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Developing Health Literacy Instruments for a Healthy Pregnancy

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ABSTRACT Health literacy refers to the ability to access, understand, and apply health information. Although health literacy has been widely measured in Indonesia, instruments specifically designed for preconception women remain limited. This study aimed to develop and validate a context-specific questionnaire for women preparing for a healthy pregnancy. A quantitative descriptive design was conducted among 108 women who had never been pregnant in the Religious Affairs Office working area of Tallo District. Validity was assessed using Pearson Product Moment correlation, and reliability was evaluated using Cronbach's Alpha. All items met validity criteria and demonstrated satisfactory internal consistency. Cronbach's Alpha values were 0.885 for information access, 0.883 for comprehension, 0.758 for self-efficacy, and 0.936 overall. The findings indicate that the questionnaire is valid and reliable for assessing health literacy and supporting targeted preconception health interventions.

INTRODUCTION

The preconception period is widely recognised as a critical window for improving maternal and infant health through interventions targeting nutrition and other lifestyle factors (Lassi et al. 2021). Health conditions and behaviours before conception influence pregnancy outcomes as well as long-term and intergenerational health trajectories for women and their offspring (Hall et al. 2023). Improving preconception health before and between pregnancies is therefore considered an essential strategy to reduce maternal and infant mortality and pregnancy-related complications (Zhang and Wang 2025).

Preconception health care is regarded as a key component of primary prevention and health promotion, focusing on risk assessment and early intervention to modify biomedical, behavioural, and social risk factors that affect future pregnancies

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(Ukoha and Mtshali 2022). Evidence suggests that the adoption of healthy behaviours, particularly those related to nutrition and lifestyle, contributes to improved preconception and pregnancy outcomes (Lang et al. 2021). Adequate nutritional knowledge has been associated with healthier maternal dietary behaviours and reduced risk of adverse pregnancy outcomes (Oladebo et al. 2024).

Recent scoping reviews emphasise the importance of preconception care in preventing adverse maternal, perinatal, and child health outcomes through indirect pathways, including improvements in nutritional status, health behaviours, and engagement with health services (Padhani et al. 2024; Poix and Elmusharaf 2023). Maternal nutritional status during the preconception period has been identified as a key contributor to intergenerational health, highlighting the need for early and tailored preventive strategies (Brink et al. 2022). However, limited access to comprehensive preconception care services remains a major challenge, particularly in low-resource settings (Ukoha and Mtshali 2022).

The effectiveness of preconception interventions is strongly influenced by health literacy. Health literacy is increasingly defined not only as the ability to access and understand health information, but as a multifaceted competency that enables individuals to seek, comprehend, appraise, and use health information effectively within diverse social contexts (Agner et al. 2024). Low health literacy has been consistently associated with health disparities, including reduced access to health services, lower participation in preventive activities, and poorer health outcomes. Empirical studies show that higher health literacy is associated with greater uptake of preconceptual care and preventive practices during early pregnancy (Sajjadian et al. 2024), whereas lower health literacy is linked to limited understanding of health information and suboptimal engagement with antenatal care (Esam et al. 2022).

Although health literacy has been widely measured using instruments such as the Health Literacy Survey-European Union (HLS-EU) and the Health Literacy Instrument for Adults (HELIA), most existing tools are designed for general adult populations and may not sufficiently address the specific informational and behavioural demands associated with reproductive life-stage transitions. Recent literature emphasises that health literacy is highly context-dependent and should be assessed in relation to the particular health decisions individuals face, including reproductive planning and preconception care (Agner et al. 2024; Zhang and Wang, 2025). Reliance on generic measurement frameworks may therefore lead to incomplete or insensitive assessments of literacy competencies required for healthy pregnancy preparation (Pelikan et al. 2021). Consequently, validated instruments specifically tailored to the preconception context remain limited and represent an important gap in maternal health research.

Objectives of the Study

This study aimed to develop a context-specific health literacy instrument for preconception women in preparation for a healthy pregnancy and to evaluate the validity and reliability of the questionnaire.

