



Feasibility Study of A Diabetes Risk Screening Media (ADA-DM) For Community Use: Expert Validation

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ABSTRACT

Background: prevalence of Diabetes Mellitus (DM) is increasing from year to year around the world causing an increase in the number of illnesses and deaths due to its complications. Screening is an important preventive step so that the public is more concerned about the risk factors for DM they have, so that they can take further steps to handle it. One of the obstacles in implementing this risk factor screening method is time, reimbursement support, barriers to interaction between healthcare workers and patients, etc. For this reason, an easy, cheap, effective tool is needed and can be used by the community at large in order to be able to screen for DM risk factors.

Purpose: this study aims to create a prototype of DM risk screening media based on the ADA method.

Methods: this study is research and development methods through the 4D model approach (*define, design, develop, disseminate*). The assessment was carried out using the pentahelix model by five (5) people selected by purposive sampling. The instrument used is a media feasibility assessment sheet to assess six main aspects: design, materials, language, illustrations, typography, and layout. Data were analyzed descriptively by calculating mean scores and eligibility categories.

Results: the results showed that the average score was 3.7 which shows that this DM risk screening media is feasible and can be used by the community.

Conclusion: ease of use is a key factor in the development of health media in the community. Media with a simple design and language that is easy to understand and easy to use has great potential to be applied in screening and DM education activities for community or health care facilities

Keywords: American Diabetes Association; Diabetes Mellitus; Risk Factor; Screening

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BACKGROUND

Type 2 diabetes mellitus (T2DM) is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin resistance and/or inadequate insulin secretion by pancreatic β -cells (Lu et al., 2024). T2DM has become a major global public health concern due to its rapidly increasing prevalence and its association with severe complications and premature mortality (Lin et al., 2021). According to the International Diabetes Federation (IDF), approximately 10.5% of adults aged 20–79 years were living with diabetes in 2021, and this number is projected to increase by 46%, reaching 783 million people by 2045. More than 90% of all diabetes cases are classified as T2DM (International Diabetes Federation, 2024).

The burden of diabetes is particularly substantial in Southeast Asia. The IDF estimated that the number of people living with diabetes in this region will rise from 90 million in 2021 to 152 million by 2045, representing an increase of 68%. In addition, diabetes was responsible for approximately 747,000 deaths in Southeast Asia in 2021, with healthcare expenditures related to diabetes and its complications reaching USD 10 billion (International Diabetes Federation, 2024). Indonesia is among the countries experiencing a growing diabetes burden. Based on the 2023 Indonesian Health Survey, the prevalence of diabetes mellitus among individuals aged 15 years and older reached 11.7% (Ministry of Health of Indonesia, 2023). This increasing prevalence is concerning because T2DM can lead to serious complications affecting the cardiovascular system, kidneys, retina, liver, and nervous system, thereby reducing quality of life and increasing healthcare costs (Ali et al., 2022; Hidayah et al., 2026). The therapy given is also not always effective because although the symptoms and indications of the pathology are quite clear, the underlying molecular mechanisms are still quite difficult to understand (Demir et al., 2021).

Despite the availability of effective preventive interventions, a substantial proportion of individuals with T2DM remain undiagnosed (Zhang et al., 2023). The IDF reported that nearly one in two people with diabetes is unaware of their condition (International Diabetes Federation, 2024). Many individuals with T2DM do not experience noticeable symptoms during the early stages of the disease, resulting in delayed diagnosis and treatment (Jeem et al., 2025; Irawaty et al., 2022). Early identification of individuals at risk is therefore essential, as lifestyle modifications such as dietary changes and increased physical activity can prevent or delay disease progression and complications (American Diabetes Association Professional Practice Committee, 2026).

