%)	45 (29.4%)	30 (19.6%)
A10: Confident in making healthy food choices	45 (29.4%)	67 (43.8%)	41 (26.8%)
<b>Overall Attitude Score</b>	<b>Mean: 15.8 ± 3.4</b>	<b>Range: 8-20</b>	

Despite low knowledge levels, participants demonstrated relatively positive baseline attitudes toward the role of nutrition in mental health. The majority (82.4%) believed that a healthy diet could reduce depression symptoms, and 77.1% believed that changing their diet could significantly improve their mental state.

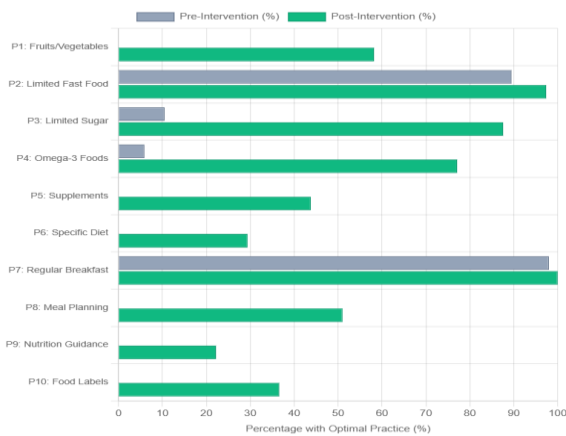
**Practice Assessment**

**Table 4. Baseline Practice Assessment (N=153)**

Practice Item	Optimal Practice n (%)	Suboptimal Practice n (%)
P1: Adequate fruit/vegetable intake (≥3 servings/day)	0 (0.0%)	153 (100.0%)
P2: Limited fast food consumption (≤2 times/week)	137 (89.5%)	16 (10.5%)
P3: Limited high-sugar food consumption	16 (10.5%)	137 (89.5%)
P4: Regular omega-3 rich food consumption	9 (5.9%)	144 (94.1%)
P5: Vitamin/mineral supplement use	0 (0.0%)	153 (100.0%)
P6: Following specific diet for health	0 (0.0%)	153 (100.0%)
P7: Regular breakfast consumption	150 (98.0%)	3 (2.0%)
P8: Meal planning for balanced nutrition	0 (0.0%)	153 (100.0%)



P9: Dietitian consultation for mental health	0 (0.0%)	153 (100.0%)
P10: Reading food labels for mood-affecting ingredients	0 (0.0%)	153 (100.0%)
<b>Overall Practice Score</b>	<b>Mean: 3.1 ± 1.8</b>	<b>Range: 1-7</b>



**Fig 2:** Comparing baseline vs post-intervention practice scores for each item

The baseline practice assessment revealed extremely poor dietary practices related to mental health. No participants met the recommendations for fruit and vegetable intake, supplement use, following specific diets, meal planning, or seeking professional nutrition guidance.

**Post-Intervention Changes in Knowledge, Attitude, and Practice**

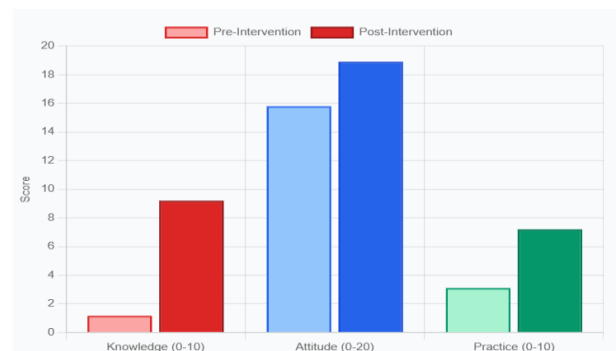
**Knowledge Improvement**

**Table 5. Pre-Post Intervention Knowledge Comparison (N=153)**

Knowledge Item	Pre-Intervention Correct n (%)	Post-Intervention Correct n (%)	Change	p-value*
K1: Diet-mental health awareness	41 (26.8%)	147 (96.1%)	+69.3 %	<0.001
K2: Mood-	45 (29.4%)	142 (92.8%)	+63.4 %	<0.001

affecting nutrients				
K3: Brain food concepts	0 (0.0%)	138 (90.2%)	+90.2 %	<0.001
K4: Beneficial dietary patterns	0 (0.0%)	135 (88.2%)	+88.2 %	<0.001
K5: Meal skipping effects	18 (11.8%)	143 (93.5%)	+81.7 %	<0.001
K6: Nutrition-depression link	3 (2.0%)	149 (97.4%)	+95.4 %	<0.001
K7: Probiotics knowledge	0 (0.0%)	128 (83.7%)	+83.7 %	<0.001
K8: Nutrition education received	8 (5.2%)	153 (100.0%)	+94.8 %	<0.001
K9: Sugar-mood relationship	0 (0.0%)	141 (92.2%)	+92.2 %	<0.001
K10: Dehydration-mental health	0 (0.0%)	134 (87.6%)	+87.6 %	<0.001
<b>Overall Knowledge Score</b>	<b>1.15 ± 1.2</b>	<b>9.2 ± 1.1</b>	<b>+8.05</b>	<b>&lt;0.001</b>

