Effect of Innovative Interactive Educational Technique on Pregnant Women's Knowledge, Practices, and Attitudes regarding Iodine Deficiency

Heba Alkotb Mohamed[1], Farida Kamel Yousef [2] Heba Ahmed Galal[3], Asmaa Abobakr Ibrahim[4]
Assistant Professor, Family and community health nursing, faculty of nursing, Suez Canal University, Egypt[1,2]
Lecturer, Obstetrics and Gynecology nursing, faculty of Nursing, Suez Canal University, Egypt[3]
Assistant Professor, Obstetrics and gynecology nursing, faculty of nursing, Suez Canal University, Egypt[4]

Abstract

Background Iodine deficiency during pregnancy remains a significant public health issue, contributing to preventable maternal and fetal complications. . **Aim of the study:** to evaluate effect of innovative interactive education technique on pregnant women' knowledge, practices, and attitudes regarding iodine deficiency. **Design**: A quasi-experimental design was used. **Setting:** It was recruited from the obstetrical outpatient clinic at Suez Canal University Hospital. **Sample:** It was involving 132 pregnant women were randomly assigned to intervention and control groups. The intervention group received structured interactive education using videos, quizzes, mobile applications, demonstrations, and group discussions, while the control group received standard antenatal health education. **Tools:** Data were collected using four validated tools covering demographic data, iodine-related knowledge, dietary behaviors, and attitudes toward iodine deficiency prevention. Measurements were taken at baseline, immediately post-intervention, and at one-month follow-up. **Results**: The results showed a statistically significant improvement in knowledge scores, dietary practices, and attitudes in the intervention group compared to the control group ($p < 0.001$). The findings confirm that interactive learning is more effective than traditional methods in promoting maternal understanding and behavioral change regarding iodine intake. These results support integrating interactive education into antenatal care programs to enhance maternal health literacy and preventive behaviors. **Conclusion:** It concludes that interactive educational interventions are significantly more effective than standard antenatal education in improving pregnant women's knowledge, attitudes, and dietary practices related to iodine deficiency. **Recommendations:** it is recommended that interactive educational techniques be integrated into routine antenatal care to enhance maternal knowledge, attitudes, and dietary behaviors related to iodine deficiency**.**

Keywords: Iodine, Prenatal Care, Health Education, Pregnant Women

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1. Introduction

Iodine, a crucial micronutrient, is essential for synthesizing thyroid hormones and neurodevelopment, especially during gestation. Iodine Deficiency Disorders (IDD) remains a significant public health concern, particularly in low and middle-income countries **(Hatch-McChesney et al., 2022).**

Pregnant women, with their increased iodine requirements during pregnancy, are especially vulnerable **(Levei, 2020).** It is crucial to intervene early to ensure adequate iodine intake, as insufficient iodine can lead to serious health issues, including miscarriage, stillbirth, and impaired cognitive development in the child (**Karthigesu et al., 2021).**

Iodine requirements increase during pregnancy due to higher production of maternal thyroid hormones, fetal transfer of iodide, and increased renal clearance **(Monaghan et al., 2021).** This rise in demand heightens the risk of iodine deficiency disorders **(John et al., 2022).** The World Health Organization (WHO) recommends a daily iodine intake of 230 to 260 micrograms during pregnancy and lactation to reduce associated risks. This necessary intake can be achieved through iodine-rich foods such as fish, dairy products, iodized salt, and certain vegetables **(Bath et al., 2022).** Healthcare professional can help monitor your urinary iodine concentration, which reflects recent iodine intake and aids in the early detection of deficiency risks **(Chastnyk et al., 2024).** Pregnant women encounter various potential complications such as preterm birth, preeclampsia, gestational diabetes, and iodine deficiency disorders, all of which present considerable risks to both maternal and infant health **(Alvarez et al., 2020).** These issues can result in significant consequences, including miscarriage or developmental problems in infants, highlighting the necessity of preventive education **(Jibril et al., 2024).** Iodine deficiency poses substantial risks, including preterm birth, congenital abnormalities, and delays in both intellectual and physical development in infants. Iodine deficiency, in severe instances, results in hypothyroidism, potentially resulting in permanent disabilities **(Sayed, 2024).**

