Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/22927
DOI URL: http://dx.doi.org/10.21474/IJAR01/22927

ISSN (O): 2320-5407
ISSN (P): 3107-4928

*RESEARCH ARTICLE*

# DEVELOPING AND VALIDATING A NUTRITION EDUCATION BOOKLET FOR PREGNANT WOMEN: A DELPHI CONSENSUS STUDY

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## *Manuscript Info*

***Manuscript History***
Received: 04 January 2026
Final Accepted: 08 February 2026
Published: March 2026

***Key words:-***
Content validity, Educational booklet, Delphi method, maternal nutrition, nutrition education, validation of educational materials

## *Abstract*

**Background.**Proper maternal nutrition is essential for maternal health and optimal fetal development. Educational materials such as booklets are commonly used to enhance pregnant women's knowledge about nutrition. Such materials need to be validated to ensure their accuracy, clarity, and relevance to the needs of pregnant women. This study sought todevelopand validate a nutrition education booklet for pregnant women.

**Method:-**A methodological research design (Delphi method) was employed, utilizing 15 experts and 30 pregnant women. A panel of experts in maternal health, nutrition, and health education evaluated the booklet through two rounds of consultation.

**Results:-**The results indicated unanimous agreement among the panel of experts regarding the validity of the educational booklet. It was observed a high degree of reliability in all evaluation domains.

**Conclusion:-**The validated booklet can be used as an educational material to promote healthy nutritional practices among pregnant women. It is recommended to evaluate the effectiveness of the booklet in improving pregnant women's knowledge, attitudes, and nutritional practices during pregnancy.



## Introduction:-

Maternal nutrition is critical for fetal growth, pregnancy health, andlong-term child health.Essential nutrients include folic acid (prenatal), iron (27mg/day), and calcium (1,000 mg/day).A nutrient-rich maternal diet before conception and throughout pregnancy supports optimal fetal growth, physiological functioning, overall maternal health contributing to higher rates of maternal and infant survival. It preventsdeficiencies, lowering risks of low birthweight and developmentaldelays.Poor maternal nutrition has been associated with adverse outcomes such as low birth weight, anemia, preterm birth, and impaired fetal development (Thornburg, & Valent, 2024).Nevertheless, despite the evidence supporting for the benefits of this dietary pattern, there islack of adherence to healthy eating recommendations during pregnancy, and low levels of nutritional knowledge have been observed among pregnant women (Olloqui-Mundet, Cavia, Alonso-Torre, & Carrillo, 2024). Pregnant women often face challenges in accessing accurate nutrition information. Hence, providing effective nutrition education is crucial component of

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antenatal care. Utilising educational tools for nutrition education during individualised counselling, has been demonstrated to improve adherence to dietary recommendations(Manaf et al., 2024).Educational materials such as booklets are widely used in maternal health interventiondue to provide simple and structuredinformation that can improve knowledge and promote healthy dietary behaviors among pregnant women. The use of a prop such as a booklet can help in the smooth execution of an educational process because it can be received and captured by the five senses as information seen by the eye can channel knowledge to the brain. In addition, the booklet delivered a message in the form of a book with a combination of narration and pictures so that the information contained is more complete, more detailed, clear, and educative (Herawati et al., 2022; Muzzioli, Gimbo, Pintavalle, Migliaccio, &Donini, 2025).

However, educational materials must be carefully developed and scientifically validated before they are used in health education programs. The validation process should assess the adequacy of the material for its content, illustrations, indexing, learning, and cultural adequacy. It ensures that the content is accurate, relevant, clear, and appropriate for the target population. Expert review is an important step in this process, as it helps identify potential gaps, improve clarity, and ensure that the information reflects current scientific recommendations (Lau et al., 2019; Sharma, Akhtar, Singh, & Mehra, 2019).Delphi Methodis most commen used in validating educational materials which seeks a structured consensus through multiple rounds of questionnaires to collect expert opinions. Delphi survey is a structured forecasting and decision-making technique that gathers consensus on complex problemsanonymously. The techniqueusesseveralroundsof questionnaire, wherethe summery of each round is provided to enable experts to revise opinions without being influenced by the other members. Delphi survey iswidely used in validating educational materials,assessment tools, and competency frameworks in health research. (Magnabosco et al., 2023; Martinino et al., 2025). Therefore, the present study seeks to validate the content of an educational booklet on nutrition for pregnant women through the Delphi method.

