

Prototype Design Of A Food Material Pocket Book With Glycemic Index And Glycemic Load For Diabetes Mellitus Type 2

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Abstract

Type 2 Diabetes Mellitus (DMT2) is a chronic metabolic disease with a growing prevalence both globally and nationally. According to the International Diabetes Federation (IDF, 2021), there were 537 million people living with diabetes worldwide, and this number is projected to increase to 643 million by 2030. In Indonesia, the prevalence rose from 1.5% (Riskesdas 2018) to 1.7% in 2023 (SKI 2023). In West Java Province, prevalence increased from 1.28% to 1.7%. In Tasikmalaya City, the number of DM patients reached 635 in 2023, rising from 498 in the previous year. The Indhiang Community Health Center work area is one of the areas with a relatively high number of cases. This study aimed to design a prototype pocket book that provides information on glycemic index (GI) and glycemic load (GL) as an educational medium for individuals with type 2 DM. The research employed a Research and Development (R&D) method using the 4D model (Define, Design, Develop, Disseminate), but was limited to the Develop stage due to time constraints regarding the research. However, the study has met the objective of assessing the product's feasibility up to the development and expert validation stages. Validation from subject matter experts yielded a score of 80.1% (valid), while media expert validation achieved 81.7% (very valid), and trial testing with 12 respondents resulted in 89.44% (very good). The pocket book was created using Canva and features clear visuals and accessible language. These results indicate that the pocket book is appropriate for use as an educational tool to help individuals with type 2 DM better understand how to choose suitable foods based on GI and GL.

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INTRODUCTION

Diabetes mellitus Type 2 (DMT2) is a condition that occurs due to increased blood sugar levels in the body which is caused by the body being unable to produce insulin or unable to use insulin effectively which can increase glucose levels in the blood. DM type 2 is the most common, often caused by a history of DM in the family, an unhealthy lifestyle, unhealthy eating habits and infrequent physical activity (kemenkes, 2022).

The International Diabetes Federation (IDF) in its 10th edition of the Atlas reports that diabetes is one of the global health emergencies with the fastest growth in the 21st century. In 2021, more than half a billion people from all over the world live with diabetes, or exactly 537 million people, and this number is projected to reach 643 million in 2030, and 783 million in 2045. The prevalence in Indonesia can be seen from the 2018 National Riskesdas Report that the prevalence of diabetes mellitus in Indonesia diagnosed by doctors according to all ages is 1.5% (Ministry of Health 2018) while in 2023

the prevalence of diabetes mellitus in Indonesia is 1.7% (SKI 2023) so it can be seen that Prevalence in Indonesia will increase from 2023 to 0.2% from 2023.

The 2018 West Java Province Risksdas results show that the prevalence of diabetes mellitus is 1.28% among people of all ages (Risksdas 2018). Based on the 2023 Indonesian Health Survey (SKI), the prevalence in West Java was 1.7%, so the prevalence of DM in West Java increased by 0.42% from 2018. Data on Diabetes Mellitus in Tasikmalaya City estimated that there were 9,729 cases of diabetes mellitus in 2021 and 4,279 received health services, or a percentage of 43.98% of cases in 2021. The prevalence data covers several areas in Tasikmalaya City, one of which is the work area. Indihiang Public Health Center has a fairly high number of sufferers, namely 498 people in 2022 and will increase in 2023 to 635 people.

Increasing the prevalence of DMT2 sufferers with the presence of incentives or risk factors, namely, social, economic, environmental and genetic. The continuous increase in Type 2 DM is caused by increasing risk factors with increasing obesity rates and unhealthy eating patterns. Diet needs to be paid attention to in DM sufferers because diet is one of the efforts in managing diabetes mellitus sufferers (WHO, 2020). An unhealthy diet includes the habit of eating foods high in carbohydrates and fats, which cause blood sugar spikes. Efforts to control blood sugar spikes in people with type 2 diabetes mellitus (DM) include choosing carbohydrate intake with the type and amount of carbohydrates with a glycemic index (GI) and glycemic load (GL). The higher the glycemic index of a food, the more rapidly the blood glucose spike will occur. The effect of foods with a high glycemic index is to accelerate and increase the rise in blood glucose. The glycemic index value of foods can be classified as low, medium, or high. Glycemic Load (GL) is a measure that combines the glycemic index of a food with the amount of carbohydrate consumed in a given portion, providing a picture of the total impact on blood glucose levels. The level of glycemic load can be determined based on the glycemic index (GI) value and the amount of carbohydrate content consumed (Atkinson, et al, 2008).