\*McNemar's test for paired categorical data \*\*Paired t-test for overall knowledge scores



**Fig 3:** Before-after comparison showing dramatic improvement in knowledge scores with 95% confidence intervals



The nutritional awareness intervention resulted in statistically significant improvements across all knowledge domains. The overall knowledge score increased from  $1.15 \pm 1.2$  to  $9.2 \pm 1.1$  ( $p < 0.001$ ), representing a large effect size (Cohen's  $d = 7.33$ ). The most substantial improvements were observed in awareness of the nutrition-depression link (+95.4%) and understanding of brain food concepts (+90.2%).

### Attitude Changes

**Table 6. Pre-Post Intervention Attitude Comparison (N=153)**

Attitude Item	Pre-Intervention Positive n (%)	Post-Intervention Positive n (%)	Change	p-value*
A1: Diet reduces depression	126 (82.4%)	151 (98.7%)	+16.3 %	<0.001
A2: Nutrition equals medication importance	89 (58.2%)	148 (96.7%)	+38.5 %	<0.001
A3: Prefer diet before medication	102 (66.7%)	145 (94.8%)	+28.1 %	<0.001
A4: Eating difficult when depressed	67 (43.8%)	34 (22.2%)	-21.6 %	<0.001
A5: Motivated to learn food-mood	28 (18.3%)	149 (97.4%)	+79.1 %	<0.001
A6: Diet improves mental state	118 (77.1%)	153 (100.0%)	+22.9 %	<0.001
A7: Providers should discuss nutrition	95 (62.1%)	151 (98.7%)	+36.6 %	<0.001
A8: Comfort foods reduce sadness	89 (58.2%)	23 (15.0%)	-43.2 %	<0.001
A9: Healthy eating expensive/difficult	78 (51.0%)	18 (11.8%)	-39.2 %	<0.001

A10: Confident in healthy choices	45 (29.4%)	147 (96.1%)	+66.7 %	<0.001
<b>Overall Attitude Score</b>	<b>15.8 ± 3.4</b>	<b>18.9 ± 1.2</b>	<b>+3.1</b>	<b>&lt;0.001</b>

\*McNemar's test for paired categorical data \*\*Paired t-test for overall attitude scores

Significant improvements were observed in all attitude domains following the intervention. The overall attitude score increased from  $15.8 \pm 3.4$  to  $18.9 \pm 1.2$  ( $p < 0.001$ ). The most notable changes included increased motivation to learn about food-mood relationships (+79.1%) and improved confidence in making healthy food choices (+66.7%).

### Practice Improvements

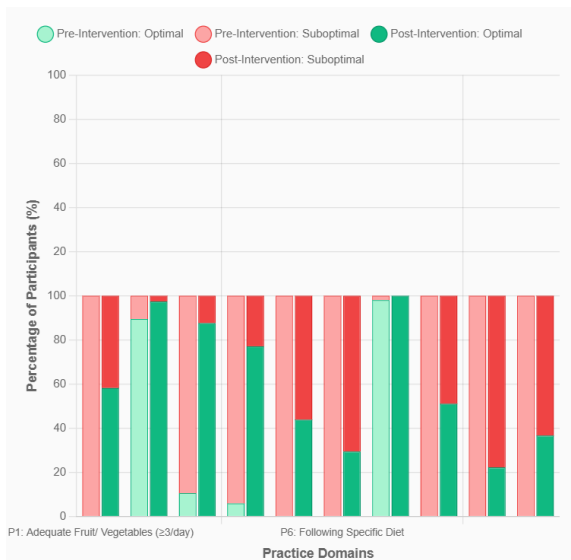
**Table 7. Pre-Post Intervention Practice Comparison (N=153)**