**Aim:-**
This stusy aimed to develope and validate a nutrition education booklet for pregnant women.

## Methods:-

**Study Design:**
This study adopted a methodological research design to evaluate and validate the content of an educational booklet on nutrition for pregnant women. The validation process was conducted using the Delphi Method, which is a structured technique used to obtain consensus from a panel of experts through iterative rounds of evaluation.

**Sampling technique and sample size:**
The researchers used convenience sampling technique to recruit of thirty pregnant women were enrolled to evaluate the educational booklet.A purposive sampling technique was used to recruit fifteen experts for the Delphi panel. Delphi panel sizes should be carried out with consideration to time and monetary constraints and ideally be between 8 to 23 participants (Shang, 2023).

**Study tools:**
**The researchers developed two tools for data collection in this study as the following:**
**Self-administrated structured questionnaire for expert panelists:-**
This tool was designed to assess the content validity of the designed educational booklet through expert evaluation using the Delphi technique conducted in two rounds. It included the demographic and professional background of the experts as age, sex, educational field, job title and years of experience. The second part consisted of seven evaluation domains to assess the booklet for exterior Design & title, content quality, relevance to target audience, clarity & readability, visual & graphic design, practicality & applicability, and legibility & printing characteristics. Each item included a qualitative comment section inviting experts to provide narrative feedback or suggestions for improvement. Each criterion was assessed using a four-point Likert scale: strongly disagree, disagree, agree, and strongly agree.

**Scoring system:-**
The criterion for determining agreement or consensus in expert panelists' opinionsthrough calculating the Content Validity Index (CVI) per item (I-CVI), as well as (Global CVI)for all items in the booklet. The I-CVI indicate the percentage of experts giventhe item a score of "adequate" or "totally adequate." Items meet the criterion of adequate content validity if its CVI0.78 or higher. In addition, Intraclass Correlation Coefficient (ICC) was determined

tomeasure the degree of agreement or consistency between panelists, ICC is commonly used reliability index when measuring test-retestreliability which considered stronger than simple correlation. The acceptable values of ICC value ≥ 0.75 indicating good reliability among raters. The analysis and interpretation of the Intraclass Correlation Coefficient presented in Table 3.

**Expert Panelists Consensus Measurement by Descriptive Statistics (Hallgren, 2012; Silva et al., 2021)**

| Consensus | Content Validity Index (CVI) | Intraclass Correlation Coefficient (ICC) |
|---|---|---|
| Low consensus: < 50% | High Agreement: I-CVI ≥ 0.80 | Perfect agreement:> 0.75- 1.0 |
| Moderate consensus: 50% to less than 70% | Moderate Agreement: I-CVI = 0.60 – 0.79 | Good agreement:0.60–0.74 Fair agreement:0.40–0.59 |
| Strong consensus: > 70% | Low Agreement: I-CVI < 0.60 | Low agreement:< 0.40 |

**Self-administrated structured scale to assess pregnant women' feedback on the educational booklet:-**

The researcher designed this tool to gather feedback from pregnant women regarding the content and usability of the educational booklet. It utilized a four-point Likert scale [Strongly Agree, Agree, Disagree, Strongly Disagree] to assess participants' perceptions. The scale comprised twenty evaluation criteria organized into six key domains: content quality, readability & clarity, layout & design, applicability, usability & navigation and cultural appropriateness.

**Scoring System**.:-

The responses were analyzed using a weighted mean approach. Each Likert response was assigned a numerical value (e.g., Strongly Agree = 4, Strongly Disagree = 1), and the weighted mean was calculated as follows:

$$\text{Weighted Mean} = \frac{\sum(\text{Frequency} \times \text{Weight})}{\text{Total Responses!}}$$

The interpretation of this equation, the mean score was converted to a percentage by multiplying the weighted mean by 25 (Pimentel, 2019). Interpretation intervals were then developed to provide qualitative insight into participants' responses, as summarized in below table.