Diabetes mellitus disease cannot be completely cured, but can only be controlled, therefore treatment of diabetes mellitus disease is very necessary. Handling of Diabetes Melitus is one of them through education. Educational activities are one of the efforts in managing diabetes mellitus. A more effective delivery of e-education is through media because it can be easier to convey information and increase communication and knowledge.

A pocket book is a medium that aims to convey information about diabetes mellitus in the form of sheets, both in writing and in pictures. From research that has been carried out, pocketbooks are more effective than online media for people's knowledge (Burkon et al. 2023). The topic of this pocketbook is based on Eneng Sindi's (2024) research on diabetes sufferers in Tasikmalaya City, which showed that the average intake of diabetes sufferers had a high GI due to a lack of knowledge about the glycemic index of foods. Therefore, this study aims to design a prototype pocket book that provides information on glycemic index (GI) and glycemic load (GL) as an educational medium for individuals with type 2 DM.

METHOD

The type of research used is Research and Development (R&D) with 4D application modes. The 4D mode consists of four stages, namely Define, Design, Develop, and Disseminate (Sukmadinata, 2022). This research focuses on designing a prototype of a grocery pocket book with a glycemic index and a glycemic load on a diabetes mellitus type 2 model that includes three initial stages of the 4D mode.

At the Define stage, researchers identify target needs and analyze the characteristic characteristics of diabetes mellitus type 2. This stage also includes identification of food ingredients by paying attention to the glycemic index and relevant glycemic load. with diabetes mellitus type 2, as well as setting goals in the design of the Food Ingredients pocket book with the Glikemic Index and the Glikemic Boundary.

The Design stage aims to design the pocket book by arranging a content structure consisting of an explanation of the type 2 diabetes, glycemic index and glycemic load on appropriate food ingredients, as well as determining the format and layout of the pocketbook so that it is easy to understand and use by sufferer. At this stage, researchers also consider aspects of visual design and the use of simple and clear language, so that the pocket book can be understood well by researchers (Nurhasanah, 2023).

In the Develop (Development) stage, a grocery book prototype is developed based on the design that has been prepared previously. At this stage, a feasibility test will be carried out by involving experts to assess whether the content and design of the pocket book are in accordance with the list of food

ingredients with the glycemic index and the glycemic load in the required type 2 diet. This feasibility test also aims to evaluate whether the pocket book is easy to understand, practical to use, and effective as an educational tool for people with diabetes mellitus type 2. Feedback from experts will be used to carry out repairs and refinement of the prototype of the pocket book (Sari & Hidayat, 2022).

RESULTS AND DISCUSSION

As a result of research into the design of this pocket book, the research used validation stages from several experts including material experts and also media experts.

Material Expert Validation

The completed pocket book was then validated using a validation questionnaire by a material expert. Material experts are asked to fill out validation questionnaires with several assessments on each aspect consisting of 3 assessment aspects and each aspect has its own statement which will be filled in by three material experts, namely 2 doctors and 1 hospital nutritionist. The assessment results of the three material experts in the pocket book are presented in the following table:

Tabel 1. Results of Validation by Material Experts

Rated aspect	%	Criteria
Content Suitability	80,3%	Valid
Presentation Components	80,4%	Valid
Linguistic Components	79,5%	Valid
Mean	80,1%	Valid

Commented [A2]: Table 1. Results of Validation by Material Experts (and Table 2 for media experts). Correct the table numbering and titles to match the content.

Based on the results of the table, it is stated that the value is the result of the average of 3 experts with several assessed aspects, namely, in the aspect of content suitability it has a percentage value of 80.3% with valid criteria, component aspects of presentation have a percentage value of 80.4% with valid criteria, and linguistic aspects have a value of 79.5% with valid criteria. Assessments on these three aspects obtained results with an average of 80.1% with "valid" criteria. The validator provides input and suggestions as follows: In general, it is good, there is still a typo in the table of contents number 2, the section on how to determine glycemic load is still unclear, there are not many examples of types of food in the vegetable group. you can add food standards and examples of daily menu items for DM patients, add material about the importance of selecting food ingredients with low glycemic index, this book has not yet included local Indonesian food ingredients in more detail, visualization and information are still limited in this book because the majority of this book is still text-based, less A contextual explanation of BG, namely an explanation of the calculation and application of glycemic load (BG), is still theoretical, not yet accommodating different individual needs. Language is still scientific. In this validation, the conclusion or result was that the pocket book media was worthy of being tested on respondents with prior revision.

