Differences in Satisfaction of Type 2 Diabetes Sufferers with the Android-Based WatDiab Application

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Abstract: The Covid 19 pandemic has forced nursing services to adapt, such as using smartphones containing applications for diabetes sufferers. The shortcomings of existing applications need to be improved to satisfy users. For this reason, the WatDiab application was designed in this research. The research design uses a comparative design to see the satisfaction of application users who live in cities and villages. Sampling using a purposive technique resulted in 140 respondents consisting of respondents who lived in the city and village. Data analysis uses Chi Square to assess differences in satisfaction with using the WatDiab application based on place of residence, education level and age group. The results showed that there were differences in user satisfaction based on education level (p value 0.002<0.05) and also based on age group (p value 0.018<0.05). Meanwhile, based on area of residence, there was no difference in satisfaction (p value 0.545 > 0.05). In conclusion, there are differences in satisfaction based on education level and age group, while there are no differences based on area of residence. Suggestion, there needs to be a review of the WatDiab application so that it can satisfy all age levels and levels of education who use it.

Keywords: Android app; Diabetes care; Satisfaction

Introduction

Diabetes Mellitus (DM) or diabetes is a chronic disease that affects many people throughout the world. Lifestyle changes are one cause. Every year diabetes sufferers tend to increase, WHO even predicts that by 2030 it will increase to 61% and it is estimated that in the 21st century, it will become a pandemic and 70% will occur in developing countries, including Indonesia.

Diabetes with various complications requires long-term treatment and requires regular monitoring, causing biopsychosocial and spiritual changes. In particular, spiritual well-being needs to be improved so that sufferers feel happy and useful in their lives when they are experiencing a long illness. Meanwhile, one of the complications often experienced is diabetic foot wounds, whichoccur due to poor blood sugar control. The condition of foot wounds will get worse if blood sugar control is poor and the individual patient is not compliant with foot care (Tony , I.O & Mutluoglu, 2023)

It is not only the physical aspects of patients who experience problems, but the psychological and spiritual aspects also experience problems such as low self-efficacy and low spiritual well-being of diabetes patients. So that the care given to patients must not forget aspectspsychological and spiritual. It can be understood that treating diabetes patients is not only enough with medication, but many things must be done so that an integrated system needs to be developed (Kalra S. et al, 2018)

Currently, with the experience of the Covid 19 pandemic and the development of information technology in the industrial era 4.0, the development of nursing services must also adapt. The widespread use of cellular telephones such as smartphones can be a means of nursing services that are easily accessible, anytime and anywhere and can be repeated, especially when providing education. As proven, applications on smartphones can also improve students' understanding of scientific concepts and logical thinking (Susanto et al.,

2022; Setiawaty et al., 2022). Meanwhile, in the education of health workers, it has also been proven that the use of applications is effective in improving students' skills (Sulastini S. et al, 2023).

Programs in the form of software such as applications will make it easier for diabetes patients to receive counseling about diabetes, obtain foot wound care services (homecare), and diabetes education and prevention. For this reason, application development to help diabetes sufferers, including increasing diabetes patient compliance in carrying out the DM pillars, has been carried out. However, in its implementation, several weaknesses and deficiencies in the application content were discovered and needed to be followed up (Santoso et al, 2022).

It is necessary to design an application that, apart from improving foot care behavior, also increases self-efficacy and provides regular foot care education as previously developed (Cheng et al., 2023). Even though social and psychological aspects have been developed, effective applications have been developed in providing information and increasing self-efficacy, self-care and motivation for diabetes sufferers, but they still need development and integration with other aspects (Mufidah, 2020). Other research emphasizes that further development, refinement and testing of applications on smartphones to increase self-efficacy and reduce the risk of diabetic foot is necessary (Kilic & Karadağ, 2020). Other research also revealed that interventions that focus on increasing self-efficacy will change diabetic foot care behavior (Cheng et al., 2023).