**Four- point Likert scale interpretation**

| Likert-scale | Interval | Difference | Description |
|---|---|---|---|
| 1 | 1-1.74 | 0.74 | Strongly disagree |
| 2 | 1.75-2.49 | 0.74 | Disagree |
| 3 | 2.50-3.24 | 0.74 | Agree |
| 4 | 3.25-4 | 0.75 | Strongly agree |

**I.Development of the Educational Booklet:-**

The educational booklet was designed after anextensive review of the literature concerning maternal nutrition during pregnancy. Guidelines, scientific articles, and other resourcesabout maternal health education were reviewd to develop evidence-based and up to datecontent.The booklet included several key topics related to maternal nutrition, including: (the definition and importance of healthy nutrition during pregnancy, macronutrient and micronutrient requirements, essential vitamins and minerals for fetal development, use of nutritional supplements, daily caloric needs based on gestational age, food safety guidelines specific to pregnancy, appropriate levels and types of physical activity and exercise). Apart from the mentioned theoritcal part, practicalaspects of healthy nutrition during pregnancy were covered in the booklet as well; thus, there were included: meals planning techniques, techniques for calculating correct portions, advice on reading food labels, and healthy recipe examples. Using a convenient design tool such as Canva (https://www.canva.com), the educational booklet could be easily created, designed, and edited. The final product had dimensions 148 x 210 mm (size A5) and eight two-side pages. The content structure of the booklet is: front cover, back cover, table of contents, and information sheets.

**Validation of Educational Booklet:-**
**Selection of Experts:-**
Experts were chosen based on their professional knowledge and experience in areas of maternal health.

**Inclusion Criteria:-**
**Experts were qualifying for participationaccording to the following criteria:**
- Specialized in field of maternal health, obstetrics, and nutrition**.**
- At least five years of experience in their respective professions
- Had experiencein research, educational and clinical experience.

**Delphi Validation Process:-**

The Delphi method is widely recognized due tothe structured process of attainingagreement amongst experts about the relevance, clarity, and adequacy of content (Adikari, Sivakanesan, Wijesinghe, and Liyanage, 2019; De Matos Magalhães et al., 2022). Content validaty involves assessing the accuracy, completeness, and appropriateness of the content from perspective of whether it fits the desired intended learning outcomes and targeted audiences of pregnant women. The Delphi method was selected for its effectiveness at consolidating views and opinions from experts via several feedback rounds, ultimately converging on a shared agreement.

**Table 1:-**
**The Criteria of Delphi Survey Implementation:-**

| Criteria | Choice |
|---|---|
| Purpose of the study | Testing validation of educational booklet |
| Number of rounds | Two |
| Participants | Heterogenous |
| Mode of operation | Remote access |
| Anonymity of panel | Full |
| Communication media | Electronic mail |
| Concurrency of rounds | Sequential set of rounds |

After selection the expertspanel, invitation letter was sent via mail provide asking for their views according to their knowledge/experience regarding the survey questionnaire. The mail contained purpose of the research, description the Delphi technique, and their request to answer the question and directionto fill out the instrument electronically.The validation process was conducted through two rounds.

**First Delphi Round:-**
Upon begining of first round, experts were provided with the educational booklet with an evaluation questionnaire which supposed to evaluate the content. The experts had to evaluate the different sections of the booklet in accordancewith: title, quality of content, appropriateness for target audience, clarity & readability, visual & graphic design, practicality & applicability, and legibility & printing characteristics.Evaluation was done on a four-point Likert scale ranging from: totally adequate, adequate, inadequate, totally inadequate.The Content Validity Index (CVI) was done to calculate the extent of consensus among the experts. This was calculated through calculating the CVI for each item (I-CVI) as well as (Global CVI)for all items.

**Second Delphi Round:-**
After the booklet was reviewed by the experts and their feddback and comments was integrated, the modified edition of the booklet was sent back to the same panel of experts for further assessment. The experts rated the modified items to determine if the changesmade were effective. The level of consensus among experts was achived whenthe content validityreached acceptable levels. Apart from Content Validity Index, the Interclass Correlation was also determined. Higher ICC values indicate greater inter-rater reliability (IRR), with an ICC equal to 1 representing perfect agreementmbetween raters while systematic disagreement indicated if there was negative (Hallgren, 2012).