Media expert validation

Validation of the media is carried out by experts with an educational background in the field of health, who have competence in designing learning media. This assessment was carried out by three media experts. The validator assesses the quality of the media aspect of the animation-based educational video being developed. Details of the assessment results regarding these aspects are presented in the following section.

Tabel 2. Results of Validation by Media Experts

Rated aspect	%	Criteria
Pocket book size	86,6%	Very Valid
Pocket book cover design	79,2%	Valid
Pocket book design	79,4%	Valid

Rata-rata	81,7%	Very Valid
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Based on the results of the table above, it shows that the expert's assessment of the size aspect of the pocket book has a percentage of 86.6% with very valid criteria, this shows that the size of the pocket book is in accordance with A6 size (10 cm x 14 cm). In terms of pocketbook cover design, 79.2% met the valid criteria. This indicates that the cover design still requires several revisions from experts. These include: the image used on the cover should be tailored to the theme, the author's name and institution should be added, and the title should not contain abbreviations. The choice of background for the text should also be considered to avoid distracting reading.

In the design aspect of the pocket book, it has a percentage result of 79.4% with valid criteria, this shows that there is still review from experts, namely: consistency in the title with similar coloring so that readers can distinguish between a new title and not, format and visual design are still necessary refined, the content is less comprehensive. The results of the media expert's assessment have concluded that this pocket book is worthy of being tested in the field with further revision first.



Figure 1 Pocket Book Cover



Figure 2 Front Section of Pocket Book



Figure 3 Contents of Pocket Book



Figure 4 End of Pocket Book

Results of Respondents' Responses to the Pocket Book

The response results from DM, users use a questionnaire with 4 assessment aspects and within the k aspects there are several statements that will be assessed by the researcher. This assessment used 12 respondents who were in the UPTD Puskesmas Indihiang work area. The following are the results of the assessment carried out by responden.

Table 3 Results of Pocket Book Eligibility by Respondents

Rated aspect	%	Criteria
Content Quality	86,11	very good
Diet Management Skills	89,17	very good
Appearance	90,83	very good
Language	91,67	very good
Mean	89,445	very good

Discussion Pocket Book Design

This research uses Research and Development (R&D) methods with 4D development modes (Define, Design, Develop, Disseminate), but only up to the Develop process. This model was chosen because it is capable of producing educative products that suit target needs through systematic and structured processes.

a. Define Stage

This stage is the initial stage before starting to design the pocket book media. Researchers carried out 2 stages in this research, namely:

1) Initial analysis

This initial analysis aims to understand the problems and needs of type 2 DM sufferers obtained from previous research, namely not yet knowing the glycemic index and glycemic load in food ingredients.

2) Second analysis

The second stage carried out by researchers is identifying, detailing and systematically compiling the main materials that will be presented in the pocket book. The material in this pocket book addresses the understanding of type 2 DM, risk factors for type 2 DM, signs and symptoms of DM, type 2, goals of type 2 DM, principles of type 2 DM, fill my plate for DM sufferers, tips for a healthy diet, glycemic index in foodstuffs, ban on glycans in foodstuffs, as well as food ingredients with glycemic index and glycemic load.

b. Design Stage (Designing)

The selection of media is carried out to determine the media that best suits the material to be conveyed. This process is based on responden analysis, responden characteristics. This stage aims to organize the structure of the content, determine the explanation of diabetes melitus type 2, Glikemic index and glikemic ban on appropriate food ingredients, as well as determining the format and layout

of the pocket book so that it is easy to understand and use by consumers. At this stage, researchers also consider aspects of visual design and the use of simple and clear language, so that the pocket book can be understood well by readers.

Based on previous research from (Dewi, Jainuri, and Yohanes 2024) regarding the development of a digital pocket book based on Canva on algebra material, in making the initial design of the pocket book, Peneliti used the Canva application to create the design of the pocket book. In research (Melyanti 2019) about improving learning outcomes for fifth grade PPKN subjects through digital pocketbooks, the creation of pocketbooks used the Canva application to create material results so that they look attractive and interactive.