METHODOLOGY

This study uses a quantitative descriptive design. The population of this study consisted of women of childbearing age residing in the Religious Affairs Office working area of Tallo District. The inclusion criteria were prospective brides who had never been pregnant and were present at the study location during data collection, while the exclusion criterion was inability to understand the Indonesian language. The sample comprised 108 prospective brides who met the inclusion criteria. The sample size was considered adequate for instrument validation based on psychometric recommendations suggesting a minimum of 3 to 5 respondents per item. Health literacy was the main variable in this study and was measured using a modified HLS-EUQ questionnaire specifically adapted for preconception women preparing for a healthy pregnancy. The instrument consisted of 31 items, including 12 items assessing access to information, 11 items measuring level of understanding, and 8 items evaluating self-efficacy. Responses were rated on a four-point Likert scale, ranging from 'very difficult' (score 1), 'quite difficult' (score 2), 'quite easy' (score 3), to 'very easy' (score 4). Cronbach's Alpha was used to assess internal consistency, reflecting the average inter-item correlation within the scale (Cronbach 1951). Univariate analysis was conducted to examine instrument

validity using the Pearson Product Moment correlation. An item was considered valid if the calculated r value was greater than or equal to the r table value (DF = N - 2) at a significance level of 0.05. Instrument reliability was evaluated using Cronbach's Alpha, with the questionnaire considered reliable if the Cronbach's Alpha coefficient exceeded the r table value at a significance level of 0.05.

RESULTS

A total of 108 preconception women participated in this study. Table 1 presents the demographic nutritional status, and sources of health information among the respondents. Most participants were aged 20-26 years (78.7%), while 21.3 percent were aged 27-33 years. In terms of educational attainment, the majority of respondents had a high level of education (89.8%), whereas only 10.2 percent had a low education level. Regarding occupational status, half of the respondents were housewives (50.0%), followed by private employees (41.7%), and a smaller proportion were civil servants (8.3%). Assessment of nutritional status based on body mass index showed that most respondents had normal body weight (67.6%), while 26.9 percent were classified as overweight and 5.5 percent as underweight. Similarly, mid-upper arm circumference measurements indicated that most respondents were in the normal nutritional category (90.7%), with 9.3 percent identified as being at risk of malnutrition. With respect to sources of health information, social media was the most commonly reported source (68.6%). Other sources included primary health care services (23.1%), religious affairs offices (5.6%), and family members (2.8%).

Table 2 presents the results of the validity and reliability testing of the health literacy questionnaire across its domains, including access to information, level of understanding, self-efficacy, and the overall health literacy score. The validity analysis showed that all items across the domains had item-total correlation coefficients (r values) exceeding the critical table r value (r = 0.1891), indicating that all items were statistically valid. For the access to information domain, the mean score was 39.92 (SD = 4.70), with item-total correlation coefficients ranging from 0.439 to 0.710. The Cronbach's alpha coefficient for this domain was 0.885, demonstrating good internal consistency. These results indicate that items related to obtaining, searching, and identifying relevant health and nutrition information consistently measured the same construct.

Table 1: Description of characteristics, nutritional status and health literacy of preconception women

Characteristic	*n (108)*	*%*
Age (Years)		
20 – 26	85	78.7
27 – 33	23	21.3
Education		
Low education level	11	10.2
High education level	97	89.8
Occupational		
Housewife	54	50.0
Private employees	45	41.7
Civil servant	9	8.3
Body Mass Index		
Underweight	6	5.5
Normal weight	73	67.6
Overweight	29	26.9
Arm Circumference		
At risk of malnutrition	10	9.3
Normal	98	90.7
Resources		
Social media	74	68.6
Primary health care	25	23.1
Family	3	2.8
Religious affairs office	6	5.6

Table 2: Validity and reality of each health literacy item

Health literacy items	*Mean*	*SD*	*R Value*	*Table R Value (DF = N-2)*	*Cronbach's Alpha*	*N of items*
Access Information	39.92	4.701		.1891	.885	12
How to get information			.552			
Ability to search for information related to solutions			.710			
Type of information needed			.624			
Information about maternal health			.639			
Information on nutritional needs			.571			
Health screening information			.439			
Information about vaccination			.587			
Information on health risks			.568			
Lifestyle information			.640			
Information about vitamins			.531			
Information about healthcare providers			.644			
Healthcare companions			.531			
Level of Understanding	35.63	4.414		.1891	.883	11
Understand the article or news			.401			
Apply information			.504			
Explaining information			.468			
Easily understand information from social media	.526					
Information from health workers			.705			
Nutrition information			.678			
Information about health checks			.696			
Information about vaccination			.605			
Information about lifestyle			.608			
Information on risks to avoid			.682			
Information about vitamins			.720			
Self-efficacy	26.37	2.837		.1891	.758	8
Implementation of a healthy diet			.321			
Routine health check-ups			.436			
Healthy lifestyle			.488			
Avoid risk factors			.468			
Regular consumption of vitamins			.469			
Application of health information			.393			
Decision			.537			
Seeking professional help			.533			
Health Literacy	101.92	10.683	.523	.1891	.936	31

The level of understanding domain had a mean score of 35.63 (SD = 4.41). All items within this domain showed acceptable correlation coefficients ($r > 0.1891$), with values ranging from 0.401 to 0.705. The Cronbach's alpha value of 0.883 indicates high reliability, suggesting that items measuring comprehension and application of health information were internally consistent. For the self-efficacy domain, the mean score was 26.37 (SD = 2.84). Item-total correlation coefficients ranged from 0.321 to 0.537, all exceeding the critical r value. The Cronbach's alpha coefficient for this domain was 0.758, indicating acceptable reliability. This finding suggests that the items measuring confidence in applying health information and engaging in healthy behaviours were sufficiently consistent.