**Evaluation and validationof the educational material by pregnant women:-**
To legitimize the educational materials throughviwe points of the target population, the draft booklet was handed out toselected group of pregnant women. Alongside the booklet, participants received an evaluation instrument comprising 12 items covering the domains of content, layout and design, applicability, and cultural and linguistic appropriateness.Thepregnant women were required to provide their level of agreement on the scale of 4-point Likert scale ranging from strongly disagree to strongly agree.

**Ethical Considerations:-**
Ethical approval was gained from Research Ethics Committee, Faculty of Nursing, Mansoura University (IRB. 468). Following ethical guidelines for research, signed informed consent was secured from all subjects after explaning the purpose, procedures, and anticipated outcomes of the study. The importance of voluntary participation was explained to both the expert panel and the pregnant women. Participants were made to know that they had the freedom to leave the study at any point without offering an explanation. Information confidentiality and anonymity were guaranteed during the entire research process. Participant personal details and answers were treated with utmost professionalism and used only for research purposes. Additionally, any findings from this research can be published either in professional journals or in conferences, without revealing any personal participant details.

**Statistics analysis:-**
The data was analyzed using personal computer using Stand for statistical product and service solutions (SPSS) program version 27. Quantitative variables were expressed as mean ± standard deviation (SD). Interclass correlation coefficient test and Cronbach alpha assess the degree of agreement or consistency among panelists, is a widely used reliability index in test-retest, Content validity index used to assess the degree of agreement or consistency among panelists to test content validation. A p-value of $\leq 0.05$ was considered statistically significant for all tests.

## Results:-
Table 1 shows that 53.3% of the expert panel were aged between 36 and 40 years, with a mean age of 41.66 (±5.327). The majority (73.3%) were male. Regarding their educational specialization, 46.7% had expertise in community health nursing. Additionally, 53.3% held lecturer positions, and 86.7% had more than 10 years of experience in their respective fields.

**Table 1**
**Demographic and professional background of expert panel**

| **Item** | **n=15** | **%** |
|---|---|---|
| **Age** | | |
| 36-40 year | 8 | 53.3 |
| From 41 years to more | 7 | 46.7 |
| **Mean (SD) 41.66 (5.327 )** | | |
| **Gender** | | |
| Male | 4 | 26.7 |
| Female | **11** | **73.3** |
| **Educational field** | | |
| Community health nursing | **7** | **46.7** |
| Public health medicine | 2 | 13.3 |
| Obstetric specialty | 3 | 20 |
| Nutrition | 3 | 20 |
| **Job title** | | |
| Professor | 4 | 26.7 |
| Assistant professor | 3 | 20 |
| Lecturer | **8** | **53.3** |
| **Years working in the field** | | |
| 6-9 years | 2 | 13.3 |
| 10+ years | **13** | **86.7** |

Table 2 presents the expert panel's evaluation of the title and content quality domains of the educational booklet during the first round of the Delphi process. Within the title domain, only three out of eight evaluation criteria achieved acceptable Item-Level Content Validity Index (I-CVI) scores above 0.80 (0.87, 0.80, and 0.80). The remaining five criteria received I-CVI scores below the recommended threshold of 0.78 (0.73, 0.67, 0.73, 0.73, and 0.73). The Scale-Level Content Validity Index based on the average method (S-CVI/Ave) for this domain was 0.77.