Next, at this stage, the we carried out the process of making a pocket book using the Canva application, looking at the previous research. The first thing we decides is the initial color that will be used in the book, namely using bright colors, after that, we makes the cover of the pocket book. The cover of this pocket book consists of the book title, animated image, agency logo, and student name. The next stage carried out by researchers is to arrange the book parts according to the material that has been collected, the book parts are as follows: the first part contains the cover, table of contents, foreword. The content section consists of the material that will be presented, namely, the meaning of type 2 DM, risk factors for type 2 DM, goals of type 2 DM, principles of type 2 DM, Fill my plate for people suffering from DM, tips for healthy eating patterns, glycemic index in foodstuffs, glycemic load in foodstuffs, and foodstuffs with glycemic index and glycemic load. At the end there is a bibliography, about the author and a QR-code to access the book online.

c. Developments Stage

This stage aims to validate the pocket book which will be tested on experts. This is confirmed by research (Yuniarni et al. 2023) which states that validity by experts provides benefits, namely, being able to identify deficiencies in the pocketbook which are conveyed through suggestions and input from validators which researchers can use to improve the pocketbook to make it better. The validator in this research uses 2 validators, namely the material expert validator and the media expert validator.

Material expert validators provide assessments on the questionnaires provided via G-form. Material experts fill in the 3 aspects listed in the questionnaire which contains several statements. The assessment results from the validation of material experts dealing with type 2 DM and the glycemic index and glycemic load were obtained with a percentage of 80.1% which is considered "valid". Material expert validators also provide input and suggestions as follows: In general it is good, in the table of contents number 2 there are still typos, in the section on how to determine the amount of glycemic load it is still not clear enough, there are not many examples of the types of food ingredients in the vegetable group. You can add food standards and examples of daily menus for DM patients, add material about the importance of selecting food ingredients with a low glycemic index. Some suggestions from experts have been implemented, but food standards and examples of daily menus based on GI and BG have not been implemented due to time constraints, so this could be an idea for further research. This validation results in the conclusion that it has been declared valid and feasible, so it can be tested on respondents. However, more respondents are needed for better results.

The expert validator provides an assessment of the pocketbook through a questionnaire provided by the researcher in the form of a G-form. This media validation was carried out by three validators, namely, 2 people were nutrition dose workers and 1 person was a health promo worker at the Health Service. The assessment carried out by the validator is in the form of three aspects, in which there are several statements regarding the assessment of the pocket book. The assessment results from the media expert validation showed a percentage of 81.7% with the category "very valid". In detail, the aspect assessment of the size of the pocket book is categorized as very valid with a percentage of 86.6% indicating that the size of the pocket book is appropriate. In research (Melyanti 2019) that the size of this pocket book can make it easier for students to carry pocket books and can be read anywhere, whenever needed with the contents of the pocket book being easier to understand and understand. In the design aspect of the pocketbook cover, it is included in the valid category with a percentage percentage of 79.2%. This shows that the pocketbook cover has an attractive visual design but can be redeveloped so that it is in line with the needs of the sponsors.

In terms of the design of the contents of the book, it is included in the valid category with a percentage of 79.4%, this shows that the appearance and design made in the pocket book have met health

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education information standards. Presenting information systematically, using words that are easy to understand, and the material presented is brief and clear. It is important for people with type 2 diabetes to pay attention to their food intake so that their diet is successful. The validator also provided suggestions and input, namely: "consistency in the title with similar coloring so that readers can distinguish between new and new titles, the background of the writing is adjusted so that it does not interfere with the writing." In this validation, it was concluded that the pocket book was feasible and could be tested on respondents.

Media that has gone through the validation process and is declared valid and feasible. This research was then tested on a small group of 12 type 2 DM patients located in the UPTD Puskesmas Indihiang area. After conducting the trial, respondents were given a questionnaire to find out their response to the use of the pocketbook machine. Based on the results of the questionnaire, the percentage score was 89.44%, which shows that the participant's response to him falls into the very good category. From the results of the discussion, validation by material experts achieved a percentage of 80.1%, while validation by experts achieved 81.7%, and user trials resulted in 89.4%. Based on these data, it can be concluded that pocket book media containing foodstuffs with glycemic index and glycemic load are included in the valid category and are suitable for use as educational tools.

CONCLUSIONS AND RECOMMENDATIONS

The suitability of the pocket book is seen from the results of validator assessments and trials on respondents. This assessment aims to determine the suitability of the pocket book which will be used as a guide in managing meals for people with diabetes type 2. The average validation results from material experts regarding the book are 80.1% declared "valid". Validation from media experts has an average value of 81.7% which is declared "very valid" and the results of trials on respondents have an average value of 89.44% which is declared "very good". These results show that the designed pocket book can be used as an educational medium, especially for people suffering from diabetes mellitus.

ACKNOWLEDGEMENTS

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