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Development of an Age-Specific Educational Application to Enhance Public Knowledge of Common Non-Communicable Diseases

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ABSTRACT

Introduction: Indonesia has experienced a significant increase in non-communicable diseases (NCDs), including diabetes, hypertension, and cardiovascular disorders, affecting individuals across various age groups. These conditions often progress silently and require long-term management. Enhancing public knowledge and awareness is essential for early detection and effective prevention.

Objective: This study aimed to develop an interactive educational application tailored to different age groups to improve public understanding and awareness of common NCDs, focusing on their signs, symptoms, and preventive strategies.

Methods: A Research and Development (R&D) method was applied using the 4D model, consisting of four phases: Define, Design, Develop, and Disseminate. The development process included a needs analysis, application content and interface design, software development, and dissemination planning. Input from health professionals and target users was integrated to ensure the application's content accuracy and usability.

Results: The final application features a secure login system and age-specific interactive menus that display relevant NCD information, including warning signs, symptoms, and prevention tips. Black-box testing confirmed its functional reliability, while usability testing indicated high user satisfaction. The application positively influenced users' health knowledge, particularly in identifying early symptoms and understanding preventive measures for NCDs.

Conclusion: Age-specific digital education tools are effective in increasing public knowledge about NCDs and fostering preventive health behaviors. Integrating such applications into community health initiatives can enhance health literacy and support early intervention strategies across diverse age demographics.

Keywords: age-based intervention, educational applications, health improvement

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Introduction

Non-communicable diseases (NCDs) are chronic health conditions that are not transmitted from person to person and typically develop over an extended period. In recent decades, a global epidemiological transition has been observed, including in Indonesia, where the dominant burden of disease and mortality has shifted from infectious diseases to NCDs (Misbah et al., 2023). NCDs—such as cardiovascular diseases, diabetes mellitus, cancer, and chronic respiratory diseases—have become the leading causes of death and disability worldwide. This trend is particularly evident in developing countries like Indonesia. According to the World Health Organization (WHO), NCDs account for approximately 73% of all global deaths, with their prevalence continuing to increase significantly.

In Indonesia, data from the Basic Health Research (Riskesdas) revealed a rise in the prevalence of key NCDs. As of 2018, hypertension affected 34% of the population, while diabetes mellitus affected 10%. In West Java, specific NCDs have shown a marked increase in recent years: cancer prevalence rose from 1.4% to 1.8% by 2023, stroke from 7% to 10.9%, and chronic kidney disease from 2% to 3.8% (Susanti et al., 2023). This upward trend underscores the urgent need for effective and scalable prevention strategies.

Multiple modifiable and non-modifiable risk factors contribute to the development of NCDs. These include unhealthy dietary patterns, physical inactivity, tobacco use, and alcohol consumption, as well as genetic predispositions and environmental influences (Pratama, 2023). Addressing these risk factors through public health education is essential in reducing the burden of NCDs.

In this regard, information technology-based educational interventions represent a promising approach. Educational applications designed for different age groups—children, adolescents, adults, and the elderly—can play a significant role in increasing public awareness and encouraging the adoption of preventive behaviors. These digital tools are not only used to disseminate accurate health information but also to support early detection and facilitate the proactive management of risk factors, thereby potentially reducing both incidence and mortality associated with NCDs (Ilmiah & Makna, 2022).

Furthermore, health education applications are effective tools in improving knowledge about NCDs and their associated risk factors. These applications often feature content on healthy nutrition, physical activity, and stress management. Beyond their role as digital health screening platforms, they empower individuals and communities to adopt healthier lifestyles and improve overall health outcomes (Satrio et al., 2025).

Objective

This study aimed to develop an interactive educational application tailored to different age groups to improve public understanding and awareness of common NCDs, focusing on their signs, symptoms, and preventive strategies.

Method

Research design

This study employed a Research and Development (R&D) approach, which is aimed at generating specific products through a structured and iterative development process (Saiz & Iedam, 2024). The R&D method is widely applied in sectors such as education and healthcare to develop innovative and practical solutions aligned with societal needs. In this study, the 4D model—comprising Define, Design, Develop, and Disseminate—was utilized as the primary development framework.

