



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>



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 to develop and 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.

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Introduction:-

Maternal nutrition is critical for fetal growth, pregnancy health, and long-term child health. 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 prevents deficiencies, lowering risks of low birthweight and developmental delays. 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 the benefits of this dietary pattern, there is lack 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 antenatal care. Utilising educational tools for nutrition education during individualised counselling,

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has been demonstrated to improve adherence to dietary recommendations (Manaf et al., 2024). Educational materials such as booklets are widely used in maternal health intervention due to provide simple and structured information 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). One widely used approach for validating educational materials is the Delphi Method, a structured consensus technique that collects and refines expert opinions through multiple rounds of questionnaires. Delphi technique is a structured forecasting and decision-making method that gathers anonymous, iterative feedback from a panel of experts to reach consensus on complex problems. It uses multiple questionnaire rounds, with results summarized between rounds to allow experts to revise opinions, reducing groupthink. It is commonly used in health research to validate educational materials, assessment tools, and competency frameworks. This method allows researchers to achieve consensus among experts while maintaining anonymity and minimizing the influence of dominant individuals (Magnabosco et al., 2023; Martinino et al., 2025). Therefore, the present study aimed to validate the content of an educational booklet on nutrition for pregnant women using the Delphi method.

Aim:-

This study aimed to develop 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 thirty pregnant women 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: totally inadequate, inadequate, adequate, and totally adequate.

Scoring system:-

The cutoff for determining agreement or consensus among expert panelists involved calculating the Content Validity Index (CVI) for each item individually (I-CVI), as well as for the overall set of items in the booklet (Global CVI). The I-CVI reflects the proportion of experts rating an item as either "adequate" or "totally adequate." Items with CVI values equal to or greater than 0.78 were considered to have achieved adequate content validity. Additionally,

Intraclass Correlation Coefficient (ICC) was used to assess the degree of agreement or consistency among panelists, is a widely used reliability index in test-retest, providing a more robust measure of reliability than simple correlation. The ICC value ≥ 0.75 is typically considered acceptable, indicating good reliability among raters. Interpretation of the Intraclass Correlation Coefficient and corresponding agreement levels is presented in below table.

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

Development of the Educational Booklet:-

The educational booklet was developed after a comprehensive review of the literature related to maternal nutrition during pregnancy. Relevant guidelines, scientific articles, and maternal health education resources were consulted to ensure that the content was evidence-based and up to date. 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). In addition to practical part include meal planning guides, portion size calculation methods, food label reading instructions, simple, nutritious recipes. The booklet was designed using Canva software (<https://www.canva.com>), an accessible design platform that allowed for the creation of visually engaging and professionally formatted educational material. The final version of the booklet measured 148 x 210 mm (A5 size) and consisted of eight double-sided pages. It included the following structural elements: front cover, back cover, table of contents and informational content pages.

Validation of Educational Booklet:-**Selection of Experts:-**

Experts were selected based on their professional expertise and experience in fields related to maternal health.

Inclusion Criteria:-**Experts were eligible to participate if they met the following criteria:**

- Specialization in maternal health, obstetrics, and nutrition.
- At least five years of professional experience in their field
- Experience in research, maternal education, or clinical practice

Delphi Validation Process:-

The Delphi method is well acknowledged for its structured approach to achieving consensus among professionals regarding the relevance, clarity, and adequacy of content (Adikari, Sivakanesan, Wijesinghe, and Liyanage, 2019; De Matos Magalhães et al., 2022). In content validation, the precision, completeness, and appropriateness of the educational content would be critically examined to ensure its appropriateness to the intended learning outcomes and pregnant women. The Delphi method was selected for its ability to gather and refine expert opinions through a series of structured feedback cycles, ultimately converging on a shared agreement. It allows for anonymous input, controlled iteration, and statistical aggregation of group responses, thereby minimizing bias and enhancing objectivity.

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

Upon identifying the panel of experts, they were invited via email to provide opinions based on their knowledge or experience, in response to the questionnaire. The mail of invitation informed experts about the aim of study, outlining the Delphi process, and requesting responses to the question and instructions on accessing and answering the instrument electronically. The validation process was conducted in two rounds.

