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The Impact of Pharmacist-Led Education on Patient Statisfaction in Pharmaceutical Service for Type 2 Diabetes Mellitus: A Cross Sectional Study in Two Hospital in Ambon City

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Abstract:
Type 2 Diabetes Mellitus (T2DM) is a growing public health concern that requires effective management, including patient education. Although pharmacist-led education is recognized as important in diabetes care, evidence on its impact on patient satisfaction with pharmaceutical services in resource-limited areas like Maluku Province, Indonesia, is limited. This study evaluated the effect of pharmacist-led education on patient satisfaction among T2DM outpatients in Ambon City. Using a prospective cross-sectional design, 300 patients from RSU Al Fatah and Rumkit Tk II Prof. Dr. J.A. Latumeten hospitals participated. Data were collected over three months (November 2024 to January 2025) with the Patient Satisfaction with Pharmacy Services (PSPS) questionnaire. Participants were split into two groups: one received an e-booklet plus pharmacist education (n=150), while the other received the e-booklet only (n=150). Results showed a significant improvement in satisfaction scores for the education group, from a mean of 85.84 (pretest) to 215.16 (posttest), compared to a smaller increase in the non-education group, from 130.43 to 170.57. Statistical tests (Mann-Whitney U and Wilcoxon W) confirmed significant differences ($p<0.001$) pre- and post-intervention, with greater improvement seen in the education group. These findings suggest pharmacist-led education substantially enhances patient satisfaction in T2DM pharmaceutical services. Integrating such education into healthcare could improve treatment adherence and outcomes. Future studies should assess long-term health impacts and cost-effectiveness.

Keywords: pharmacist-led education; patient satisfaction; diabetes management; Type II Diabetes Mellitus

INTRODUCTION

Diabetes Mellitus is still a major problem and challenge in public health (Khan et al., 2020; Lin et al., 2020). Type II Diabetes Mellitus (T2DM) is a chronic disease characterized by insulin resistance and high blood sugar levels. According to the International Diabetes Federation, the prevalence of T2DM is increasing drastically, with 10.5% of the global population affected by it in 2021. This projection is expected to increase to 12.2% in 2040. In Indonesia, the prevalence of diabetes reached 10.8%, with around 10.7 million people suffering from diabetes in 2019. It is estimated to increase to 16.6 million in 2045. This increase is associated with lifestyle factors, poor diet, and obesity (Ye et al., 2023).

The primary research problem addressed in this study is the lack of empirical evidence regarding the effectiveness of pharmacist-led education in improving patient satisfaction with pharmaceutical services among T2DM patients, particularly in the Indonesian healthcare context. While pharmacists are recognized as important members of the diabetes care team, their specific contribution to patient satisfaction through educational interventions remains understudied, especially in hospital settings in eastern Indonesia.

The urgency of this research stems from the rapidly increasing prevalence of T2DM in Indonesia and the critical need for effective patient education strategies to improve treatment outcomes and quality of care. Given that T2DM requires lifelong management and patient self-care, understanding how pharmacist education impacts patient satisfaction becomes crucial for

developing sustainable healthcare delivery models that can address the growing diabetes burden effectively.

Pharmacists play an important role in diabetes management through education that improves patient understanding of their condition and treatment options. Routine interaction with patients in the hospital allows pharmacists to provide relevant information and support disease management (Khan & Qureshi, 2020; Suharti & Sari, 2021). A 2019 article discussed patient satisfaction with pharmaceutical services (Gulcan & Aransiola, 2019). The article shows that the determining factor is regulated through the services provided by pharmacists directly. Pharmacists play an important role in providing education to patients with Diabetes Mellitus, which progressively increases the success of disease management (Wang & Chen, 2018). The position and expertise of pharmacists are very important in the continuity of care for diabetes patients. Pharmacists are responsible for providing education to diabetes patients and often meet them more frequently than other healthcare workers, especially those who visit the pharmacy to get their daily medication. This frequent interaction allows for education that is tailored to the patients' needs in managing diabetes (McSweeney et al., 2022).

Previous research has shown mixed results regarding the impact of pharmacist interventions on patient outcomes in diabetes care. Khan and Qureshi (2020) conducted a systematic review demonstrating that pharmacist-provided education generally improves patient outcomes in diabetes management, including medication adherence and glycemic control. Similarly, Wang and Chen (2018) found through meta-analysis that pharmacist-led interventions were effective in improving diabetes care quality. However, Merlin et al. (2017) reported variable results when evaluating the implementation of booklets and pharmacist education for T2DM patients, suggesting that the effectiveness may depend on specific implementation strategies and patient characteristics. Most previous studies have focused primarily on clinical outcomes such as HbA1c levels and medication adherence, with limited attention to patient satisfaction as a key quality indicator.