Screening for diabetes risk factors is recognized as an important strategy for early detection and prevention (Bergman et al., 2023). Several screening approaches have been developed, including the American Diabetes Association (ADA) Diabetes Risk Test, which is commonly used to identify asymptomatic adults who may require further blood glucose testing (Kim et al., 2022a). Previous research conducted in

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Yogyakarta reported sensitivity and specificity values of 61% and 71%, respectively, for the ADA risk test, while a modified version improved sensitivity to 80% but reduced specificity to 63% (Jeem et al., 2021). However, the implementation of existing screening methods remains challenging due to limited consultation time, inadequate interaction between healthcare providers and patients, cultural barriers, and difficulties in ensuring follow-up after risk identification (Duan et al., 2021). Integrated DM screening in primary services and public health centers can improve program sustainability (Id et al., 2023).

Although several diabetes risk screening instruments are available, most are text-based, require assistance from healthcare personnel, or are not specifically designed for independent community use. To date, there remains a lack of simple, visual-based screening tools that can be easily understood and used independently by the general public to identify diabetes risk factors. This gap limits the accessibility and scalability of early diabetes screening efforts, particularly in community settings. Therefore, this study aimed to develop and validate a visual-based screening media for Type 2 diabetes mellitus risk factors using the 4D development model. The developed media is expected to provide an accessible, user-friendly, and community-oriented tool that supports early detection and prevention of T2DM.

OBJECTIVE

The aims of this study is to develop a design for media screening of risk factors for DM based on the ADA method that has been modified from previous research so that it can be used by the public so that they can conduct screening independently to determine the risk of prediabetes or DM before conducting a blood sugar test. This aims to support the Ministry of Health's priority programs for the prevention of non-communicable diseases (Direktorat Jenderal Tenaga Kesehatan, 2023).

METHODS

This study is a research and development (RND) with a 4D development model (*define, design, develop, disseminate*) (Waruwu, 2024). Data collection was carried out by studying theories about DM screening from various literature as a consideration for making the design of the product to be made. Furthermore, the prototype of a tool as a medium for screening risk factors for DM made from art paper material with a design like a wheel and equipped with an arrow pointer to assess the score of the risk factors (gender, age, body mass index/BMI, exercise, hypertension, and family history with DM). The results of the sum of the scores obtained are categorized into two, namely low risk and high risk complemented by suggestions for each of these categories (Jeem et al., 2021).

The developed ADA-DM prototype was evaluated through expert assessment to assess its feasibility as a community-based screening tool for risk factors for type 2 diabetes mellitus. The product design that has been made is consulted with an expert for

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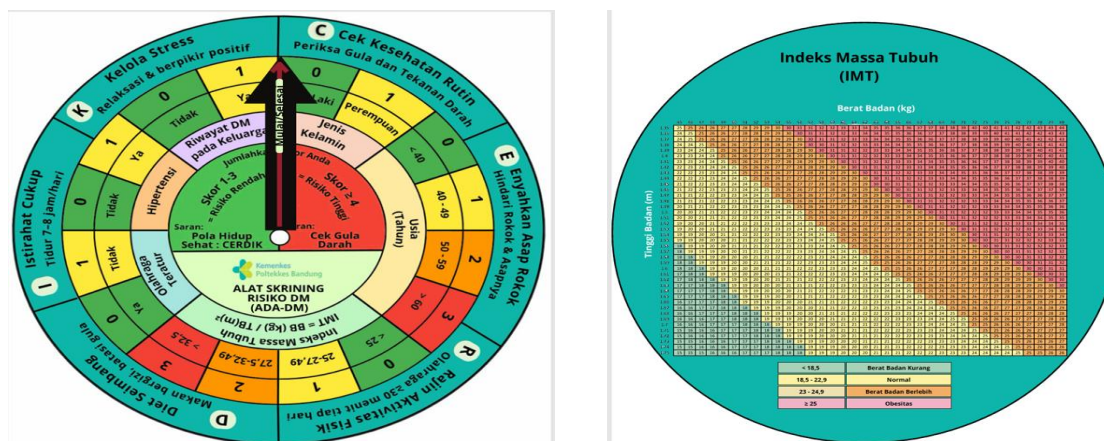


assessment and input on the suitability of the product for the purpose of its use as *an expert judgement*. The assessment was carried out using a pentahelix approach involving five validators selected using a purposive sampling technique. The validators represented academia, government, media, business, and community sectors. Inclusion criteria were: (1) at least two years of professional experience related to healthcare, health promotion, media development, community empowerment, or diabetes prevention programs, and (2) willingness to participate in the validation process.