**Table 2**
**1st round: Experts' Evaluation of Booklet Regarding Title, Content Quality of Booklet**

| Criteria | Inadequate | adequate | Totally adequate | I-CVI |
|---|---|---|---|---|
| | N (%) | N (%) | N (%) | N=15 |
| **Title** | | | | |
| The title should be clear | 2 (13.3) | 4 (26.7) | 9 (60) | 0.87 |
| The title should be concise | 3 (20) | 2 (13.3) | 10 (66.7) | 0.80 |
| The title should be reflecting the main goal of the booklet. | 4 (26.7) | 2 (13.3) | 9 (60) | 0.73 |
| Cover page's color palette should be visually appealing, | 4 (26.7) | 4 (26.7) | 6 (40) | 0.67 |
| Cover pages include institutional logos | 4 (26.7) | 1 (6.7) | 10 (66.7) | 0.73 |
| Simple layout (Not with too much text nor many elements) | 4 (26.7) | 2 (13.3) | 9 (60) | 0.73 |
| Cover page is indicated the publication date | 4 (26.7) | 1 (6.7) | 10 (66.7) | 0.73 |
| The developer of booklet has been mentioned | 2 (13.3) | 2 (13.3) | 11 (73.3) | 0.87 |
| **S-CVI/Ave** | 0.77 | | | |
| **Content quality** | | | | |
| Content is clear | 3 (20) | 3 (20) | 9 (60) | 0.80 |
| Content is accurate | 2 (13.3) | 4 (26.7) | 9 (60) | 0.87 |
| Content is up to date | 2 (13.3) | 3 (20) | 10 (66.7) | 0.87 |
| Content is relevant | 3 (20) | 3 (20) | 9 (60) | 0.80 |
| Content is consistent with the needs of pregnant women | 2 (13.3) | 3 (20) | 10 (66.7) | 0.87 |
| Content aligns with educational objectives | 2 (13.3) | 2 (13.3) | 11 (73.3) | 0.87 |
| Content aligned with current guidelines or best practices | 2 (13.3) | 3 (20) | 10 (66.7) | 0.87 |
| **S-CVI/Ave** | **0.85** | | | |

**I-CVI: Item content validity index**
**S-CVI/Ave: Scale- content validity index (Average method)**

Table 3 displays the expert panel's agreement within the relevance domain, where all three evaluation criteria achieved consensus, resulting in Item-Level Content Validity Index (I-CVI) scores above 0.80 (0.87, 0.87, 0.87), and a Scale-Level Content Validity Index using the average method (S-CVI/Ave) of 0.87. In the clarity and readability domain, five out of six evaluation criteria attained I-CVI scores exceeding 0.80 (0.87, 0.87, 0.80, 0.87, 0.87), while one criterion was rated below the acceptable threshold, with an I-CVI of 0.73. The overall S-CVI/Ave for this domain was 0.84. For the practicality and applicability domains, all three evaluation criteria reached agreement with I-CVI scores above 0.80 (1.00, 0.80, 0.93), yielding a high S-CVI/Ave of 0.91.

**Table 3 1st round: Experts' Evaluation of Booklet Regarding Relevance, Clarity and Applicability**

| Criteria | Inadequate | Adequate | Totally adequate | I-CVI |
|---|---|---|---|---|
| | N (%) | N (%) | N (%) | % |
| **Relevance to Target Audience** | | | | |
| The content is age-appropriate and suitable for the intended audience | 2 (13.3) | 4 (26.7) | 9 (60) | 0.87 |
| The content is culturally and socially relevant. | 2 (13.3) | 5 (33.3) | 8 (53.3) | 0.87 |

| | | | | |
|---|---|---|---|---|
| The language level matches the literacy of the target group | 2 (13.3) | 4 (26.7) | 9 (60) | 0.87 |
| **S-CVI/Ave** | **0.87** | | | |
| Clarity and Readability | | | | |
| The language is clear, simple, and easy to understand | 2 (13.3) | 2 (13.3) | 11 (73.3) | 0.87 |
| Technical terms, key concepts are explained or minimized to ensure clarity | 4 (26.7) | 2 (13.3) | 9 (60) | 0.73 |
| Headings and subheadings clearly labeled to guide the reader | 2 (13.3) | 3 (20) | 10 (66.7) | 0.87 |
| Ideas are concisely expressed | 3 (20) | 4 (26.7) | 8 (53.3) | 0.80 |
| The content provides sufficient depth to facilitate learning | 2 (13.3) | 2 (13.3) | 11 (73.3) | 0.87 |
| The proposed content follows a logical sequence. | 2 (13.3) | 3 (20) | 10 (66.7) | 0.87 |
| **S-CVI/Ave** | **0.84** | | | |
| **Practicality and Applicability** | | | | |
| Booklet motivates readers to apply the knowledge in daily life | -- | 5 (33.3) | 10 (66.7) | 1.00 |
| The recommendations are feasible (easily implemented) for the target audience. | 3 (20) | 5 (33.3) | 7 (46.7) | 0.80 |
| The suggested foods and actions are accessible and realistic. | 1 (6.7) | 4 (26.7) | 10 (66.7) | 0.93 |
| **S-CVI/Ave** | **0.91** | | | |

