DIGITAL APPLICATION FOR LIFESTYLE PROMOTION IN PREDIABETES MANAGEMENT: A CASE STUDY IN BANDUNG CITY

Ridwan Setiawan[1], Atin Karjatin[1], Dhimas Herdhianta[1]*
[1]Department of Health Promotion – Poltekkes Kemenkes Bandung
*Email: ridwansetiawan@staff.poltekkesbandung.ac.id

Abstract **Background**: Prediabetes is a condition where blood glucose levels are elevated but not high enough to be classified as diabetes. This condition is a significant global health challenge, especially in urban areas like Bandung. Effective prevention relies on lifestyle changes, which can be supported through accessible digital applications.
Objectives: To develop an accurate digital app model to support lifestyle changes in prediabetes and be able to differentiate well between various user groups.
Method: Data were collected from respondents regarding age, diabetes history, daily activity, and Body Mass Index (BMI). The model's effectiveness was assessed using Omnibus Tests of Model Coefficients, with accuracy evaluated through the Likelihood Ratio Test and ROC Curve analysis.
Results: The majority of respondents were under 45 years of old (88.1%) and female (72.2%). Most had no diabetes history (92.1%) and were active daily (71.4%), with normal BMI in 57.9% of participants. Model testing revealed significant outcomes, with a p-value of 0.00 and an Asymptotic Significance of 0.006, alongside a likelihood ratio value of 81.962, underscoring the model's accuracy and reliability.
Conclusion: The developed digital application is both accurate and reliable for promoting lifestyle changes in prediabetes.

Keywords: *Application, Digital*, *Lifestyle, Prediabes*

BACKGROUND

Prediabetes is a condition characterized by blood glucose levels higher than normal values but below the blood glucose levels of diabetes mellitus, is a very significant global health problem today, where the prevalence of the three highest countries in the world, namely China (48.6 million), the United States (36.8 million), and Indonesia (27.7 million), and accumulates to equal one third of the prevalence of prediabetes in the world. The results of RISKESDAS 2018 show that prediabetes in Indonesia is quite high, with 26.3% having impaired fasting blood glucose (GDPT), and 30.8% having impaired glucose tolerance.

Various risk factors that can cause prediabetes to become type 2 diabetes mellitus such as obesity, body mass index (BMI), physical activity (exercise) dietary intake of carbohydrates, fat, protein and fiber and smoking where all of these risk factors are lifestyle patterns. Prevention for the development of prediabetes based on strong evidence is to make lifestyle changes. The first prevention program is the regulation of dietary intake to reduce carbohydrates, reduce fat, and increase consumption of foods with high fiber. The second is physical activity and exercise, which includes all activities that involve physical activity, while physical exercise includes structured and planned physical exercise.

DOI 10.34011/icihcce.v6i1.308

The potential to use program technology combines interactive mobile computing, remote monitoring, Several published studies show that smartphones can provide effective behavioral interventions among various age groups and for various diseases. health coaching, and on line colleagues support people with prediabetes to prevent or delay the onset of Type 2 diabetes. So that the use of digital applications will make it easier to make lifestyle changes in prediabetes by being able to be applied using smartphone devices that have been used in daily life in the Bandung city area will be easy to do.

METHODS

Study setting and design

This study is an experimental study that uses Android-based digital applications to change lifestyles in individuals with prediabetes. Working Area of Puskesmas in Bandung City, from April to August 2024

Study population and sampling procedure

The study population consisted of 126 respondents.

Data Collection and Variable measurement

The instruments used in this study consisted of two main components:

1. Digital App for Lifestyle Change: This Android-based app is specifically designed to assist individuals with prediabetes in changing their lifestyle.
2. Intermittent Blood Sugar Testing: This was used to determine the level of prediabetes and to monitor changes that occurred during the intervention.

These two instruments were used together to evaluate the effectiveness of the app in assisting lifestyle changes as well as its impact on respondents' blood sugar levels.

RESULT AND DISCUSSION

Table 1
Data of Respondents in the Health Center Working Area
Bandung City in 2024 (n=126)

Respondent Data		Total	Participation
Age	<45 Years Old	111	88,1
	45- 54 Years Old	8	6,3
	> 55 Years Old	7	5,6
Gender	Laki laki	35	27,8
	Perempuan	91	72,2
Diabetes History	Yes	10	7,9
	No	116	92,1
Daily Activities	Yes	90	71,4
	No	36	28,6
IMT	Skinny	16	12,7
	Normal	73	57,9
	Fat	37	29,4

DOI 10.34011/icihcce.v6i1.308

Table 1 above describes the majority of respondents were under 45 years old (88.1%) and female (72.2%). Most had no history of diabetes (92.1%), and were active in daily activities (71.4%). The vast majority. The majority had BMI in the normal category (57.9%), with a significant proportion classified as obese (29.4%).