The application that the researchers designed is called the diabetes care application, abbreviated as WatDiab. This application uses the Android operating system (AOS) as a platform because based on research it is more cost-effective and has a very wide range of users in society (Mehraeen et al., 2022). This application uses JavaScript, TML5, PHP, and a MySQL database which is hosted in the Play Store service and consists of various features, namely: Patient data, foot care, self-efficacy, and spiritual well-being; Each feature contains a questionnaire, educational material and information related to each feature in the form of images and videos.

The WatDiab application also provides a reminder feature in the foot care aspect to remind patients to care for their feet every day. This has been researched and resulted in the conclusion that the use of a reminder application when applied, will provide regular reminders and can help with self-care at home (Gusdiani 2021). Specifically for wound care services, information is provided on wound care clinics closest to the patient's domicile in Solo Raya and Yogyakarta.
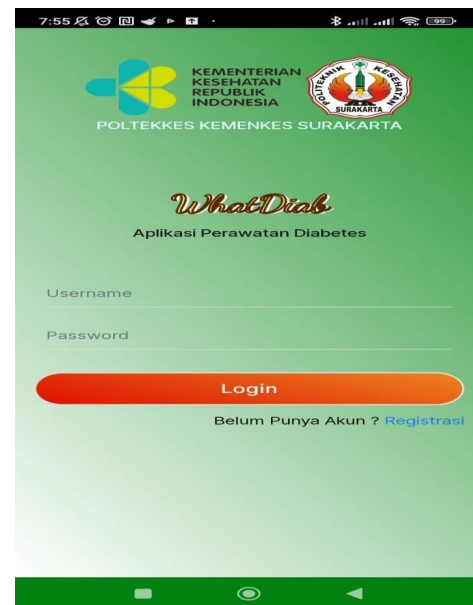

Figure 1. Main Screen WatDiab Application

This research was conducted as an innovation in care in the form of developing an integrated nursing service model for type 2 diabetes patients. The WatDiab application is compiled from several research variables that have been carried out in multi-year research starting from 2021 to 2023.

For this reason, at the end of this multi-year research, the results of the research that had been carried out were combined and an assessment was carried out in the form of satisfaction with using the WatDiab application by patients in rural and urban areas. They also assess user satisfaction based on education level and age group.

Method

This type of research is comparative design research to see the differences in user satisfaction with the WatDiab application between those living in rural areas and urban areas based on the level of education and age group of the users. The population of this study was 930 people suffering from type 2 diabetes in the Karang Anyar Regency Surakarta City, Central Java, and Yogyakarta City. Sampling used purposive sampling with the Stratified Random Sampling technique. Using Arikunto's natural Slovind formula with a confidence level of 95%, a sample of 140 people was obtained, divided into two groups, namely 69 people living in rural areas and 71 people living in urban areas.

Data was collected from June 2023 to August 2023 used a questionnaire adopted from the End User Computing Satisfaction (EUCS) instrument developed by Doll et al, 1998 (Fitriansyah, A & Harris, 2018) containing questions in the aspects of content, accuracy, format, ease of use, and timeliness of the WatDiab

application. Data measurement uses a Linkert scale, namely Very Satisfied (4), Satisfied (3), Dissatisfied (2), and Very Dissatisfied (1).

The validity test obtained an r value of 0.034 and the reliability test obtained a Cronbach's Alpha value of 0.765. Data was collected starting with an explanation of the WatDiab application. Then assistance is provided on how to download it on a smartphone. After successful downloading, the assistant continues to try to use it. Respondents were required to try using the WatDiab application at least 3 times within 2 weeks which was monitored in the researcher admin feature in the WatDiab application.In the final stage, respondents were asked to fill out a user satisfaction questionnaire for the WatDiab application. This research received permission for research ethics from the Muwardi Hospital Surakarta Health Research Ethics Commission on April 28 2021 Number: 464/IV/HREC/20.

Result and Discussion

In Table 1, it can be seen that the majority of respondents' education was at junior high school level. Meanwhile, 23 respondents' education was categorized as tertiary education graduates.