Significance of the Study:

This study addresses a critical gap in maternal health education by exploring interactive learning to improve knowledge about iodine deficiency as a preventable condition with profound implications for maternal and fetal outcomes. Traditional educational approaches often lack engagement and fail to promote sustained knowledge retention (Garrison et al., 2021). By introducing a dynamic, interactive format, this research highlights a scalable and cost-effective strategy to enhance health literacy among pregnant women. The findings have the potential to inform antenatal care practices, support public health initiatives aimed at preventing Iodine

Deficiency Disorders (IDD), and contribute to improved pregnancy outcomes. Furthermore, this study adds to the growing body of evidence advocating for participatory, learner-centered education in maternal and child health programs.

The Aim of the study:

The primary aim of this study is to evaluate effect of innovative interactive education technique on pregnant women' knowledge, practices, and attitudes regarding iodine deficiency

Hypotheses

Null Hypothesis (H_0):

There is no significant difference in pregnant women' knowledge, practices, and attitudes(KPAs) about iodine deficiency between pregnant women receiving standard health education and those participating in an interactive learning intervention.

Alternative Hypothesis (H_1):

Pregnant women who participate in an interactive learning intervention will demonstrate significantly higher knowledge, practices, and attitudes (KPAs) about iodine deficiency compared to those who receive standard health education.

2. Subject and Method

Research design:

This study employed a quasi-experimental, non-randomized controlled design with pre-test and post-test assessments. The intervention group received interactive learning sessions, while the control group received standard antenatal education. The design was selected to assess the intervention's causal effects while accounting for real-world constraints in participant assignment.

Setting of the study:

The study was conducted at the obstetrical outpatient clinic of Suez Canal University Hospital in Ismailia Governorate, Egypt. Antenatal outpatient clinic contains two rooms. The first room has a desk and chairs for taking history. The other room has two parts: the first is an examination bed and the other is a bed with an ultrasound machine. Using purposive sampling, 120 pregnant women attending antenatal clinics were enrolled. Eligibility criteria included being in the second trimester, being able to give informed consent, and having no prior formal education on iodine deficiency.

Sampling size and technique:

Participants in the study were chosen through a convenient sampling method, adhering to specified inclusion and exclusion criteria. The sample comprised two groups: an intervention group that received innovative interactive education and a control group that received usual care in the obstetrical outpatient clinic at Suez Canal University Hospital. *Inclusion criteria*: The target population included primigravid women, irrespective of age or educational background, who were recruited during their first trimester of pregnancy. Participants provided informed consent and agreed to adhere to study requirements*:* ***Exclusion Criteria:*** The researchers excluded pregnant women with chronic health conditions (e.g., hypothyroidism, diabetes) and those who opted out of the training intervention.

The sample was categorized into two groups:

The sample was categorized into two groups: control and study. The women for the study and control groups were selected randomly. The first woman selected was assigned to the study group, while the last was designated as part of the control group. Subsequently, the names, group types, and phone numbers of the women were recorded on a sheet.

The control group comprised 66 pregnant women who received standard antenatal care, which included health assessments for both the mother and fetus through pregnancy ultrasound scans.

The study group comprised 66 pregnant women who received an innovative interactive education technique alongside routine antenatal care.

Sample Size*:*

The total sample size was 132, comprising 66 pregnant women in each group, as per **Cohen (1988)**. Effect size and statistical power: The utilization of partial eta squared (η^2) was confirmed to elucidate the measure of effect size. Power and significance level notation: The power is specified as "0.95 (95%)" and the significance level as $\alpha = 0.05$ for clarity and to conform to standard statistical reporting practices.