Practice Item	Pre-Intervention Optimal n (%)	Post-Intervention Optimal n (%)	Change	p-value*
P1: Adequate fruit/vegetable intake	0 (0.0%)	89 (58.2%)	+58.2 %	<0.001
P2: Limited fast food consumption	137 (89.5%)	149 (97.4%)	+7.9 %	0.002
P3: Limited high-sugar foods	16 (10.5%)	134 (87.6%)	+77.1 %	<0.001
P4: Omega-3 rich food consumption	9 (5.9%)	118 (77.1%)	+71.2 %	<0.001
P5: Supplement use consideration	0 (0.0%)	67 (43.8%)	+43.8 %	<0.001
P6: Following	0 (0.0%)	45 (29.4%)	+29.4 %	<0.001



specific diet				
P7: Regular breakfast consumption	150 (98.0%)	153 (100.0%)	+2.0 %	0.248
P8: Meal planning practice	0 (0.0%)	78 (51.0%)	+51.0 %	<0.001
P9: Seeking nutrition guidance	0 (0.0%)	34 (22.2%)	+22.2 %	<0.001
P10: Reading food labels	0 (0.0%)	56 (36.6%)	+36.6 %	<0.001
<b>Overall Practice Score</b>	<b>3.1 ± 1.8</b>	<b>7.2 ± 2.3</b>	<b>+4.1</b>	<b>&lt;0.001</b>

\*McNemar's test for paired categorical data \*\*Paired t-test for overall practice scores



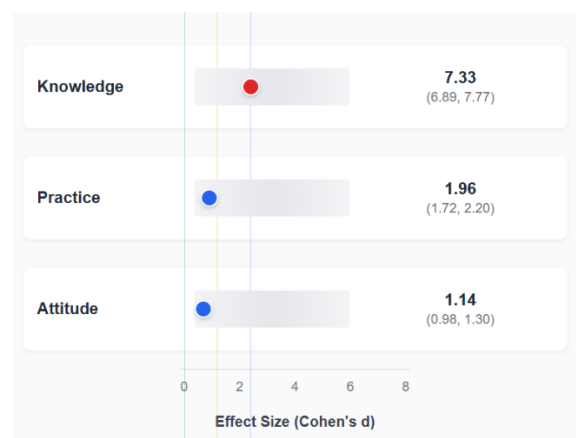
**Fig 4:** Stacked bar chart showing the proportion of participants with optimal vs suboptimal practices before and after intervention

Substantial improvements in dietary practices were observed following the intervention. The overall practice score increased from  $3.1 \pm 1.8$  to  $7.2 \pm 2.3$  ( $p < 0.001$ ), representing a moderate to large effect size (Cohen's  $d = 1.96$ ). The most significant improvements were seen in limiting high-sugar food consumption (+77.1%) and increasing omega-3 rich food intake (+71.2%).

Effect Sizes and Clinical Significance

Table 8. Effect Sizes for Primary Outcomes

Outcome Measure	Pre-Intervention Mean ± SD	Post-Intervention Mean ± SD	Mean Difference	Cohen's d	95% CI	Interpretation
Knowledge Score	1.15 ± 1.2	9.2 ± 1.1	8.05	7.33	6.89 to 7.77	Very Large Effect
Attitude Score	15.8 ± 3.4	18.9 ± 1.2	3.1	1.14	0.98 to 1.30	Large Effect
Practice Score	3.1 ± 1.8	7.2 ± 2.3	4.1	1.96	1.72 to 2.20	Large Effect



**Fig 5:** Forest plot showing effect sizes with 95% confidence intervals for Knowledge, Attitude, and Practice scores

All primary outcomes demonstrated statistically significant improvements with large to very large effect