Finally, the overall health literacy scale demonstrated a mean score of 101.92 (SD = 10.68). The overall item-total correlation coefficient exceeded the critical value, and Cronbach's alpha coefficient was 0.936, indicating excellent internal consistency. This result confirms that the questionnaire as a whole is a reliable and valid instrument for assessing health literacy among preconception women.

Table 3 presents the distribution of respondents' health literacy levels (n = 108) across four domains of Access to Information, Level of Under-

Table 3: Number and percentage of respondents who answered the health literacy items correctly (n=108)

Health literacy items	*n (108)*	*%*
Access Information		
Inadequate health literacy	5	4.6
Problematic health literacy	5	4.6
Sufficient health literacy	59	54.6
Excellent health literacy	39	36.1
Level of Understanding		
Inadequate health literacy	6	5.6
Problematic health literacy	9	8.3
Sufficient health literacy	59	54.6
Excellent health literacy	34	31.5
Self-efficacy		
Inadequate health literacy	5	4.6
Problematic health literacy	2	1.9
Sufficient health literacy	71	65.7
Excellent health literacy	30	27.8
Health Literacy		
Inadequate health literacy	3	2.8
Problematic health literacy	11	10.2
Sufficient health literacy	63	58.3
Excellent health literacy	31	28.7

standing, Self-Efficacy, and Overall Health Literacy. In general, the majority of respondents demonstrated sufficient health literacy in all domains. Specifically, 54.6 percent of respondents exhibited sufficient health literacy in both the Access to Information and Level of Understanding categories, while an even higher proportion (65.7%) was found in the Self-Efficacy domain. The excellent health literacy level followed consistently as the second most prevalent category across domains, ranging from 27.8 percent to 36.1 percent. Conversely, the proportion of respondents with problematic or inadequate health literacy was relatively low. The highest percentage of problematic health literacy was observed in the Overall Health Literacy domain (10.2%), whereas inadequate health literacy remained below 6.0 percent in all domains.

DISCUSSION

This study addresses a critical gap in health literacy research by developing and validating a multidimensional instrument specifically tailored to preconception women. While health literacy measurement has been extensively applied in general adult populations, instruments rarely capture the distinct informational and behavioural demands that arise during the preconception period. Recent conceptual advances emphasise that health literacy is context-sensitive and shaped by life-course transitions, including reproductive planning (Agner et al. 2024; Zhang and Wang 2025). Therefore, the development of a context-specific instrument responds directly to calls for more targeted assessment tools in maternal and reproductive health research.

The findings demonstrate strong psychometric performance across domains, with Cronbach's alpha values ranging from acceptable to excellent. These results align with recent validation studies of multidimensional health literacy instruments that confirm the robustness of structured frameworks adapted to specific populations (Bergman et al. 2023; Pelikan et al. 2021). However, unlike previous general-population validations, this study applies the framework to preconception women, thereby extending measurement research into a reproductive lifestage that remains underrepresented. This study is among the first validated instruments specifically developed to assess multidimensional health literacy in preconception women, a population that remains underrepresented in measurement research. This contribution is particularly relevant given growing evidence that health literacy influences engagement with preventive services and reproductive decision-making (Sajjadian et al. 2024).

Notably, several items demonstrated comparatively lower item-total correlations, particularly those related to vaccination information, interpretation of health-related media content, and implementation of healthy dietary practices. This pattern is theoretically meaningful rather than merely statistical. Contemporary literature suggests that higher-order competencies such as critical appraisal and behavioural translation represent the most challenging components of health literacy (Agner et al. 2024). Translating information into sustained behavioural change requires not only cognitive understanding but also motivational and structural support. In the context of preconception health, this may reflect broader barriers, including misinformation exposure, inconsistent digital content quality, and sociocultural influences on dietary behaviour.

The distribution of health literacy levels in this study indicates generally sufficient to high literacy among respondents, likely influenced by the predominance of participants with higher educational attainment. This observation is consistent with recent findings that education remains a strong predictor of self-reported health literacy and nutrition literacy (Sanlier et al. 2024; Oladebo et al. 2024). However, high mean scores should be interpreted cautiously. Self-assessment instruments may overestimate functional capacity, particularly in populations with higher formal education. Moreover, the reliance on social media as the primary source of health information raises important questions regarding digital health literacy. Emerging research highlights that general health literacy does not necessarily equate to the ability to critically evaluate digital health content (Demirer and Yardimci 2023). This distinction is especially relevant for preconception women, who may encounter conflicting or non-evidence-based online information.