Table 2
Omnibus Tests of Model Coefficients of Respondents in the Puskesmas Working Area Bandung City in 2024
(n=126)

	Chi-square	df	Sig.
Step	61.962	1	.000
Block	61.962	1	.000
Model	61.962	1	.000

Table 2 Omnibus Tests of Model Coefficients shows that the model has met the requirements set, and there is a significant effect simultaneously, with a p value of 0.00, which is smaller than 0.005.

Table 3
Likelihood Ratio Test of Respondents in the Puskesmas Working Area Bandung City in 2024
(n=126)

Value	df	Asymp. Sig. (2-sided)
81.962	1	.006

Based on the results of the Omnibus Tests of Model Coefficients test, the model used has proven to meet all the conditions required for further analysis. After ensuring the model is feasible, the next step is to test the accuracy of the Sipredi application. This accuracy test was conducted to determine the extent to which the application could provide consistent and reliable results. The results of the test showed an Asymp. Sig value of 0.006, which is smaller than the critical limit of 0.05, and a value likelihood ratio of 81.962, meaning that if the value is close to 1 or 100 then the application is accurate and appropriate. This value indicates that the differences found in the test results do not occur by chance, but have real significance. Therefore, it can be concluded that the Digital Application of Lifestyle Promotion Program for Prediabetes is in accordance with the established standards and can be relied upon for further use.

CONCLUSION

1. The majority of respondents were under 45 years old and female. Most had no diabetes history and were active daily, with normal BMI in 57.9% of participants. Model testing revealed significant outcomes, with a p-value of 0.00 and an Asymptotic Significance of 0.006, alongside a likelihood ratio value of 81.962, underscoring the model's accuracy and reliability.
2. Digital applications for lifestyle promotion in prediabetes have met the requirements set, and there is a significant effect simultaneously, and the application is both accurate and reliable for promoting lifestyle changes in prediabetes.

DOI 10.34011/icihcce.v6i1.308

REFERENCES

1. Christopher N. Ford, et.al, 2018, Dietary changes in a diabetes prevention intervention among people with prediabetes: the Diabetes Community Lifestyle Improvement Program trial, Acta Diabetologica https://doi.org/10.1007/s00592-018-1249-1, 29 October 2018 © Springer-Verlag Italia S.r.l., part of Springer Nature

2. Deborah J. Toobert, Sarah E. Hampson, Russell E. Glasgow, 2000, The Summary of Diabetes Self-Care Activities Measure Results from 7 studies and a revised scale, Diabetes Care, Volume 23, Number 7, July

3. Dina Griauzde1. et.al, 2019, A Mobile Phone-Based Program to Promote Healthy Behaviors Among Adults With Prediabetes Who Declined Participation in Free Diabetes Prevention Programs: Mixed-Methods Pilot Randomized Controlled Trial JMIR Mhealth Uhealth | vol. 7 | iss. 1 | e11267 | p. 1 (page number not for citation purposes, http://mhealth.jmir.org/2019/1/e11267

4. Eun-Hee Nah, et.al, 2 0 1 9, Efficacy of lifestyle interventions in the reversion to normoglycemia in Korean prediabetics: https://doi.org/10.1016/j.pcd.2018.11.017 1751-9918/© 2019 Primary Care Diabetes Europe. Published by Elsevier Ltd.

5. George Kerrison, et.al, 2017, The Effectiveness of Lifestyle Adaptation for the Prevention of Prediabetes in Adults: A Systematic Review, Journal of Diabetes Research Volume Article ID 8493145, 20 pages https://doi.org/10.1155/2017/8493145, ,

6. Gyri Skoglund, et.al. 2022., Facilitators and barriers for lifestyle change in people with prediabetes: a meta-synthesis of qualitative studies, BMC Public Health, https://doi.org/10.1186/s12889-022-12885-8, © The Author(s)

7. Iskim Luthfa, 2019, Implementasi Selfcare Activity Penderita Diabetes Mellitus di Wilayah Puskesmas Bangetayu Semarang, Buletin Penelitian Kesehatan, Vol. 47, No. 1, Maret 2019: 23 https://doi.org/10.22435/bpk.v47i1.779 ,
8. Justin B. Echouffo-Tcheugui1 and Elizabeth Selvin, 2022, Prediabetes and What It Means: The Epidemiological Evidence, www.annualreviews.org • Prediabetes and What It Means, Access provided by 114.124.244.155 on 04/26/22. See copyright for approved use.