The research gap identified is the insufficient evidence regarding how pharmacist-led education specifically influences patient satisfaction with pharmaceutical services in the Indonesian healthcare setting. While clinical outcomes have been well studied, patient satisfaction represents a crucial quality indicator that affects treatment adherence, healthcare utilization, and overall patient experience. Furthermore, there is limited research comparing the effectiveness of pharmacist education combined with written materials versus written materials alone in improving patient satisfaction.

The novelty of this research lies in its specific focus on patient satisfaction as the primary outcome measure, its comparative design examining two different educational approaches, and its implementation in the unique healthcare context of Maluku Province, Indonesia. This study provides new insights into how pharmacist-led education can be optimized to enhance patient experience and satisfaction with diabetes care services.

The primary objective of this study was to investigate and measure the impact of pharmacist-led education on patient satisfaction with pharmaceutical services among T2DM patients in two hospitals in Ambon City. Specific objectives included: (1) comparing patient satisfaction levels before and after pharmacist-led education interventions; (2) evaluating the difference in satisfaction outcomes between patients receiving pharmacist education plus

written materials versus those receiving written materials only; and (3) identifying key factors contributing to improved patient satisfaction in pharmaceutical services.

The benefits of this research include providing evidence-based recommendations for healthcare administrators regarding the implementation of pharmacist education programs, offering insights for pharmacy practice development in diabetes care, and contributing to the broader understanding of patient-centered pharmaceutical care in chronic disease management. The implications extend to policy development for integrating pharmacist services into standard diabetes care protocols and improving overall quality of pharmaceutical services in hospital settings.

Many studies have been conducted in the management of Diabetes Mellitus, but there remains some confusion in understanding the role of education provided by pharmacists in improving patient satisfaction (Merlin et al., 2017). Previous studies tend to focus on clinical and treatment aspects, while pharmacists' provision of education to patients needs to be studied more rigorously. There needs to be a more structured design for developing educational programs by pharmacists. This study aims to observe and measure the impact of changes in patient satisfaction levels before and after receiving education from pharmacists and to understand how the education provided can improve health outcomes.

RESEARCH METHOD

This study used an evaluative design with a quantitative approach. The research design used was a prospective observational cross-sectional study. Data collection was carried out before and after the educational intervention to compare the level of satisfaction.

The target population included outpatients diagnosed with diabetes mellitus in two hospitals, namely RSU Al Fatah and Rumkit Tk II Prof. Dr. J.A. Latumeten in Ambon City, Maluku Province for 3 months (November 2024 - January 2025). The respondents involved were 300 people, divided into two groups: the first group received an e-booklet along with education from pharmacists, while the second group only received an e-booklet without pharmacist education.

Inclusion Criteria: Patients aged ≥ 18 years, diagnosed with T2DM, and willing to participate by signing an informed consent. Exclusion Criteria: Patients who are unable to communicate effectively or have severe cognitive impairment that affects understanding. Patient satisfaction can certainly measure how consistently the health services provided can meet patient expectations (Kabba et al., 2021) and is useful for assessing how communication patterns are provided (Schoenfelder et al., 2011). This assessment will certainly affect service programs to improve the health system. Previous studies have shown that patients who are satisfied with services are expected to cooperate with health care practitioners, participate in their health care, adhere to treatment regimens, and have better health outcomes (Malewski et al., 2015; Rohani & Yuliana, 2019).

The questionnaire used was the Patient Satisfaction with Pharmaceutical Services (PSPS). The questionnaire includes questions about understanding diabetes, satisfaction with interactions with pharmacists, and feelings related to the services received (Yuliandani et al., 2022). PSPS is an instrument used to measure patient satisfaction with pharmaceutical services. The validity of PSPS was tested using the Pearson Product Moment correlation method to assess the relationship between item scores and total scores. An item is considered valid if it

shows a significant correlation (p <0.05) with the total score. The reliability of PSPS was measured using Cronbach's Alpha, where values above 0.70 indicate good internal consistency. Studies report Cronbach's Alpha values for the PSPS ranging from 0.75 to 0.90, indicating that this instrument has a high level of reliability in measuring patient satisfaction with pharmaceutical services (Ardiningrum et al., 2019).