From a broader perspective, the findings underscore the importance of distinguishing between functional literacy (access and understanding) and interactive or critical literacy (application and evaluation). The relatively lower performance in self-efficacy-related items suggests that behavioural enactment remains a complex domain requiring supportive interventions beyond information provision alone. Recent reviews emphasise that nutrition knowledge and literacy influence maternal dietary behaviours and may affect pregnancy outcomes; however, structural and contextual determinants also play significant roles (Oladebo et al. 2024). Thus, measurement tools should not only assess informational capacity but also identify domains where supportive strategies are needed.

From a public health perspective, integrating this instrument into primary care settings or premarital screening programmes may facilitate early identification of health literacy gaps and support targeted preconception counselling. Such integration could strengthen preventive strategies before conception and enhance maternal health outcomes.

Several limitations should be acknowledged. The sample was drawn from a single district and included a high proportion of women with higher education levels, which may limit generalisability. Additionally, cross-sectional validation does not capture predictive validity over time. Future studies should examine the instrument's sensitivity to change following digital or community-based interventions and explore its performance among women with lower educational and socioeconomic backgrounds. Longitudinal validation would further strengthen its utility in monitoring preconception health programmes.

Overall, this study contributes to the evolving literature on context-specific health literacy measurement by providing empirical evidence for a reliable and valid instrument tailored to preconception women. By integrating multidimensional literacy domains directly linked to pregnancy preparation, the instrument advances measurement research and offers practical utility for identifying literacy gaps that may influence preconception health behaviours. Continued refinement and cross-cultural validation will enhance its applicability and potential impact in maternal health promotion initiatives.

Digital Health Literacy and Health Literacy in Preconception Women

Preconception women in this study predominantly demonstrated sufficient to excellent health literacy across all assessed domains, including access to information, level of understanding, self-efficacy, and overall health literacy. This distribution suggests that most respondents possess an adequate capacity to obtain, comprehend, and apply health information relevant to pregnancy preparation. Comparable patterns have been reported in recent studies indicating that women with

greater educational exposure and access to information resources tend to exhibit higher levels of health and nutritional literacy, although variability across domains remains evident (Demirer and Yardimci 2023; Sanlier et al. 2024).

Despite these generally favourable findings, the presence of respondents with problematic or inadequate health literacy indicates that important gaps persist, particularly in the application and critical evaluation of health information. This issue is further underscored by the predominant reliance on social media as a source of health information, which may expose women to content of varying quality. Recent studies emphasise that sufficient general health literacy does not necessarily equate to strong digital health literacy, highlighting the need for targeted strategies to strengthen critical appraisal skills and promote the use of reliable digital health resources (Demirer and Yardimci 2023; Sanlier et al. 2024). Strengthening digital health literacy among preconception women may therefore play an important role in supporting informed decision-making and healthier pregnancy preparation.

CONCLUSION

This study demonstrates that the developed health literacy questionnaire is a valid and reliable instrument for assessing health literacy among preconception women preparing for a healthy pregnancy. The instrument effectively captures key multidimensional domains, including access to information, level of understanding, and self-efficacy, which are essential for informed decision-making during the preconception period. Although most respondents demonstrated sufficient to excellent health literacy, the presence of domain-specific gaps indicates that not all women are equally equipped to apply health information in practice. These findings highlight the importance of using context-specific tools to accurately assess health literacy and to support targeted preconception health interventions.

RECOMMENDATIONS

Further validation of this instrument among preconception women with diverse educational and socioeconomic backgrounds is recommended to enhance its generalisability. The questionnaire can be utilised in public health and primary care settings to identify health literacy gaps and support the development of targeted preconception health interventions. Strengthening both general and digital health literacy during the preconception period is essential to promote informed decision-making and healthier pregnancy preparation.

DECLARATIONS

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research has been approved by the ethics committee of the Faculty of Public Health, Hasanuddin University with protocol number 213240 93021.

CONSENT FOR PUBLICATION

Not applicable.

COMPETING INTERESTS

The authors declare no competing interests.

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AUTHORS' CONTRIBUTIONS

NR, VH, RI dan ISA developed the initial concept and ideas. NR, MS, SS carried out methodology design. NR, AW performed data collection. NR, VH, RI, ISA, SS and RAY, performed data analysis and initial writing of the manuscript. NR, VH, RI, ISA, SR, MA and RAY reviewed the work and provided further revisions. All contributing authors have approved the final draft.

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