Tools of data collection:

This study employed various structured tools to ensure comprehensive data collection across several domains. **The Tool consisted of a demographic and baseline data collection form**, which gathered essential participant information, including age, educational level, occupation, residence, and income status. This background data was used to contextualize results and assess potential influences on knowledge acquisition.

Tool II was a pre-and post-intervention

knowledge questionnaire designed to evaluate participants' understanding of iodine deficiency before and after the educational program. This Tool included multiple-choice questions (MCQs), true/false items, and short-answer questions. It covered key topics such as the importance of iodine during pregnancy, dietary sources, signs and symptoms of deficiency, and consequences for maternal and fetal health, drawing on frameworks established by **Alimohammadi et al. (2019) and Lee et al. (2020)**. Each correct MCQ or accurate/false response earned one point for scoring. Short-answer questions were scored based on completeness: an entirely accurate answer received two points, a partially correct response earned one point, and incorrect or missing responses were scored as zero. The total scores were then categorized to reflect knowledge levels: low (0–40%), moderate (41–70%), and high (71–100%). To measure improvement, the percentage increase in knowledge was calculated using the formula:

Knowledge Improvement (%) = (Post-test Score − Pre-test Score) / Pre-test Score) × 100.

Tool III assessed dietary behavior and changes in iodine-related dietary practices. This included an evaluation of dietary habits, particularly the frequency of consumption of iodine-rich foods such as iodized salt, seafood, dairy, sea vegetables, and eggs. A food frequency questionnaire (FFQ) and dietary logs were used pre- and post-intervention to track changes. A behavioral scoring system was applied, with total scores ranging from 0 (no intake) to 20 (daily intake of all listed foods). Intake was classified as low (0–5), moderate (6–10), high (11–15), and very high (16–20). The same Tool also assessed salt usage behavior, focusing on the shift toward iodized salt use post-intervention, using a short survey that explored preferences and practices related to salt selection.

Lastly, **Tool IV measured participants' attitudes toward iodine deficiency prevention** based on five psychological constructs adapted from **Basilious and Salim (2019)**: beliefs and awareness, perceived importance, self-efficacy, motivation, and perceived support. A 16-item Likert-scale questionnaire was used, with each item rated from 1 (strongly disagree) to 5 (strongly agree). The total Score ranged from 16 to 80 and was interpreted as follows: scores from 16–32 indicated a low attitude, 33–48 moderate, 49–64 positive, and 65–80 a strong proactive attitude. Together, these tools provided a multifaceted assessment of knowledge, behavior, and attitudinal changes resulting from the intervention.

Tools Validation, Reliability, and Pilot Testing

The instruments used in this study were rigorously evaluated for validity, reliability, and practicality through a structured pilot process. Content validity was confirmed by a panel of six subject-matter experts, comprising two specialists each in obstetrics and gynecological nursing, medicine, and community health nursing. The experts reviewed all tools to ensure clarity, relevance, and alignment with the study objectives. A pilot study was conducted with 13 randomly selected pregnant women (representing approximately 10% of the intended sample) who were not included in the final analysis to assess reliability and instrument clarity. This pilot study also helped estimate the average time required to complete the instruments. Based on participant feedback, minor revisions were made to improve the phrasing of certain items for better comprehension. No structural changes were necessary, as the tools were generally perceived as clear and accessible. Internal consistency, measured using Cronbach’s alpha, yielded a coefficient of 0.70, indicating acceptable reliability for evaluating knowledge, behavior, and attitudes related to iodine deficiency prevention. These steps ensured that the instruments were valid and robust for the main study.

Ethical considerations:

Ethical approval for this study was obtained from the Research Ethics Committee of the Faculty of Nursing, Suez Canal University, in April 2023 (Approval Code: 217). The study was conducted in accordance with the Declaration of Helsinki.