Development procedures

Define phase

In the Define phase, a comprehensive needs analysis was conducted to identify the existing problems and define the objectives of the application. This involved qualitative and quantitative data collection through interviews with healthcare professionals and surveys distributed to potential users. The analysis aimed to capture users' informational needs and expectations regarding health education content and digital delivery platforms.

Initial Investigation Preliminary investigations indicated a critical need for health education applications that are not only informative but also engaging and adaptable across different age groups. These findings underscore the importance of incorporating user feedback and aligning content with current technological trends to enhance the delivery of health information (Muhammad Fauzen et al., 2024).

Problem Analysis The problem analysis revealed that while existing health education applications hold significant potential to improve public understanding of common diseases, key challenges remain. These include the need for age-appropriate content, user engagement strategies, and accessibility across various demographic segments (Khairan Nisa, 2024).

Requirements Analysis This sub-phase aimed to validate whether the proposed application could effectively address community health education needs. By identifying user characteristics and integrating relevant features and content, the development was expected to enhance health knowledge across multiple age groups (Setia & Nopiyani, 2023).

Decision Analysis A structured decision analysis framework was used to evaluate critical factors influencing application development. This included the incorporation of user requirements and the engagement of stakeholders in decision-making processes, ensuring that the final product would support targeted, age-specific health education (Christian et al., 2024).

Design phase

In this phase, the application design was developed based on the insights gained from the Define phase. The process included the creation of storyboards, learning flowcharts, and user interface prototypes. Educational content was designed to be engaging and age-appropriate, incorporating interactive elements such as quizzes, multimedia presentations, and user feedback mechanisms to increase user involvement and retention.

Development phase

This phase involved the actual software development and system integration based on the established design specifications. Key features implemented included health education videos, push notification reminders, and interactive learning modules. The application was developed using an iterative process, allowing for ongoing testing and refinement based on user input and expert feedback.

Result

At this stage, the researcher designed the application and created a menu that contains several features that can be accessed, including age ranges and common diseases that usually appear along with signs, symptoms and prevention.