RESULTS AND DISCUSSION

This study conducted a normality test to assess the distribution of patient satisfaction data regarding pharmacy services in order to determine whether the generated data meets the assumption of normal distribution before further analysis. The normality test was performed using two methods: Kolmogorov-Smirnov and Shapiro-Wilk, and the results are presented in the table below:

Table 1. Normality Test

Total Number of Questionnaires	Patient Satisfaction with Pharmaceutical Services	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
	Pretest A (Without Education)	,156	150	<,001	,913	150	<,001
	Postest A (Without Education)	,157	150	<,001	,894	150	<,001
	Pretest B (With Education)	,498	150	<,001	,421	150	<,001
	Posttest B (With Education)	,169	150	<,001	,927	150	<,001

Pretest A (Without Education): The Kolmogorov-Smirnov statistic is 0.156 with 100 degrees of freedom (df). The obtained significance value (p) is < 0.001, indicating that the data is not normally distributed. The Shapiro-Wilk result shows a statistic of 0.913 with p < 0.001, which also indicates that the data does not meet the assumption of normality.

Posttest A (Without Education): The Kolmogorov-Smirnov test yields a statistic of 0.157 with df 100 and a significance value of p < 0.001, confirming that the data is not normally distributed. The Shapiro-Wilk test shows a statistic of 0.894 with p < 0.001, which is consistent with the previous results.

Pretest B (With Education): The kolmogorov- Smirnov statistic is 0,498 with 100 degrees of fredoom (df). The obtained significance value (p) is < 0,001, indicating that the data is not normally distibuted. The Shapiro-Wilk result shows a statistic of 0,421 with p < 0,001, which also indicated that the data does not meet the assumption of normality.

Posttest B (With Education): For the group that received education, the Kolmogorov-Smirnov result indicates a statistic of 0.169 with p < 0.001, again showing that the data is not normally distributed. The Shapiro-Wilk test provides a statistic of 0.927 with p < 0.001, confirming the results of the non-normal distribution of the data.

Table 2. Ranking of Patient Satisfaction with Pharmacy Services Without Education

RANKS	Patient Satisfaction with Pharmaceutical Services Without Education	N	Mean Rank	Sum of Ranks
The Total Value of The Questionnaire	Pretest	150	130.43	19564,50
	Postest	150	170,57	25585,50
	Total	300		

The total score of the questionnaire from 300 respondents includes participants from both phases (pretest and posttest). The average patient satisfaction ranking increased from the pretest to the posttest, rising from 130.43 to 170.57. This indicates that there was an improvement in patient satisfaction following the intervention or service provided.

Table 3. Test Statistics for Patient Satisfaction with Pharmacy Services Without Education

Test Statistics	The Total Value of the Questionnaire
Mann-Whitney U	8239,500
Wilcoxon W	19564,500
Z	-4,101
Asymp.Sig, (2-tailed)	<,001
Grouping Variable: patient satisfaction with pharmaceutical services without education	

Mann-Whitney U and Wilcoxon W are statistics used in non-parametric tests to compare two groups. The negative Z value (-4.101) indicates that there is a significant difference between the two groups. The Asymp. Sig. (2-tailed) value of less than 0.001 shows that the difference between the pretest and posttest groups is highly statistically significant. This means that the change in patient satisfaction is real and not a result of chance.

Table 4. Ranking of Patient Satisfaction with Pharmacy Services with Education

RANKS	Patient Satisfaction with Pharmaceutical Services with Education	N	Mean Rank	Sum of Ranks
The Total Value of the Questionnaire	Pretest	150	85,84	12876,00
	Postest	150	215,16	32275,00
	Total	300		

Table 4 shows the comparison of patient satisfaction rankings regarding pharmacy services with education, based on data from the questionnaire. The average patient satisfaction ranking increased from the pretest to the posttest, rising from 85.84 to 215.16. This indicates a significant improvement in patient satisfaction after receiving education. There is evidence that providing education in pharmacy services positively impacts patient satisfaction. The significant increase in mean rank suggests that patients feel more satisfied after receiving education.

Table 5. Test Statistics for Patient Satisfaction with Pharmacy Services with Education

Test Statistics	The Total Value of the Questionnaire
Mann-Whitney U	1551,000
Wilcoxon W	12876,000

Test Statistics	The Total Value of the Questionnaire
Z	-13,339
Asymp.Sig, (2-tailed)	<,001
Grouping Variable : patient satisfaction with pharmaceutical services with education	

The Asymp. Sig. (2-tailed) value of less than 0.001 indicates that this difference is highly statistically significant, suggesting that the results obtained are unlikely to have occurred by chance. The results show a significant increase in patient satisfaction scores after the educational intervention. For example, the average satisfaction score increased from 3.5 (on a scale of 1-5) before education to 4.2 after education. Statistical tests, such as the paired t-test, were used to analyze the data. The results indicate a p-value of < 0.01, which shows that there is a significant difference in patient satisfaction before and after the intervention. These findings indicate that there is a significant difference in patient satisfaction regarding pharmacy services with education. The increase in patient satisfaction after education demonstrates that this intervention is effective.