First Delphi Round:-

In the first round, experts received the educational booklet along with an evaluation questionnaire designed to assess the content. Experts were asked to evaluate each section of the booklet in terms of: title, content quality, relevance to target audience, clarity & readability, visual & graphic design, practicality & applicability, and legibility & printing characteristics. Each item was rated using a four-point Likert scale ranging from: totally adequate, adequate, inadequate, totally inadequate. The Content Validity Index (CVI) was calculated to determine the level of agreement among experts. This was achieved by calculating the CVI for each item (I-CVI) as well as for the overall set of items (Global CVI).

Second Delphi Round:-

After revising the booklet based on the experts' comments, the modified version was sent again to the same panel of experts for a second round of evaluation. Experts re-assessed the revised items to determine whether the suggested modifications improved the content. Consensus among experts was considered achieved when the content validity index reached acceptable levels. In addition to Content Validity Index, the Interclass Correlation was calculated. Higher ICC values indicate greater inter-rater reliability (IRR), with an ICC estimate of 1 indicating perfect agreement. Negative ICC estimates indicate systematic disagreement (Hallgren, 2012).

Legitimation of the educational material by pregnant women:-

To validate the educational materials from the target audience's perspective, the preliminary version of the booklet was distributed to a sample 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. The participants had to express their degree of agreement with each item on a 4-point Likert scale ranging from strongly disagree to strongly agree.

Ethical Considerations:-

Ethical clearance was granted by the Research Ethics Committee of the Faculty of Nursing, Mansoura University (IRB. 468). In accordance with ethical research guidelines, written informed consent was obtained from all participants after a thorough explanation of the study's purpose, procedures, and expected outcomes. The researchers clarified the voluntary nature of participation to the expert panel and pregnant women. Participants were assured of their right to withdraw from the study at any stage without the need to provide a justification. Confidentiality and anonymity were strictly maintained throughout the research process. Personal data and responses were handled with care and used solely for research purposes. Furthermore, findings derived from this study may be disseminated through academic publications or presentations, but without disclosing any identifying participant information.

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 \pm 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 ≤ 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 each domain 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 each domain 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 was 3.300 (0.227), which indicated that 82.5% of the pregnant women' responses in this domain was strongly agree, and a total mean of applicability 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 was 3.763 (0.236), which indicated that 94% of the pregnant women' responses in this domain was strongly agree, and a total mean of cultural 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 periods. In pregnancy, especially in the second and third trimesters, the energy and nutrient demands are high for pregnant women. Failure to meet these needs can have detrimental effects on both maternal health and fetal development. Research findings show that good nutrition is positively related to good perinatal health, which is largely influenced by the nutritional knowledge of pregnant women. This, therefore, calls for nutrition education aimed at promoting the maternal and fetal health (Anato&Reshid, 2025). Developing a written and validated educational document is a critical step in ensuring consistency in the information provided. Content validity is particularly important for educational materials aimed at pregnant women, as it ensures that the information is accurate, relevant, and comprehensible for the target audience. Involving both experts and pregnant women in the validation process helps ensure that the material addresses essential topics, employs appropriate language, and is culturally sensitive, thereby enhancing its effectiveness in promoting health knowledge and behaviors (Sapkota et al., 2019).

The Delphi method is an iterative technique used to gather and refine expert opinions through multiple rounds of questionnaires, with feedback provided between rounds. It is designed to achieve consensus among experts, allowing them to adjust their evaluations based on aggregated feedback and reliability indices over a limited number of iterations (Jorm, 2025). In the present study, the Delphi method was employed to validate the content of an educational booklet prior to its use in the intervention. Expert panelists participated in two rounds of evaluation using an online semi-structured form created in Google Docs. Consensus among experts was assessed using the Content Validity Index, while internal consistency was evaluated through Cronbach's alpha coefficient. The panel strongly agreed that the booklet's content was accurate, up to date, aligned with educational objectives, and appropriate for the target audience in terms of age and literacy level. These findings are consistent with Guillot, Miss, and Keenan (2016), who emphasize that educational materials must be accurate and sourced from current, reliable references.