**I-CVI: Item content validity index**
**S-CVI/Ave: Scale- content validity index (Average method)**

Table 4 displays the expert panel agreement on visual and graphic design domains with four evaluating criteria reached an agreement leading to a I-CVI score more than 0.80 (1.00, 0.93, 1.00, 0.80) while only two criteria was assessed as being inadequate and attained a CVI score lower than the expected value 0.78 (0.73, 0.67) with S-CVI/Ave was 0.86. Concerning legibility and printing characteristics domain, all five evaluating criteria reached an agreement leading to a I-CVI score more than 0.80 (0.93, 1.00, 1.00, 0.93, 0.87) with S-CVI/Ave was 0.95.

**Table 4**
**1st round: Experts' Evaluation of Booklet Regarding Design and Legibility Characteristics**

| **Criteria** | **Inadequate** | **Adequate** | **Totally adequate** | **I-CVI** |
|---|---|---|---|---|
| | **N (%)** | **N (%)** | **N (%)** | **%** |
| **Visual & Graphic Design** | | | | |
| Visual elements (e.g., images, charts) support understanding. | -- | -- | 15 (100) | 1.00 |
| Visuals are culturally appropriate and inclusive | 1 (6.7) | 3 (20) | 11 (73.3) | 0.93 |
| Layout and formatting are clean and well-organized. | -- | -- | 15 (100) | 1.00 |
| Layout is attractive for the target audience | 4 (26.7) | 2 (13.3) | 9 (60) | 0.73 |
| Layout is engaging for the target audience | 5 (33.3) | 2 (13.3) | 8 (53.3) | 0.67 |
| Colors and contrast between text and background are visually appealing | 3 (20) | 3 (20) | 9 (60) | 0.80 |
| **S-CVI/Ave** | **0.86** | | | |
| **Legibility & printing characteristics** | | | | |
| Font size is appropriate for readability | 1 (6.7) | 4 (26.7) | 10 (66.7) | 0.93 |
| Font style is appropriate for readability | -- | -- | 15 (100) | 1.00 |
| Line spacing are appropriate for readability | -- | 3 (20) | 12 (80) | 1.00 |
| Paper durable, non-glossy, and easy to handle | 1 (6.7) | 2 (13.3) | 12 (80) | 0.93 |
| Uniform typography across headings, body, captions, and pages. | 2 (13.3) | 4 (26.7) | 9 (60) | 0.87 |
| **S-CVI/Ave** | **0.95** | | | |

I-CVI: Item content validity index S-CVI/Ave: Scale- content validity index (Average method)
As shown in table 5 internal reliability and interclass correlations (ICC) for eachdomain score of the feedback from experts in first round of Delphi survey was observed that a high degree of reliability in all domains including overall assessment as measured by ICC range from (0.986: 0.999) which indicated high agreement level for all feedback domains of the designed booklets**.**

**Table 5**
**Internal Reliability and Intraclass Correlation for Expert Feedback in 1st round**

| | **Interclass correlation (ICC)** | **95% Confidence interval** | | **Cronbach Alpha α** |
|---|---|---|---|---|
| | | Lower Bound | Upper Bound | |
| Single Measure | 0.915 | 0.807 | 0.982 | 0.995 |
| Average Measure | 0.994 | 0.984 | 0.999 | |

Table 6 shows the results of the second round of the Delphi survey demonstrate unanimous agreement among the panel of experts regarding the validity of the educational material. All evaluation domains (title, content quality, clarity & readability, practicality and applicability, visual and graphic design, legibility & printing characteristics) achieved a S-CVI using both the average method (S-CVI/Ave) and universal agreement method (S-CVI/UA) of 1.00 and 100%, respectively.