The research team strictly adhered to the approved protocol and committed to submitting any amendments for prior review and approval. Continuous oversight and monitoring were ensured throughout the study to uphold ethical compliance and research transparency. Before participation, all eligible women received a detailed explanation of the study's objectives, procedures, and potential risks or benefits. Written informed consent was obtained, and participants were assured of their right to withdraw at any stage without penalty. These measures reflect the researchers' strong commitment to protecting participant rights, minimizing harm, and maintaining the highest standards of ethical conduct throughout the study.

Pilot study:

A pilot study was conducted with 13

randomly selected pregnant women (representing approximately 10% of the intended sample. The aim of pilot study was assess reliability and instrument clarity. Pregnant women who share in the pilot study were excluded with the main study sample.

Administrative design:

An official letter from the Dean of the Faculty was submitted to the Director of Suez Canal University Hospital, explicitly addressing the coordination of activities within the obstetrics and gynecology outpatient clinics. The letter outlined the study's objectives, significance, and scope to facilitate institutional collaboration.

Fieldwork and Procedures

Fieldwork Duration and Data Collection

Data collection was carried out over ten months, from the beginning of May 2023 to the end of February 2024. It was conducted four days per week at the obstetrical outpatient clinic of Suez Canal University Hospital. Based on eligibility criteria, 132 pregnant women were recruited. All participants provided written informed consent prior to participation. Data was collected using pre-validated instruments, ensuring complete privacy and confidentiality.

1. Preparation and Planning

The study was meticulously planned to evaluate changes in knowledge, attitudes, and dietary behaviors related to iodine deficiency among pregnant women. Interactive educational materials were developed specifically for this population, including videos, digital applications, quizzes, printed handouts, and demonstrations. Ethical approval for the study was obtained in April 2023 (Approval Code: 217), following rigorous protocols to protect the rights and well-being of participants. Facilitators were trained to implement the intervention effectively, ensure consistency in delivery, respond to participant inquiries, and administer data collection tools accurately.

2. Participant Recruitment

Pregnant women attending the antenatal clinic who met the inclusion criteria were approached for participation. Written informed consent was obtained after a detailed explanation of the study's objectives, procedures, and confidentiality assurances. Participants were then randomly assigned to either the intervention or control group using a simple randomization technique, ensuring fairness and promoting participant confidence in the study process.

3. Pre-Intervention Interview Phase

Prior to the educational intervention, participants completed a baseline interview. The research team explained all components of the assessment sheet, after which participants filled out Tool I—covering demographic and obstetric information—during their prenatal care visits. The administration time for this Tool ranged from 12 to 15 minutes.

4. Baseline Assessment Phase

Participants were assessed on their initial knowledge, attitudes, and dietary behaviors concerning iodine deficiency using Tools II, III, and IV. Data included iodine knowledge scores, baseline iodine intake (via food frequency questionnaire), and behavioral patterns. Each assessment session lasted approximately 15 to 20 minutes and was conducted in small groups.

5. Intervention Implementation

The intervention group participated in a structured interactive educational program to enhance engagement, comprehension, and long-term knowledge retention regarding iodine deficiency during pregnancy. Each session lasted approximately one to two hours and utilized a multifaceted instructional approach. Multimedia presentations, including videos and animations, were used to illustrate the physiological importance of iodine and its role in maternal and fetal health. To further stimulate active learning, participants engaged with mobile applications, digital quizzes, and gamified educational activities tailored to reinforce key concepts. Practical demonstrations introduced common iodine-rich foods and supplements, guiding participants in recognizing and incorporating these items into their daily diets. Additionally, facilitators led group discussions to address barriers and collaboratively explore strategies for maintaining adequate iodine intake. To reinforce the learning outcomes, participants received follow-up messages via WhatsApp and email summarizing essential points and providing motivational reminders.