9. Katia Cristina Portero McLellan,et.al, 2014, Therapeutic interventions to reduce the risk of progression from prediabetes to type 2 diabetes mellitus, Therapeutics and Clinical Risk Management:10 173–18, C, submit your manuscript | www.dovepress.co,

10. Mei-Fang Chen1 & Shu-Ling Hung2 & Shu-Lin Chen3, 2017, Empowerment Program for People With Prediabetes: A Randomized Controlled Trial, The Journal of Nursing Research h VOL. 25, NO. 2, APRIL.
11. Ginting, Dhaniel Theolia Persadanta, 2021,Tingkat Pengetahuan terhadap Prediabetes dan Pencegahan Faktor Risiko Prediabetes pada Siswa SMA Methodist-2 Medan Tahun

DOI 10.34011/icihcce.v6i1.308

2021, https://repositori.usu.ac.id/handle/123456789/46124 . Medan , ……

12. Mohammadnia Motlagh et al, 2022,. Efect of theory-based education on promoting a healthy lifestyle in pre-diabetic women: RCT, BMC Women's Health 22:29 https://doi.org/10.1186/s12905-022-01608-1,

13. Moin et al. 2019, Effectiveness of SDM for Diabetes: 12-Month Results from the PRIDE Study, HEALTH POLICY JGIM Published online August 30,

14. Monique E Francois, Katie M Oetsch,, 2022, Prediabetes: Challenges, Novel Solutions, and Future Directions, Creative Commons Attribution-Non Commercial 4.0 January •

15. Nicole Ehrhardt, and Enas Al Zaghal,, 2018, Behavior Modification in Prediabetes and Diabetes: Potential Use of Real-Time Continuous Glucose Monitoring, Journal of Diabetes Science and Technology , Journal of Diabetes Science and Technology 2019, Vol. 13(2) 271–275 DOI: 10.1177/1932296818790994. ©

16. Norliza Ibrahim1, et,al, 2016, Effects of a Community-Based Healthy Lifestyle Intervention Program (Co-HELP) among Adults with Prediabetes in a Developing Country: A Quasi-Experimental Study, Co-HELP among Adults with Prediabete, PLOS ONE | DOI:10.1371/journal.pone.0167123 December 9,

17. Persatuan Diabetes Indonesia and PERKENI. 2019, Pedoman Pengolaan Dan Pencegahan Prediabetes Di Indonesia 2019, Journal of Chemical Information and Modeling.

18. Phillip Tuso, 2014, Prediabetes and Lifestyle Modification: Time to Prevent a Preventable Disease, e Care Management Institute Physician Lead for Total Health. E-mail: phillip.j.tuso@kp.org. e Care Management Institute Physician Lead for Total Health. E-mail: phillip.j.tuso@kp.org. The Permanente Journal/ Summer Volume 18 No. 3, /

19. Ryan Batten, et.al. 2022, A 12-Month Follow-Up of the Effects of a Digital Diabetes Prevention Program (VP Transform for Prediabetes) on Weight and Physical Activity Among Adults With Prediabetes:Secondary Analysis, (JMIR Diabetes 7(1):e23243) doi: 10.2196/23243,;

20. Shamizadeh et al. , 2019Trials Social cognitive theory-based intervention to promote physical activity among prediabetic rural people: a cluster randomized controlled trial, 20:98 https://doi.org/10.1186/s13063-019-3220-e Commons Public Domain Dedication waiver (http://creativecommons.org/publicdomain/zero/1.0/) applies to the data made available in this article, unless otherwise stated, ,

21. Skoglund et al., 2022 Facilitators and barriers for lifestyle change in people with prediabetes: a meta-synthesis of qualitative studies, BMC Public Health 22:553 https://doi.org/10.1186/s12889-022-12885-8,

22. Tahereh Shamizadeh , Leila Jahangiry , Parvin Sarbakhsh and Koen Ponnet, 2019, Social cognitive theory-based intervention to promote physical activity among prediabetic rural people: a cluster randomized controlled trial, 20:98

DOI 10.34011/icihcce.v6i1.308

https://doi.org/10.1186/s13063-019-3220-z,

23. Taoreed Azeez, et.al, 2020 The Roles of Physical Activity in Preventing Type 2 Diabetes Mellitus: The Implications for Sub-Saharan Afric, Sport Exerc Med Open J.; 6(1): 21-26. doi: 10.17140/SEMOJ-6-17,

24. Yujing Zhang, et.a;, 2021, Effect of Vitamin D Supplementation on Glycemic Control in Prediabetes: A Meta-Analysis, Nutrients, 4464. https://doi.org/10.3390/nu13124464 https://www.mdpi.com/journal/nutrition,.

DOI 10.34011/icihcce.v6i1.308