**Table 6**
**Experts' Evaluation Results in Second Round of Delphi Survey**

| **Evaluation Domains** | **S-CVI/Ave** | **S-CVI/UA** |
|---|---|---|
| Title | 1.00 | 100 |
| Content quality | 1.00 | 100 |
| Clarity & Readability | 1.00 | 100 |
| Practicality & Applicability | 1.00 | 100 |
| Visual & Graphic Design | 1.00 | 100 |
| Legibility & printing characteristics | 1.00 | 100 |

**S-CVI/Ave: Scale- content validity index(Average method)**
**S-CVI/UA: Scale- content validity index (Universal Agreement)**

Table 7 reveals internal reliability and interclass correlations for eachdomain score of the feedback from an excellent agreement level for was observed that a high degree of reliability in all domains including overall assessment as measured by ICC range from(0.994: 1.000) which indicated an excellent agreement level for all feedback domains of the designed booklets

**Table 7**
**Internal Reliability and Intraclass Correlation for Expert Feedback in round 2**

| | **Interclass correlation (ICC)** | **95% Confidence interval** | | **Cronbach α** |
|---|---|---|---|---|
| | | Lower Bound | Upper Bound | |
| Single Measure | 0.994 | 0.986 | 0.999 | 1.000 |
| Average Measure | 1.000 | 0.999 | 1.000 | |

Table 8 illustrates pregnant women' evaluation of designed booklet, 95% of pregnant women' responses in content domains was strongly agree with a total mean 3.807 (0.224), a total mean of readability domain was3.300 (0.227), which indicated that 82.5% of the pregnant women' responses in this domain was strongly agree, and a total mean ofapplicability domain was 3.763 (0.236) which indicated that 94% of the pregnant women' responses in this domain was strongly agree.92.7% of pregnant women' responses in layout & design domains was strongly agree with a total mean 3.708 (0.186), a total mean of usability & navigation domain was3.763 (0.236), which indicated that 94% of the pregnant women' responses in this domain was strongly agree, and a total mean ofcultural appropriateness domain was 3.750 (0.281)which indicated that 93.7% of the pregnant women' responses in this domain was strongly agree.

**Table 8**
**Pregnant Women' Evaluation of Designed Booklet**

| Criteria | Mean (SD) |
|---|---|
| Content | 3.807 (0.224) |
| Readability & Clarity | 3.300 (0.227) |
| Practicality & Applicability | 3.763 (0.236) |
| Layout & design | 3.708 (0.186) |
| Usability & Navigation | 3.763 (0.236) |
| Cultural Appropriateness | 3.750 (0.281) |

## Discussion:-

Maternal nutrition emphasizes on the importance of nutrition in affecting the health of mothers and their babies through various stages, which include preconception, pregnancy, childbirth, and postpartum periodsIn pregnancy, particularly in the second and third trimesters, the energy and nutrient requirements are high for pregnant women. When not met, it can adversely affect the mother's well-being and the child's growth. Based on research, it is evident that adequate nutrition has a positive correlation with adequate perinatal health, which is mostly dependent on the nutritional knowledge of the pregnant woman. For this reason, it necessitates nutrition education to foster maternal and fetal health (Anato&Reshid, 2025). It is crucial to produce an educational document in writing and validate it. Content validity is necessary when preparing educational documents for pregnant women because it will assure the accuracy and clarity of information that the document will provide. Having experts and pregnant women participate in the validation process is vital because it allows for the incorporation of all necessary topics and the use of appropriate language in terms of cultural sensitivity(Sapkota et al., 2019).

The Delphi technique is a repetitive approach involving the distribution and modification of experts' responses through questionnaires conducted repetitively with feedback in-between. The goal is to reach a consensus between experts, enabling them to modify their responses based on the feedback collected during the limited number of repetitions(Jorm, 2025).The Delphi technique was used in the current research to verify the accuracy of the content of an educational booklet before the implementation phase. The selected experts filled out a semistructured online questionnaire developed in Google Docs twice. The experts reached a consensus regarding the content validity of the booklet, and its internal consistency was measured by calculating Cronbach's alpha.In the current study, there was a high consensus between the experts that the booklet content was accurate, updated, met the educational objectives, and was suitable for the intended population considering their age and literacy level. This conclusion is in agreement with Guillot, Miss, and Keenan (2016) stating that any educational material should be accurate and based on contemporary sources.