6. Immediate Post-Intervention Assessment

Immediately following the educational session, participants completed a brief quiz to assess immediate knowledge retention. Additional surveys were conducted to evaluate changes in attitudes and behavioral intentions related to iodine consumption. Participants also provided feedback on the educational materials and delivery methods.

7. Follow-Up Assessment

One-month post-intervention, a follow-up assessment was conducted to examine knowledge retention and sustained changes in behavior. The knowledge questionnaire was re-administered, and dietary behaviors, including salt usage, were reassessed. Additionally, qualitative interviews were carried out with a purposive sub-sample of participants to gain in-depth insights into the long-term impact of the intervention on beliefs, dietary decisions, and adherence to iodine-rich nutritional practices.

Statistical Analysis:

Data entry and data analysis were done using SPSS version 22 (Statistical Package for Social Science) and Excel 2016 program. Data were presented as number, percentage, mean, and standard deviation. Chi-square test was used to compare between qualitative variables. P-value considered highly statistically significant when $p < 0.01$ and statistically significant when $P < 0.05$.

Data analysis in this study employed **quantitative and qualitative approaches** to evaluate the effectiveness of interactive educational interventions comprehensively. Quantitative data were analyzed using **paired t-tests** or, where appropriate, **Wilcoxon signed-rank tests** to compare pre-and post-intervention scores, thereby assessing statistically significant improvements in participants' knowledge. Behavioral changes related to dietary practices and attitudes toward iodine intake were analyzed descriptively, with means, standard deviations, and frequency distributions calculated to highlight practice patterns and shifts across the study period. Additionally, proportions were used to evaluate categorical responses to iodine-rich food consumption and salt usage behavior. For qualitative insights, **thematic analysis** was conducted on participant feedback collected through open-ended survey items and follow-up interviews. This analysis helped identify recurring themes regarding the strengths of the educational program and areas in need of refinement, providing valuable context to the quantitative outcomes.

3. Results

The results presented in this section address the study's hypotheses by assessing the effectiveness of an interactive educational intervention on pregnant women's knowledge, dietary practices, and attitudes regarding iodine deficiency. The findings reveal a statistically significant improvement in the intervention group across all measured domains of knowledge, behavior, and attitude compared to the control group. These results support the alternative hypothesis, indicating that interactive learning is more effective than standard health education in enhancing maternal awareness and preventive practices related to iodine deficiency during pregnancy.

1. Socio demographic Characteristics of Participants

Table 1 summarizes the socio demographic variables of the study and control groups. There were no statistically significant differences between the two groups regarding age, education level, occupation, residence, or income status ($p > 0.05$). Participants ranged in age from 18 to 40, with the majority in both groups aged between 25 and 35. Most participants were urban residents and housewives; over half of each group reported insufficient household income. These similarities confirmed baseline equivalency between the study groups.

2. The dietary Practice score related to rich iodine food

Figure 1 presents Mean values of the dietary Practice Scale score related to rich iodine food for the control and study groups at the pre-intervention, immediate post-intervention, and follow-up stages. Pre-intervention, no significant difference existed between the control and study groups. However, immediately after post-intervention and follow up, the study group demonstrated high Practice score related to rich iodine food (67.27&62.80) compared to the control group (47.20 & 44.92). These results highlight the interactive education intervention's substantial and sustained the dietary Practice score related to rich iodine food gains.

3. Knowledge Scores on Iodine Deficiency

Table 2 presents the mean knowledge scores at the pre-intervention, immediate post-intervention and follow-up stages. Pre-intervention, no significant difference existed between the control and study groups ($p = 0.755$). However, immediately after post-intervention, the study group demonstrated a dramatic increase in knowledge (Mean = 93.18, SD = 10.66) compared to the control group (Mean = 33.01, SD = 12.82), with a highly significant p-value (< 0.001). This trend persisted at follow-up, with the study group maintaining high knowledge scores (Mean = 92.10, SD = 8.87) versus the control group (Mean = 34.31, SD = 13.79), again yielding a statistically significant difference ($p < 0.001$). These results highlight the interactive education intervention's substantial and sustained knowledge gains