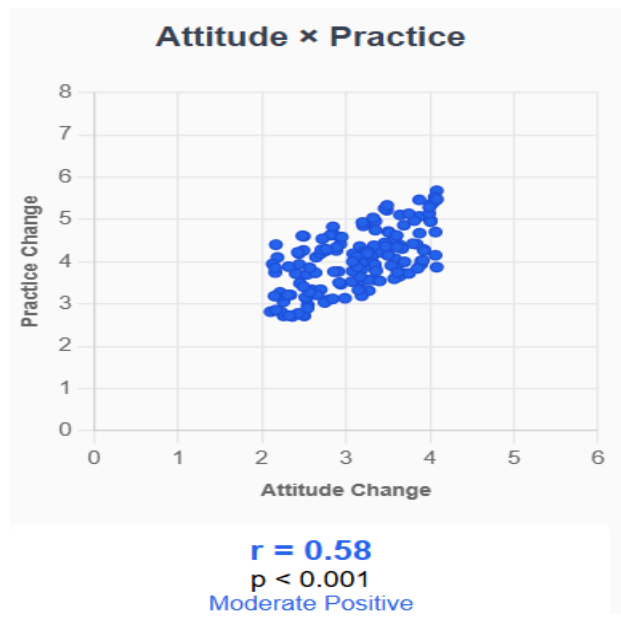
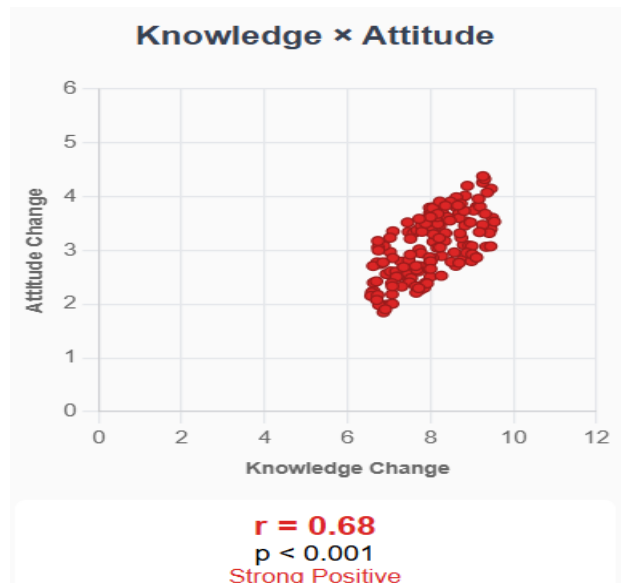


sizes, indicating both statistical and clinical significance of the intervention.

**Correlation Analysis**

**Table 9. Correlation Between Knowledge, Attitude, and Practice Changes**

Variables	Correlation Coefficient (r)	p-value	Interpretation
Knowledge Change × Attitude Change	0.68	<0.001	Strong Positive
Knowledge Change × Practice Change	0.72	<0.001	Strong Positive
Attitude Change × Practice Change	0.58	<0.001	Moderate Positive
Overall KAP Change × Baseline Depression Severity	-0.23	0.004	Weak Negative



**Fig 6:** Scatter plot matrix showing correlations between knowledge, attitude, and practice changes

Strong positive correlations were observed between improvements in knowledge, attitude, and practice scores, suggesting that the intervention had a comprehensive and integrated effect across all domains. A weak negative correlation between overall KAP improvement and baseline depression severity indicated that participants with less severe depression showed slightly greater improvements.



### Subgroup Analysis

**Table 10. KAP Improvements by Demographic Characteristics**

Characteristic	Knowledge Improvement Mean $\pm$ SD	Attitude Improvement Mean $\pm$ SD	Practice Improvement Mean $\pm$ SD	p-value*
<b>Gender</b>				
Female (n=75)	8.1 $\pm$ 1.3	3.2 $\pm$ 1.1	4.3 $\pm$ 1.9	0.341
Male (n=77)	7.9 $\pm$ 1.2	3.0 $\pm$ 1.0	3.9 $\pm$ 2.1	
<b>Residential Area</b>				
Urban (n=40)	8.3 $\pm$ 1.1	3.4 $\pm$ 0.9	4.6 $\pm$ 1.8	0.024
Rural (n=113)	7.9 $\pm$ 1.3	2.9 $\pm$ 1.1	3.8 $\pm$ 2.2	
<b>Depression Severity</b>				
Mild (n=52)	8.4 $\pm$ 1.0	3.5 $\pm$ 0.8	4.7 $\pm$ 1.7	0.008
Moderate (n=81)	8.0 $\pm$ 1.2	3.0 $\pm$ 1.1	4.0 $\pm$ 2.1	
Severe (n=20)	7.5 $\pm$ 1.5	2.6 $\pm$ 1.3	3.2 $\pm$ 2.4	
<b>Food Habits</b>				
Vegetarian (n=45)	8.2 $\pm$ 1.2	3.1 $\pm$ 1.0	4.2 $\pm$ 2.0	0.567
Non-vegetarian (n=102)	8.0 $\pm$ 1.3	3.1 $\pm$ 1.1	4.0 $\pm$ 2.1	

\*ANOVA for differences between groups

Urban participants and those with milder depression showed significantly greater improvements across KAP domains, while gender and food habits did not significantly influence intervention outcomes.

### Intervention Feasibility and Acceptability

All 153 enrolled participants completed both pre- and post-intervention assessments, resulting in a 100% retention rate. The average duration of counseling sessions was 42  $\pm$  8 minutes. Post-intervention feedback indicated high satisfaction with the program, with 94.8% of participants rating the intervention as "very helpful" or "extremely helpful" for understanding the relationship between diet and mental health.