Content validity was assessed through expert review of the developed media. The validators evaluated the media's relevance, clarity, appropriateness, and completeness based on six aspects: design, content/material, language, illustrations, typography, and layout. The validators' suggestions and recommendations were used to revise and improve the prototype before finalization. The validation instrument consisted of a media feasibility assessment sheet using a four-point Likert scale ranging from 1 (not feasible) to 4 (very feasible). Quantitative data were analyzed descriptively by calculating mean score using the formula: $\bar{X} = \Sigma X / n$ ($\bar{X}$ is the mean score, ΣX is the total score obtained from all validators, and n is the number of validators). The resulting mean scores were then interpreted according to predetermined eligibility categories. Qualitative data obtained from validator comments and suggestions were used to guide revisions to the ADA-DM screening tool. The next step is to produce media as a tool for screening risk factors for DM and disseminate it with proposals for copyright registration and publication (Waruwu, 2024).

RESULTS

As a result of the development process, an ADA-DM screening tool was successfully produced. The tool adopts a visual wheel-based format that integrates key diabetes risk factors into an easy-to-use community screening medium. The final prototype is shown in Figure 1.



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Figure 1. Prototype of the ADA-DM Wheel-Based Screening Media Developed for Community Screening of Type 2 Diabetes Mellitus Risk Factors

Figure 1 presents the ADA-DM (ADA Diabetes Mellitus Risk Screening Tool) prototype developed in this study. The tool was designed as a rotating wheel consisting of six evidence-based diabetes risk factors adapted from the ADA Diabetes Risk Test. Users determine their score according to their characteristics, and the total score is interpreted into low-risk or high-risk categories accompanied by appropriate recommendations. This design aims to facilitate independent screening by community members without requiring healthcare personnel assistance.

To determine the feasibility of the developed ADA-DM screening media, an expert validation process was conducted. The results of the expert validation of the developed diabetes mellitus risk factor screening media are presented in figure 2. The assessment covered six aspects, namely design, content, language, illustration, typography, and layout, to determine the feasibility of the media for community use.

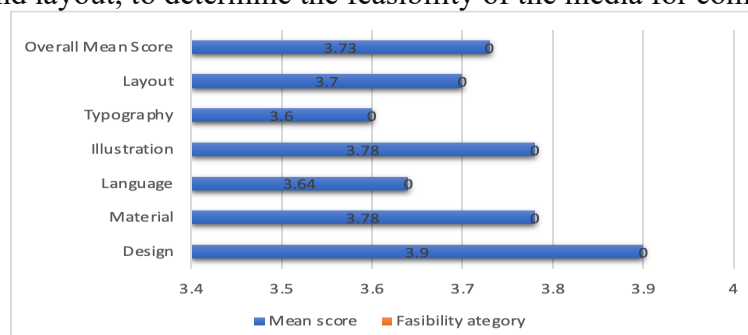


Figure 2. Expert Validation Results of the Diabetes Mellitus Risk Factor Screening Media

Figure 2 shows that all assessed aspects of the developed diabetes mellitus risk factor screening media were categorized as feasible. The highest mean score was obtained for the design aspect (3.90), indicating that the visual appearance and usability of the media were highly appreciated by the validators. In contrast, the typography aspect received the lowest mean score (3.60), suggesting that improvements in font size and readability may further enhance the media. Overall, the developed media achieved a mean score of 3.73, indicating that it is feasible for use as a community-based screening tool for diabetes mellitus risk factors.