4. Attitude Scores on Iodine Deficiency

Table 3 presents the mean Attitude scores at the pre-intervention, immediate post-intervention, and follow-up stages. Pre-intervention, no significant difference existed between the control and study groups (p = 0.043). However, immediately after post-intervention, the study group demonstrated a dramatic increase in Attitude (Mean = 99.62, SD = 3.08) compared to the control group (Mean = 42.59, SD = 7.55), with a highly significant p-value (< 0.001). This trend persisted at follow-up, with the study group maintaining high attitude scores (Mean = 99.24, SD = 2.80) versus the control group (Mean = 43.20, SD = 7.85), again yielding a statistically significant difference (p < 0.001). These results highlight the interactive education intervention's substantial and sustained attitude gains

4. Discussion

This study demonstrates that interactive educational methods significantly enhance pregnant women's knowledge, attitudes, and dietary practices concerning iodine deficiency. The results validate the effectiveness of participatory, multimedia-based learning approaches in promoting health-related behavior change among expectant mothers. The absence of statistically significant differences between the study and control groups in age, education, occupation, residence, and income level indicates strong baseline comparability. This strengthens the internal validity of the intervention's outcomes. The fact that most participants were urban, low-income housewives aligns with evidence showing that iodine deficiency remains prevalent among women in reproductive age groups living in socioeconomically disadvantaged settings **(Asfaw et al., 2021).**

However, some researchers argue that demographic similarity alone is insufficient to ensure equivalency in behavioral outcomes, as cultural beliefs and health literacy levels may vary even within similar socio-demographic profiles **(Pfeiffer et al., 2022).** The current researcher acknowledges this point and suggests that future studies should include psychosocial assessments to account for such hidden variability.

The study found a significant and sustained improvement in dietary practices related to iodine-rich foods in the intervention group. This is consistent with several recent studies showing that interactive educational strategies—particularly those using community health workers—lead to improved nutritional practices **(Gebremichael et al., 2023; Tesema et al., 2022).**

However, opposing viewpoints suggest that improvements in self-reported dietary behavior may not reflect actual changes in iodine intake. For example, a study by **Zhao et al. (2021)** in China indicated that even after nutritional education, urinary iodine levels did not significantly improve among participants, likely due to environmental and food supply limitations. The researcher acknowledges this and suggests that future studies include biochemical indicators such as urinary iodine concentration (UIC) to validate dietary behavior changes.

The dramatic and sustained increase in knowledge among the intervention group strongly supports the efficacy of interactive health education. This mirrors findings from studies conducted in Ethiopia and Egypt, where knowledge levels significantly improved post-intervention **(Geda et al., 2022; Mohamed et al., 2023).**

Nonetheless, critics argue that knowledge gain does not always lead to behavior change or improved health outcomes. For example**, Hassan et al. (2021)** highlighted a gap between awareness and practice in a study where women had high knowledge scores but continued using non-iodized salt due to affordability and accessibility issues. From the researcher's point of view, while knowledge is a prerequisite for behavior change, it must be supported by enabling environments—such as access to iodized salt and community support systems—to translate into action.

The substantial improvements in knowledge scores within the intervention group confirm that interactive education surpasses conventional content delivery and retention methods. These findings are consistent with prior research by **Wang et al. (2018)**, which reported notable knowledge gains from tailored educational programs focusing on micronutrient awareness. Similarly, **Li et al. (2020)** emphasized the superiority of customized interventions over routine health education in addressing nutritional deficiencies. In our study, sustained high knowledge scores at follow-up underscore the long-term benefits of interactive engagement, reinforcing the importance of continuous reinforcement strategies, such as digital reminders and follow-up communication.