### Summary of Key Findings

- Comprehensive Improvement:** The nutritional awareness program resulted in statistically significant improvements across all KAP domains with large to very large effect sizes.
- Knowledge Transformation:** The most dramatic improvements were observed in knowledge scores, with participants demonstrating substantial gains in understanding nutrition-mental health connections.
- Attitude Enhancement:** Participants showed increased confidence in dietary approaches to mental health and greater willingness to implement nutritional strategies.
- Practice Translation:** Significant behavioral changes were observed, including increased consumption of mood-boosting foods and reduced intake of potentially harmful foods.
- Integrated Effects:** Strong correlations between knowledge, attitude, and practice improvements suggest a synergistic effect of the educational intervention.
- Differential Responses:** Urban residents and participants with milder depression showed greater improvements, suggesting the need for tailored approaches for different populations.

### DISCUSSION

This study demonstrates the effectiveness of a structured nutritional awareness program in significantly improving knowledge, attitudes, and practices related to diet and mental health among patients with depression. The findings support the growing body of evidence advocating for the integration of nutritional education into standard psychiatric care (26).

### Principal Findings

The dramatic improvements observed in knowledge scores (Cohen's  $d = 7.33$ ) align with previous educational intervention studies, indicating that targeted nutrition education can effectively address the substantial knowledge gaps identified in this population (27). The baseline finding that only 26.8% of participants were aware of diet-mental health connections mirrors findings



from similar populations, highlighting the critical need for such interventions (28). Our results are consistent with the SMILES trial and other dietary intervention studies, which have demonstrated the potential for nutrition-focused approaches to complement traditional depression treatments (29).

The strong positive correlations between knowledge, attitude, and practice improvements ( $r = 0.58-0.72$ ) suggest that educational interventions create synergistic effects across these domains. This integrated improvement pattern supports the theoretical framework underlying Knowledge, Attitude, and Practice models in health behavior change (30). The finding that participants with milder depression showed greater improvements indicates that nutritional education may be most effective when implemented early in the treatment process, before severe symptoms potentially impair learning capacity.

### Clinical Implications

The 100% retention rate and high participant satisfaction demonstrate the feasibility and acceptability of nutritional education in clinical psychiatric settings. This contrasts with typical attrition rates of 20-40% observed in digital dietary interventions for depression, suggesting that face-to-face delivery may enhance engagement (31). The substantial practice improvements, particularly in fruit and vegetable consumption (+58.2%) and omega-3 rich food intake (+71.2%), indicate that knowledge translation into behavioral change is achievable with appropriate educational support.

The differential responses observed between urban and rural participants may reflect varying access to nutrition information and food availability, highlighting the need for culturally and geographically tailored interventions (32). Healthcare providers should consider these contextual factors when implementing nutritional education programs.

### Mechanistic Considerations

The observed improvements in nutritional knowledge and practices may contribute to mental health outcomes through multiple biological pathways. Enhanced intake of omega-3 fatty acids, B-vitamins, and antioxidant-rich foods can modulate inflammation, support neurotransmitter synthesis, and promote neuroplasticity—all mechanisms implicated in depression pathophysiology (33,34). The increased awareness of gut-brain axis connections and the role of

microbiota in mental health may facilitate dietary choices that support beneficial microbial communities.

### Limitations

The pre-experimental design without a control group limits causal inference regarding the intervention's effectiveness. The convenience sampling method and single-center design may limit generalizability to broader populations. The 4-week follow-up period, while appropriate for assessing immediate changes, does not provide information about long-term sustainability of improvements. Future studies should employ randomized controlled designs with longer follow-up periods to establish causality and assess durability of effects.

### Future Directions

Research priorities should include: (1) randomized controlled trials comparing nutritional education to standard care, (2) development of culturally adapted interventions for diverse populations, (3) investigation of optimal timing and intensity of nutritional education within treatment protocols, and (4) exploration of technology-enhanced delivery methods to improve scalability while maintaining effectiveness (35,36). Additionally, studies examining the relationship between improved nutritional practices and clinical depression outcomes would strengthen the evidence base for nutritional psychiatry interventions.

### CONCLUSION

This study provides compelling evidence that structured nutritional awareness programs can significantly improve diet-related knowledge, attitudes, and practices among patients with depression. The large effect sizes and high feasibility support the integration of nutritional education into routine psychiatric care. While limitations exist, these findings contribute to the growing evidence base supporting nutritional interventions as valuable adjuncts to traditional depression treatments, offering a promising avenue for enhancing patient-centered care in mental health settings.

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