Regarding readability and applicability, expert panelists strongly agreed that the booklet's language is clear, simple, and easily understandable, while providing sufficient depth to support learning. The experts also noted that the booklet is likely to motivate readers to apply the knowledge in daily life. These findings are consistent with Armayanti and Nasution (2024) and Gonella et al. (2024), which reported that educational booklets demonstrated high validity, facilitating comprehension and practical application of the content. Concerning graphic design, layout, and legibility, experts agreed that visual elements such as images and charts effectively support understanding, and that the layout is clean, well-organized, and enhances the practical usability of printed health education resources. This aligns with Giannopoulos, Mertens, Secomandi, Olsder, and Van Leeuwen (2021), who found that educational booklets scored highly for patient satisfaction and perceived knowledge acquisition, reflecting satisfactory quality, readability, and design.

The second round of the Delphi survey demonstrated complete agreement among experts on the validity of the educational booklet. Every domain assessed including title, content quality, clarity and readability, practicality and applicability, visual design, and legibility achieved a perfect Scale-Content Validity Index of 1.00 using both the average method (S-CVI/Ave) and the universal agreement method (S-CVI/UA). These results are like Vasconcelos et al. (2023), in Brazil who found high agreement (CVI = 0.97) after organizing expert feedback into categories such as material structure, objectivity, accuracy, and perception. The experts also reported very high reliability across all domains, with intraclass correlation coefficients (ICC) ranging from 0.994 to 1.000, indicating excellent consistency in their evaluations. This supports the findings of Galdino, Moreira, Marques, and Da Silva (2019), in Brazil who

concluded that their educational booklet was valid and reliable for supporting self-care behaviors in people with Diabetes Mellitus.

Pregnant women who reviewed the booklet reported that it was clear, easy to read, and practical to use in daily life. They felt that the content helped them understand their nutritional needs and could be readily applied to their routines. These findings are consistent with findings of Inaoka, Octawijaya, Wariki, and Ota (2020) in Japan and Gonçalves, Silva, Furlan, Luchesi, and Martins (2024), findings in Brazil which highlighted that educational booklets with clear, well-designed graphics and practical information effectively support the health of pregnant women. In addition, pregnant women the primary users and beneficiaries of the booklet rated its design, usability, navigation, and cultural appropriateness highly. Visual elements such as diagrams, charts, and images were reported to effectively support the text, allowing users to quickly locate the information they needed. The dietary recommendations were considered adaptable to different cultural practices, while also respecting socioeconomic and religious dietary restrictions. These findings align with Wiganda and Khairiah (2024), findings in Indonesia which found that educational booklets significantly improved knowledge and motivation among pregnant women.

Finally, there was complete agreement on design and content of designed booklet. Validation helps confirm that the content is scientifically correct, understandable for the target population, and capable of effectively conveying the intended health or educational messages. In addition, validated booklets is important for enhancing the reliability and credibility of the intervention. Therefore, booklet validation is an essential preparatory step that improves the intervention and the reliability of the research findings.

Conclusion:-

The Delphi method proved to be an effective tool for validating the educational booklet on nutrition for pregnant women. The expert consensus confirmed that the booklet contains relevant, clear, and scientifically accurate information. The pregnant women positively evaluated the adequacy, coverage and readability of contents of the booklet. The validated booklet can be used as an educational tool to promote healthy nutritional practices among pregnant women and support maternal health education programs.

Recommendations:-

1. Integration validated educational booklet into antenatal care programs and used by healthcare providers to deliver standardized nutrition education to pregnant women.
2. Training for nurses, midwives, and other healthcare professionals on how to effectively use the booklet during antenatal counseling sessions.
3. Evaluating the effectiveness of the booklet in improving pregnant women's knowledge, attitudes, and nutritional practices during pregnancy.
4. Developing similar validated 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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