Based on this table, it can be seen that the largest age category of respondents was less than 50 years. Meanwhile, only 6 respondents were over 60 years old. In the same table, it can be seen that the gender of most respondents is female. Meanwhile, the occupation of most respondents is as a housewife and entrepreneur.

Regarding respondents' satisfaction when using the WatDiab application, it can be seen in Table 1 that respondents stated that satisfaction was the largest category they expressed while only 12 people were dissatisfied.

Table. 1 Characteristics of Research Respondents

Characteristics	Frequency	PreProsentase (%)
Age		
< 50 years	84	60
50-60 year	50	35.70
>60 year	6	4.30
Level of education		
SD	37	26.40
SLTP	50	35.70
SLTA	30	21.40
PT	23	16.4
Work		
IRT	50	35.70
PNS	31	22.10
Retired	11	7.90
	48	34.30
Private		
Gender		
Man	53	37.90
Woman	87	62.10
Satisfaction		
Not satisfied	12	8.60
	101	72.10
Satisfied		
Very satisfied	27	19.30

Table 2. Distribution of Respondents according to satisfaction and education level

Satisfaction											Level of education
		Sd		SLTP		SLTA		PT		Total	PT
	n	%	n	%	n	%	n	%	n	%	
Not satisfied	5	41.70	4	33.30	3	25	0	9	12	100	
Satisfied	19	18.80	34	33.70	25	24.80	23	22.80	101	100	0.00
Verysatisfied	13	48.10	12	44.40	2	7.40	0	0	27	100	
About	37	26.40	50	35.70	30	21.40	23	16	140	100	

The results of the Chi-Square analysis to see differences in respondents' satisfaction based on their level of education in using the WatDiab application obtained a chi-square value of 0.002, meaning <0.05. So, it can be concluded that there is a significant difference in respondents' satisfaction with using the WatDiab application based on differences in their level of education. Thus, the null hypothesis is rejected and the alternative hypothesis which reads "There is a difference in user satisfaction of the WatDiab application based on education level" is accepted.

Table 3. Distribution of Respondents according to satisfaction and age group

Satisfaction										Age (Years)
		<50		50-60		>60		Total	p. Value	
	n	%	n	%	n	%	n	%		
Not satisfied	9	75	3	25	0	0	12	100		
Satisfied	52	51.50	43	42.60	6	5.90	101	100	0.02	
Very satisfied	23	85.20	4	14.80	0	0	27	100		
Amout	84	60	50	35.70	6	4.30	140	100		

The results of the square analysis to see differences in respondent satisfaction based on age group in using the WatDiab application received a chi-square value of 0.018, meaning <0.05. So it can be concluded that there is a significant difference in respondent satisfaction based on different age groups.

Thus the null hypothesis is rejected and the alternative hypothesis which reads "There are differences in user satisfaction of the WatDiab application based on age group" is accepted.

Table 4. Distribution of Respondents according to satisfaction and place of residence

Satisfaction	Residential Area					Total	p. Value
	Village		City				
	n	%	n	%	n		
Not satisfied	7	10	7	10	12	100	
Satisfied	48	70	52	73	101	100	0.55
Verysatisfied	14	20	12	17	26	100	
Amount	69	100	71	100	140	100	

Chi-Square analysis to see differences in respondent satisfaction based on the area where the respondent lives in using the WatDiab application obtained a chi-square value of 0.545, meaning > 0.05. So, it can be concluded that there is no significant difference in respondent satisfaction based on differences in area of residence. Thus, the null hypothesis is accepted and the alternative hypothesis which states "There is a difference in user satisfaction of the WatDiab application based on an area of residence" is rejected.