Beyond knowledge acquisition, the

intervention also resulted in significant behavioral improvements. Participants in the study group adopted healthier dietary practices, particularly increased consumption of iodine-rich foods. These results align with the findings of **Lim and Lee (2019)**, who observed that interactive nutrition education fosters lasting changes in dietary habits. The persistent improvement in iodine intake behavior among the study group indicates the practical applicability and influence of the intervention in daily life.

Limitations

While the study presents compelling evidence supporting the effectiveness of interactive education, several limitations should be acknowledged. First, the study employed a quasi-experimental design without randomization at a broader scale, which may introduce selection bias and limit generalizability. Second, the reliance on self-reported dietary practices and attitudes may be subject to recall or social desirability bias. Third, the follow-up period was limited to one month, which may not capture the long-term sustainability of knowledge and behavior changes. Additionally, the study was conducted in a single geographical setting, which may restrict the applicability of the findings to other cultural or socioeconomic contexts.

5. Conclusion:

This study concludes that interactive educational interventions are significantly more effective than standard antenatal education in improving pregnant women's knowledge, attitudes, and dietary practices related to iodine deficiency. Using multimedia content, participatory discussions, and personalized learning tools resulted in enhanced knowledge retention, more favorable attitudes, and meaningful behavioral changes among participants. These outcomes suggest that interactive education is a valuable and scalable approach to maternal health promotion, particularly in addressing preventable micronutrient deficiencies during pregnancy.

6. Recommendations:

Based on the study findings, it is recommended that

1. Interactive educational techniques should be integrated into routine antenatal care to enhance maternal knowledge, attitudes, and dietary behaviors related to iodine deficiency.
2. Regular follow-up sessions and

digital reinforcement tools should be utilized to sustain knowledge retention and behavioral changes over time.

3. The intervention model may also be expanded to address other maternal health concerns, including iron deficiency and gestational diabetes.
4. Policymakers should prioritize training healthcare providers in delivering interactive education and allocate resources to support its implementation in maternal health programs.
5. Future research should investigate interactive education's long-term impact, cost-effectiveness, and adaptability across different populations.

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Table (1): The studied groups' distribution of them regarding their socio demographic characteristics:

Variable	Control Group (n=66)	Study Group (n=66)	p-value
Age (years)			0.561 (NS)
18–24	8 (12.1%)	14 (21.2%)	
25–30	30 (45.5%)	26 (39.4%)	
31–35	25 (37.9%)	23 (34.9%)	
36–40	3 (4.5%)	3 (4.5%)	
Mean ± SD	29.42 ± 4.06	28.79 ± 4.63	0.327 (NS)
Education Level			0.461 (NS)
- Illiterate	26 (39.4%)	24 (36.4%)	
- Intermediate	29 (43.9%)	33 (50%)	
- High level	11 (16.7%)	9 (13.63%)	
Occupation			
- Worked	21 (31.8%)	23 (34.85%)	
- Housewife	33 (50.0%)	31 (46.97%)	
- Student	12 (18.2%)	12 (18.2%)	0.532 (NS)
Residence			
- Urban	54 (81.8%)	55 (83.3%)	
- Rural	12 (18.2%)	11 (16.6%)	0.437 (NS)
Income Status			
- Enough	32 (48.5%)	30 (45.5%)	
- Not enough	34 (51.5%)	36 (54.5%)	0.345 (NS)

independent samples test for comparing the two groups

*: Statistically significant ($p<0.05$)

Table (2): Comparison of total knowledge scores on iodine deficiency during pregnancy between two studied Groups at different time points.