DISCUSSION

The primary contribution of this research is the development of the ADA-DM, a visual wheel-based screening tool adapted from the ADA Diabetes Risk Test. The ADA-DM transforms the screening questionnaire into an interactive visual format more suitable for community-based screening programs. The development of the ADA-DM

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addresses a critical gap in diabetes screening, particularly among individuals with limited health literacy. Previous diabetes risk assessment tools have generally focused on improving predictive accuracy, with relatively little attention paid to the accessibility and usability of the screening tool for the general public.

The ADA-DM integrates six risk factors: sex, age, body mass index, physical activity, hypertension, and family history of diabetes into a single visual tool, so this tool offering a simple approach to risk assessment while retaining the essential components of established diabetes screening instruments (Harbuwono et al., 2021). Therefore, this developed tool has the potential to increase community participation in diabetes risk screening and support preventive health behaviors.

The validation results from experts show that the prototype media that has been created as a screening tool for DM risk factors has a good level of feasibility to be used by the public (Irnu et al., 2026). A simple and easy-to-understand language and ease of use have the potential to be used by the wider community. This is in line with Kim et al's research which states that simple, non-invasive and widely usable screening tools can increase community participation in the prevention and screening of DM (Kim et al., 2022b).

Expert validation is a crucial step in instrument development because it ensures that each item accurately represents the intended construct, is relevant to the target population, and is comprehensible to users. Research by Abdullah et al., (2026) in Malaysia demonstrated that content validation by ten experts successfully identified suboptimal items and improved the overall quality of an Mpox questionnaire, resulting in excellent content validity indices and a final instrument suitable for practical use. These findings highlight the importance of expert review in enhancing the scientific rigor, accuracy, and credibility of health assessment tools (Abdullah et al., 2026). Through expert review, the content can be assessed for accuracy, relevance, clarity, and cultural appropriateness, thereby improving the usability, acceptability, and overall quality of the tool (Nurmalisa & Pangaribuan, 2025). Consequently, expert validation helps ensure that health interventions are suitable for dissemination and implementation in the target population (Mokkink et al., 2025).

The use of scoring on this media can help identify individuals who do not have symptoms, but are at risk of developing diabetes. Scoring can be more easily used by various levels of society so that the results of scoring these risk factors can be used to determine further needs and actions (Alfonso and Al-Lawati 2022). However, adjusting the font size and tools to make it easy to read is a very useful input so that this simple visual media can be used by all levels of society independently to increase public awareness of DM risk factors. Input from experts is needed to gather feedback before a medium is used in the community (Mokkink et al., 2025).

The main strength of this study is the development of a simple, visual-based, community-oriented screening tool for Type 2 diabetes mellitus risk factors. This tool

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was designed based on a modified ADA risk assessment method and validated using a pentahelix expert approach. The tool has the potential to provide self-administered DM risk screening at the community level as an early detection and prevention tool. However, this study has several limitations. The validation process involved only a limited number of experts representing specific stakeholder groups, and no direct testing was conducted with community users. Therefore, these findings focus more on the expert evaluation of the ADA-DM's suitability for community use, rather than its usefulness and effectiveness in detecting DM risk.

Future research is recommended to conduct large-scale field testing involving diverse community populations to assess the tool's usability, acceptability, reliability, and effectiveness in identifying individuals at risk for diabetes in real conditions. Further research should also compare the performance of the developed tool with existing diabetes screening tools and evaluate its impact on community participation in diabetes prevention and early detection programs.

CONCLUSION

This study contributes to the field of diabetes prevention by developing and validating a screening media specifically designed for community use. The findings indicate that the developed media is feasible, understandable, and practical based on expert evaluation. Beyond establishing feasibility, this study provides an evidence-based tool that may bridge the gap between public awareness and early detection of diabetes risk factors. By enabling self-screening and promoting preventive behaviors, the media has the potential to support community-based diabetes prevention strategies. Further research is needed to examine its effectiveness in identifying individuals at risk and its impact on screening uptake and health outcomes in broader populations.

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