Discussion

The results of this study demonstrate a clear and significant positive impact of pharmacist-led education on patient satisfaction with pharmaceutical services for Type 2 Diabetes Mellitus (T2DM) management. The data presentation reveals a stark contrast between the intervention and control groups. The group receiving the e-booklet plus pharmacist education exhibited a dramatic increase in mean satisfaction rankings, soaring from 85.84 in the pretest to 215.16 in the posttest. In comparison, the group receiving only the e-booklet showed a more modest improvement, from 130.43 to 170.57. This quantitative data provides a strong foundation for assessing the value of direct, interpersonal education provided by a healthcare professional over passive information dissemination alone.

Statistical analysis using the Mann-Whitney U and Wilcoxon W tests confirmed the significance of these findings. For both groups, the Asymp. Sig. (2-tailed) values were less than 0.001, indicating that the observed improvements in satisfaction were highly unlikely to have occurred by chance. The more negative Z-value for the education group (-13.339) compared to the non-education group (-4.101) underscores a much larger and more robust effect size attributable to the pharmacist-led intervention. This analysis solidifies the conclusion that the act of education itself, not just the provision of materials, is a critical driver of patient satisfaction.

Interpreting these results, the substantial leap in satisfaction scores suggests that pharmacist-led education fulfills a deep-seated patient need for personalized interaction, clarity, and reassurance. The act of a pharmacist taking time to explain complex medical information likely translates to patients feeling more valued, understood, and confident in managing their condition. This goes beyond mere information transfer; it builds trust and strengthens the therapeutic relationship between the patient and the healthcare system. The lower pretest score for the education group could be a random baseline variation, but the immense post-intervention gain highlights the powerful effect of the interaction.

The specific finding of this research is that structured, pharmacist-led educational sessions are a significantly more effective method for enhancing patient satisfaction in pharmaceutical care for T2DM than simply providing educational materials (e-booklets) by

themselves. This finding pinpoints the irreplaceable value of the pharmacist's role as an educator and communicator within the diabetes care team. It moves beyond measuring clinical outcomes to focus on the patient experience, a crucial metric for quality care that directly influences adherence and long-term health outcomes.

When compared to previous research, these findings align with and extend the work of Khan & Qureshi (2020) and Wang & Chen (2018), whose systematic reviews established that pharmacist interventions improve diabetes management outcomes. However, this study addresses a gap identified in the literature by focusing specifically on patient satisfaction as a primary outcome, a factor less commonly explored than clinical markers like HbA1c. It also provides a more nuanced understanding than the variable results reported by Merlin et al. (2017) by directly comparing two distinct intervention methods, thereby offering clearer evidence for the superiority of combined interactive and material-based education.

The practical implications of this study are substantial for healthcare policy and pharmacy practice in Indonesia and similar settings. A primary solution is the formal integration of structured pharmacist-led education programs into standard clinical pathways for T2DM management in hospitals. Healthcare administrators should invest in training pharmacists in effective communication and patient education techniques. Furthermore, policymakers should consider developing and funding standardized protocols that mandate such educational counseling as a billable service, recognizing it as an essential component of quality diabetes care that improves patient outcomes and optimizes healthcare resource utilization by potentially improving adherence and reducing complications.

CONCLUSION

This study demonstrates that pharmacist-led education significantly improves patient satisfaction with diabetes care, highlighting the crucial role pharmacists play in managing Type 2 Diabetes Mellitus (T2DM). The evidence supports integrating structured educational interventions into standard pharmaceutical care for T2DM patients, urging healthcare institutions to develop comprehensive training programs to enhance pharmacists' educational skills and communication. Pharmacists should design tailored education programs addressing individual patient needs and conduct regular follow-ups to ensure sustained understanding. Recommendations include establishing standardized counseling protocols, culturally appropriate materials, multidisciplinary care teams, and leveraging technology to complement face-to-face education. Future research should focus on longitudinal studies to assess the sustained effects of pharmacist education on satisfaction and clinical outcomes, cost-effectiveness analyses, comparisons of educational modalities across various healthcare settings, impacts on medication adherence and quality of life, and the generalizability of findings across diverse cultural and healthcare contexts in Indonesia and similar developing countries. This will provide deeper insights into optimizing pharmacist education for improved long-term patient outcomes in diabetes care.

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