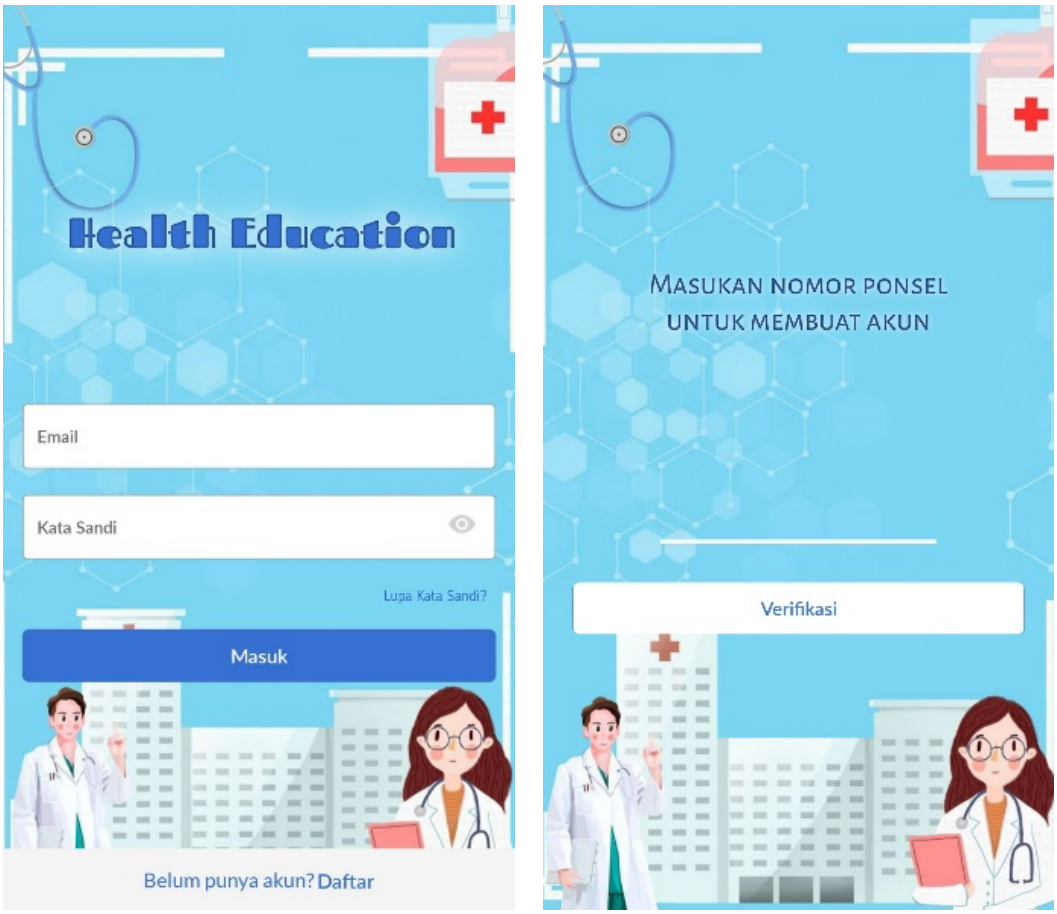

Figure 1. Login Page

In Figure 1, users can access this application by entering their email and password, and new users can click register first and then immediately enter the application when finished.