Time Point	Control Group (n=66)	Study Group (n=66)	Mean Difference	p-value
Pre-Intervention	32.68 ± 12.84	31.51 ± 23.03	-14.17	0.755
Immediate post-intervention	33.01 ± 12.82	93.18 ± 10.66	60.17	<0.001*
Follow-Up	34.31 ± 13.79	92.10 ± 8.87	57.79	<0.001*

b One-way Anova comparing pre-, post, and follow-up within each group

*: Statistically significant (p<0.05)

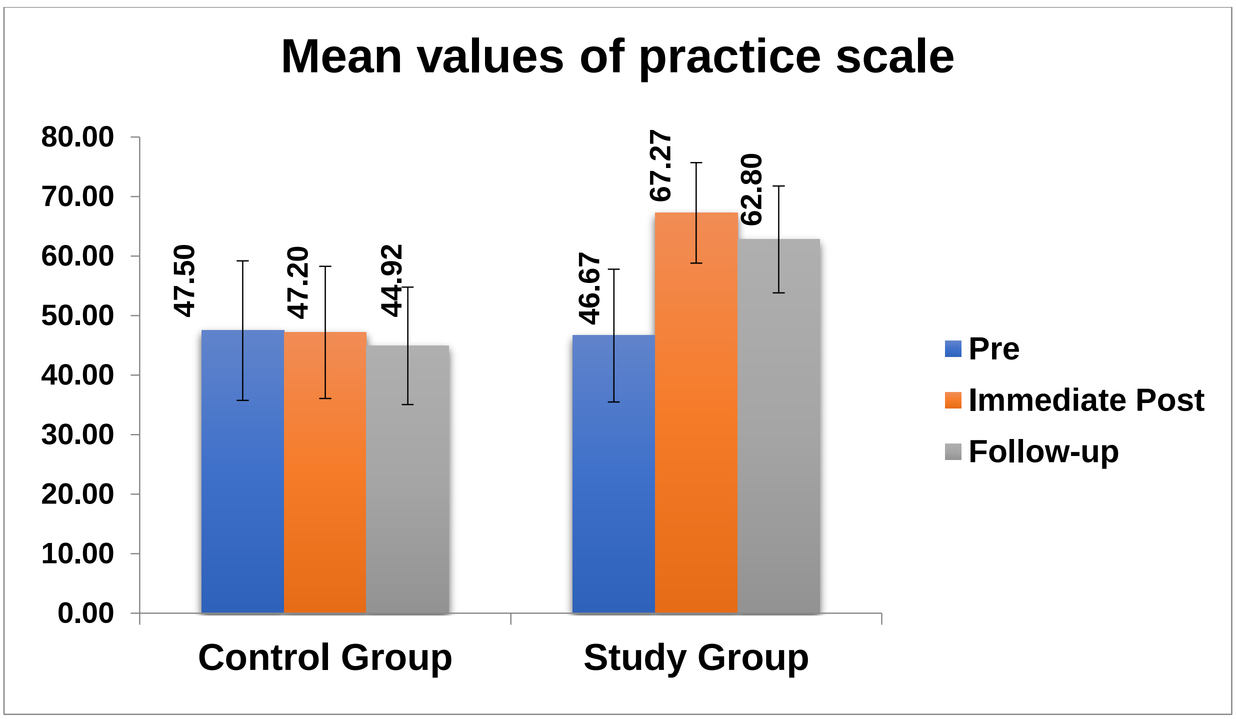

Figure (1): Mean values of the dietary Practice Scale score related to rich iodine food for the control and study groups at three-time points.

Table (3): Comparison of attitudes toward iodine deficiency prevention between two studied groups at different time points.

	Control Group (n=66)		Study Group (n=66)			
	Mean	SD	Mean	SD	[a]t	P value
Pre	36.86	7.43	40.08	10.83	-1.99	0.043 NS
Immediate Post	42.59	7.55	99.62	3.08	-56.85	0.000*
Follow-up	43.20	7.85	99.24	2.80	-54.60	0.000*
[b]F **P value**	13.96 0.00*		1728.80 0.00*			

an independent samples t-test for comparing the two groups

b One-way Anova compares pre-, post, and follow-up within each group

*: Statistically significant (p<0.05)

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