Foot wounds are one of the most common complications and the Covid-19 pandemic requires new management such as using information technology to minimize direct visits to clinics. This condition creates awareness that changes in services and health education for diabetes patients need to be developed by the industrial era 4.0. Especially in diabetes patients who have a high risk of experiencing foot injuries (Miranda et al., 2022). The use of media such as smartphones as a tool in information technology is recognized as a way to overcome the problems of diabetes patients, not only physical problems but also psychological and spiritual problems. As a medium, smartphones can be used to carry out promotions and education so that patient knowledge, skills, and behavior change effectively. For example, in preventing and controlling blood sugar levels for type 2 diabetes (Andriyanto & Hidayat, 2018).

It is also known that smartphone-based applications can direct positive knowledge, skills, and behavior changes in self-care activities for diabetes sufferers and show user satisfaction (Kim et al., 2015).

In another aspect, it is also known that applications can improve self-care management in managing the diet of diabetes mellitus patients through monitoring using applications (Luawo et al., 2019). Meanwhile, in the world of education management, it is known that satisfaction increases in the education system with increased information services to the community after using the application in its services (Haq et al., 2023).

WatDiab Application User Satisfaction Based on Age Group

Below we will discuss patient satisfaction using diabetes care applications on Android-based smartphones. WatDiab Application User Satisfaction Based on Age Group Measuring the level of satisfaction of users of the Android-based diabetes care application (WatDiab) based on age group has been carried out and shows that the chi-square value obtained is 0.018 < 0.05. So, it can be concluded that there is a significant difference in respondent satisfaction based on different age groups.Differences in smartphone application user satisfaction based on age group occurred because there were several age groups in this study. The young age of the respondents is in the group under 50 years, which makes it possible for this age group to still be able to master the use of applications on smartphones easily. As found in the millennial generation who were studied when using health applications, the results showed that there was health application user satisfaction with a significance value of 0.000 (Ningrum & Budiani, 2023).

This is in line with research with respondents whose average age is 44 years which states that smartphone-based applications can be a useful tool that leads to positive changes in the self-care activities of diabetes sufferers and states user satisfaction (Kim et al., 2015). In contrast to research on elderly diabetes sufferers, when using Android applications, most will experience problems in using or operating applications on smartphones. The results of this research found that there are several weaknesses of smartphones when used in services for elderly diabetes sufferers. Apart from that, it is also known that the motivation of elderly people to use it also has other influencing factors, namely age and economics. Diabetes patients will not be free when using applications on smartphones. For this reason, the application design must be friendly to elderly users so that it is easy to use.

The age factor which is an influencing factor in the use of applications on smartphones has also been studied. It was stated that advanced age causes difficulties in using applications on smartphones. So

even though they have the application on their smartphone, they rarely use it. It was also explained that existing application functions often do not meet the preferences of those aged over 56 years (Wahyudi, C.T & Rahman, 2019). Even though the WatDiab application used in this research was prepared based on the results of previous research with respondents who had the same characteristics, it still has to pay attention to usability aspects so that it is easy to use.

This has been explained based on research results that in designing applications it must be prepared by paying attention to aspects of ease of use. When developing an application, it is necessary to have usability aspects so that it is easy for users to operate and provide benefits and satisfaction to users, especially the elderly. For this reason, so that elderly people can use the application easily, the best design for elderly users is in the design of features such as using images (Alsana, 2021).

Figure 2. Features Watdiab Application

This has also been found in research that the application must be friendly, the writing must be bold and use large letters so that it is easy to see and therefore satisfying (Hewu A. et al, 2022). Thus, each application must continue to be evaluated and developed if necessary, redesigned to make it easier to use, especially for elderly users (Konda et al., 2022).

It is recommended that in order for the application to be used by the elderly, whose number of users is increasing, to pay attention to several aspects, namely instructions on how to start using the application, the

use of clear icons and buttons in the form of images or text (Wahyudi, C.T & Rahman, 2019). As the results of other research have found that teenagers have increased acceptance of knowledge about reproductive health by using Android applications because they are interesting and easy to operate and involve many of the five senses but need to be developed by adding pictures, animations or videos so that they are more interesting (Dinengsih, S., & Hakim, 2020; Yustin et al., 2020).