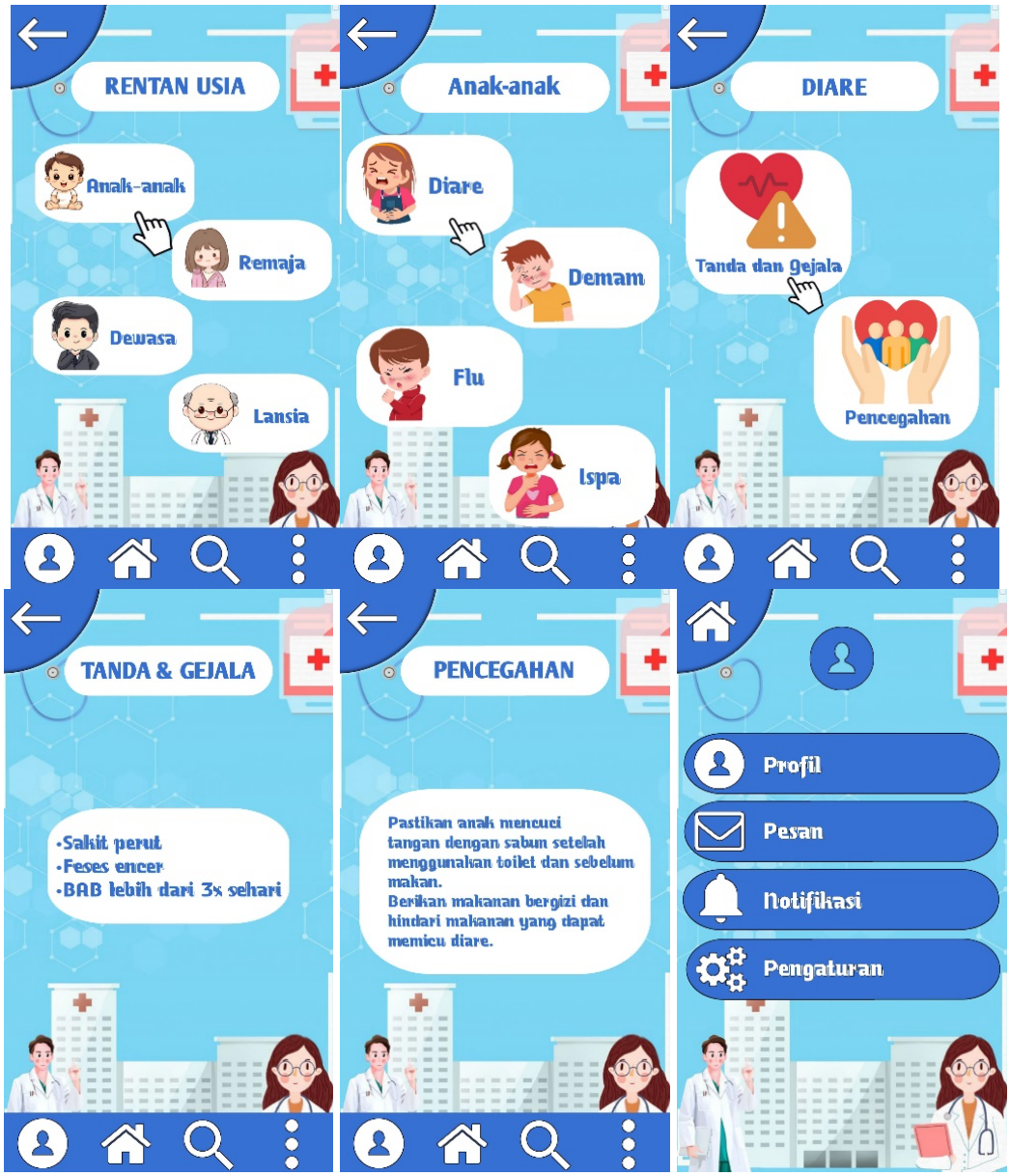

Figure 2. Main Features

From the figure 2 above, the user is directed to the age range menu, then later it can be clicked according to the user's wishes and diseases that often occur at that age will appear, then there are also signs, symptoms and prevention, and so on.

Discussion

Education on the prevention of non-communicable diseases (NCDs) plays a critical role in enhancing public knowledge, particularly among adolescents. Participation in structured health education programs has been shown to improve students' understanding of NCD risk factors and to encourage the adoption of healthier lifestyle behaviors. Digital innovations, such as the e-NCDs application, enable adolescents to independently assess their risk profiles by utilizing technology to identify modifiable risk factors and promote preventive health actions. This is particularly important given that many NCDs originate from lifestyle patterns formed during early developmental stages.

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Furthermore, the involvement of community health cadres and the integration of digital health applications can significantly strengthen public engagement in NCD prevention strategies. Health cadres act as key facilitators in disseminating health information and fostering behavioral change within communities. The integration of the proposed application into established programs—such as Posbindu NCD (Integrated Non-Communicable Disease Post)—can enhance early detection, support ongoing surveillance, and improve the overall management and control of NCDs at the community level (Kartika et al., 2024).

Health education applications designed to address NCD prevention have demonstrated effectiveness in raising awareness and improving public understanding of preventive health practices. By leveraging digital technology, such tools can facilitate early identification of risk factors and support sustained behavioral change across different age groups. Their successful implementation requires coordinated efforts among educational institutions, healthcare providers, and community-based organizations to ensure broad accessibility and impact (Lentera et al., 2024).

Conclusion

Digital health education applications represent a promising strategy for enhancing NCD prevention, particularly among adolescents and community members. By empowering individuals to understand and mitigate their risk factors, such tools support early intervention and promote long-term health outcomes. The involvement of community health cadres and integration into existing health programs—such as Posbindu NCD—further amplifies the application's potential to improve public health literacy and reduce the burden of NCDs in Indonesia. To maximize effectiveness, sustained collaboration among stakeholders—including the education sector, healthcare system, and community organizations—is essential for ensuring equitable access, continuous engagement, and measurable impact on population health.

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Not applicable.

Authors' contribution

Each author contributed equally in all the parts of the research. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Conflict of interest

The researchers stated that there is no conflict of interest related to the implementation and publication of the results of this research. The entire research process, from planning, data collection, analysis, to report preparation, was carried out independently without any influence or pressure from any third party. A commitment to research ethics is upheld throughout the research process, ensuring transparency, accuracy and honesty in reporting results.

Ethical consideration

Not applicable.

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