For readability and usability, expert panelists concurred that the language in the booklet is clear, concise, and easy to comprehend, but still detailed enough to enhance learning. Additionally, the experts observed that the booklet is expected to inspire the readers to use the information gained from reading it in their daily activities. This result corroborates the findings in the studies conducted by Armayanti and Nasution (2024) and Gonella et al. (2024). According to them, educational booklets showed high validity in promoting comprehension and practicality of the content. For graphic design, format, and readability, the experts agreed that graphics such as pictures and graphs play a critical role in enhancing comprehension, and that the design is well structured and organized for ease of practical usage of printed health education materials. This result corroborates the study conducted by Giannopoulos, Mertens, Secomandi, Olsder, and Van Leeuwen (2021).

Complete consensus was achieved by experts in the second round of the Delphi survey concerning the validity of the educational booklet. Consensus was achieved in all evaluated aspects including title, content quality, clarity and readability, applicability, appearance, and legibility where all of them obtained a perfect Scale-Content Validity Index of 1.00 both by average method (S-CVI/Ave) and universal agreement method (S-CVI/UA). The results of the current study are like those obtained by Vasconcelos et al. (2023), in Brazil where high consensus level was observed (CVI = 0.97) through categorization of expert opinion regarding structure of the material, objectivity, accuracy, and perception. It was also observed that very high reliability values were noted by experts in all evaluated aspects where ICC values varied from 0.994 to 1.000. These results corroborate the results of Galdino, Moreira, Marques, and Da Silva (2019), in Brazil where authors found that their educational booklet was valid and reliable for promoting self-care behaviors in individuals with Diabetes Mellitus.

The pregnant women who read through the booklet noted that it was clear, concise, and easy to implement in everyday life. The content, according to them, was informative and useful in understanding their nutritional needs and implementing the information in their day-to-day activities. This is in line with the findings of Inaoka et al. (2020) and Gonçalves et al. (2024) from Japan and Brazil respectively where the role of educational booklets with clear and effective graphical representation on supporting the health of pregnant women is discussed.The pregnant women, being the users of the booklet, expressed great satisfaction about the design, usability, navigation process and suitability of the booklet for their culture. They appreciated the graphics and visual representations including illustrations, diagrams, charts, and images provided within the booklet as means of enhancing the effectiveness of the text in helping them find the desired information. Moreover, the dietary information contained in the booklet was flexible enough to accommodate various cultures while considering social, economic and religious restrictions on the diet. This is consistent with the findings of Wiganda&Khairiah (2024) from Indonesia.

Finally, the consensus was reached regarding the design and content of the booklet to be designed. Validation will help in proving the scientific correctness, understandability by the target group, and capability of communicating the intended message. Moreover, valid booklets will prove very helpful in increasing the reliability and credibility of the intervention. Therefore, booklet validation is a crucial preparatory process that can benefit the intervention and increase its reliability.

## Conclusion:-

I can cocluded that Delphi method was found to be an effective way to validatethe educational booklet on nutrition for pregnant women. The consensusof expert proved the fact that informations included in the the booklet is relevant, relevant, understandable, and scientifically accurate. The pregnant women provide a positive assessment of the contents'adequacy, coverage and readability. The validated educa`tionalbooklet can be considered as excellent tool forteaching pregnant women proper nutrition.

## Recommendations:-

1. Integration helped incorporate the educational booklet into antenatal care programs and was utilized by healthcare practitioners for provision standardized nutrition education among pregnant women.
2. Training provided for nurses, midwives, and other healthcare providers in using the booklet effectively in antenatal counseling sessions.
3. Assessment the efficacy of the booklet in enhancing knowledge, attitudes, and nutritional practices among pregnant womenduring pregnancy.
4. Developing other educational materials for other maternal health topics such as breastfeeding, postpartum nutrition, and newborn care.

## Acknowledgments:-

We would like to express our sincere gratitude to all pregnant women and expert panel participated in this study.

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