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WatDiab Application User Satisfaction Based on Education Level

The results of this research state that there are differences in respondent satisfaction based on education level in using the WatDiab application. This makes it clear that the level of education is a factor that must be considered in utilizing information technology as a tool in treating diabetes patients.

As in research on the diabetes self management and education (DSME) application which aims to help diabetes sufferers manage caring for themselves who suffer from diabetes, it was found that there were influential factors, namely the level of education (Kurniawan et al., 2020). In academic circles for health sports education, it has been found that Android applications for health fitness are very popular (Antoni & Suharjana, 2019). Meanwhile, in other worlds of health education, it is known that learning and consultation methods between lecturers and students are based on digital has increased satisfaction in documenting using Case Midwifery Notes (Mutiah et al., 2023).

Differences in satisfaction based on education level can occur due to the content of the applications available. This has been found in research examining the satisfaction of health application users. Respondents' dissatisfaction with the application was found in the content variable (Izatti V A, 2020). For this reason, as a follow-up, it is necessary to review and improve the content of the WatDiab application.

Differences in satisfaction are possible because it has been found that educational level factors greatly influence user knowledge, such as knowledge about foot care which is at risk of developing diabetic foot wounds (Dincer, B & Bahcekik, 2020). So, it is understandable that the higher the level of education, the better the knowledge and the possibility of differences in satisfaction when using applications on smartphones.

WatDiab Application User Satisfaction by Place of Residence

It is known that there is quite a big difference in the number of Android-based smartphone users between those who live in cities, namely 54%, and those who live in villages, only 14% and 30% who live in border areas (Das, 2015). However, the difference between rural and urban residences does not cause differences in satisfaction in using the WatDiab application.

This shows that the WatDiab application can be accessed and used easily and can be operated without being constrained by the area where the respondent lives. The absence of differences in satisfaction could be related to the choice of application operational system based using Android, which currently has a larger number of users and is easier to use than other operational systems. Nowadays applications on smartphones can play an important role in complementing diabetes care. Therefore, so that differences do not occur, it is better to regulate the content and context of the problem and adapt it more to user needs with clear guidelines (Huang Z. et al, 2018).

User satisfaction with applications on smartphones for users who live in urban areas is at the same level as in the city of Surabaya. However, further development still needs to be carried out, such as timeless aspects and simplifying usage procedures as well as continuing to motivate people to use applications when they want to get health services (Azzahrah et al., 2020).

It is also known that applications on smartphones have the potential to improve diabetes care, especially in self-management. But there is still no evidence of its continued use so an evaluation of the impact of using the 1,100 applications available worldwide for diabetes care on diabetes care is not yet known (Garabedian et al., 2015). Meanwhile, the satisfaction of users who live in rural areas is currently unknown. No evidence can explain this so further studies still need to be carried out. The development and use of diabetes care service applications on smartphones have become an alternative and innovative way to reach sufferers who are experiencing treatment difficulties, such as during the COVID-19 pandemic, as was done by Salud Wound Care (Sugiyo & Sumadi, 2021). Likewise, it is known that ante-natal care using Android-based applications can reach the wider community and improve the quality of services for pregnant women (Octavia & Sembiring, 2023).

Conclusion

Based on the results of the research that has been carried out, it can be concluded that there are differences in the satisfaction of users of the WatDiab application from the aspect of education and age group. Thus, the WatDiab application needs to be improved so that it can satisfy users of different age groups and educational levels. It is recommended first to carry out a feature analysis in the form of image use if it will be used by users at various levels of education and age groups

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Conceptualization; S., S. L. D. A.; methodology; S; validation; S. L. D. Aformal analysis.; S. investigation.; S. L. D. A; resources; S..data curation: writing—original; S. L. D. A,draft preparation;S., writing—review and editing; S. L. D. A. Visualization; S. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest
The author declares that there is no conflict of interest in the research and publication of this research.

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