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Original Research Paper

The Relationship Between The Role of Nurses as Educators and Medication Compliance in Diabetes Mellitus Patients

Aurrell Adna Kusuma, Okti Sri Purwanti*

Nursing Study Program, Faculty of Health Sciences, Muhammadiyah University of Surakarta, Indonesia

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Email Corresponding:
osp136@ums.ac.id

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Abstract

Background: Diabetes mellitus (DM) is a chronic disease caused by impaired insulin production or utilization, leading to serious complications if not properly managed. Non-compliance with medication remains a major challenge, contributing to poor outcomes and increased mortality. Nurses play a pivotal role as educators in improving patient adherence. **Objective:** To examine the relationship between the role of nurses as educators and medication compliance among DM patients. **Methods:** A quantitative cross-sectional study was conducted on 129 DM patients at the Endocrinology Polyclinic of Dr. Moewardi Regional Hospital, Surakarta, from November to December 2024. Data on nurses' educational roles and patients' medication compliance were collected using structured questionnaires, including the validated Morisky Medication Adherence Scale (MMAS-8). The Spearman Rank test was used for analysis. **Results:** The analysis revealed a significant positive relationship between the role of nurses as educators and medication compliance (p = 0.001; Rho = 0.634). Although most respondents (97.7%) rated the nurses' role as "good," more than half (54.2%) still demonstrated moderate to poor compliance. **Conclusion:** Nurses' educational role has a strong positive impact on medication compliance in DM patients. Strengthening and sustaining educational strategies are essential to improve adherence and health outcomes.

Keywords: *Diabetes mellitus; Compliance in taking medication; Role of nurse educators.*

Introduction

Diabetes mellitus (DM) is generally defined as a condition in which the pancreas is unable to produce sufficient insulin or use it efficiently[1]. Untreated DM can lead to severe complications such as depression, retinopathy, nephropathy, diabetic foot, chronic kidney disease, and cardiovascular disease[2]. One of the prerequisites for achieving effective treatment and improving patient quality of life is compliance. Compliance is essential for achieving therapeutic goals for patients with diabetes mellitus[3]. Medication compliance is defined as the extent to which a patient's behavior aligns with the prescribed medication regimen and medical advice[4].

Globally and nationally, DM is a major public health concern due to its rising prevalence. In 2021, approximately 537 million people worldwide were affected by DM, a number projected to increase to 643 million by 2030[1]. In Indonesia, 19.5 million people have diabetes, making it the country with the sixth-highest number of DM cases globally[1]. In Central Java province, an estimated 623,973 people were diagnosed with diabetes in 2022[5]. The city of Surakarta recorded 12,105 confirmed diabetes cases in 2021, an increase from 8,884 cases in 2020[6]. At Dr. Moewardi

Regional Hospital, Surakarta, DM was the seventh most common outpatient disease in the first quarter of 2023, with 1,037 patients[7]. Non-compliance with medication is a significant issue, with studies reporting a global prevalence of non-compliance among chronic disease patients, including diabetes, contributing to treatment failure and increased mortality[1].

In Indonesia, the prevalence of DM as a chronic disease continues to rise. Disease control is heavily dependent on patient compliance with treatment, including regular medication consumption. A key element in enhancing patient compliance is the role of nurses as educators. Effective education can help patients understand the importance of their medication, prevent complications, and improve their quality of life. As a referral hospital, Dr. Moewardi Regional Hospital in Surakarta has a large population of diabetic patients. However, there is limited research specifically examining the relationship between the role of nurses as educators and the level of medication compliance among diabetic patients in this hospital.

While previous studies, such as those by Husna (2023)[8] and Djibu (2021)[9], have explored the role of nurses in patient compliance, this research offers a novel contribution by focusing specifically on the context of a major referral hospital in Central Java, providing context-specific evidence that can directly inform local nursing practice and hospital policy. This study addresses the question: "Is there a relationship between the role of nurses as educators and the level of medication compliance in diabetes mellitus patients at Dr. Moewardi Hospital, Surakarta?" The findings are expected to provide practical guidance for nursing professionals and hospital management in designing more effective patient education programs, ultimately improving diabetes management outcomes.

Materials and Methods

Study Design

This study used a quantitative design with a cross-sectional approach, aiming to analyze the relationship between the independent variable (the role of nurses as educators) and the dependent variable (the level of medication compliance) among DM patients.

Sample

The research sample consisted of 129 respondents who were DM patients seeking treatment at the Endocrinology Polyclinic of Dr. Moewardi Regional Hospital, Surakarta, from November to December 2024. The sampling technique used was purposive sampling. This non-probability method was chosen to ensure that selected participants had the specific characteristics and experience relevant to the study's focus, having interacted with the nursing education program multiple times. Inclusion criteria were: (1) DM patients aged 18–65 years, (2) had received treatment at the polyclinic more than three times, ensuring sufficient exposure to nursing education, (3) were cooperative, and (4) willing to participate. Exclusion criteria included patients with physical limitations such as blindness, hearing impairment, or decreased consciousness that would prevent them from completing the questionnaire.

Data Collection Technique

Data were collected using three types of questionnaires. First, a Demographic Data Questionnaire was used to identify respondent characteristics such as age, gender, education level, and duration of DM, which could influence their perceptions and behavior. Second, a Nurse Educator Role Questionnaire was used to evaluate patients' perceptions of the quality of education provided by nurses, covering aspects such as information delivery, emotional support, and motivational

reinforcement. This questionnaire was developed based on standard nursing education principles and was tested for validity and reliability on a sample of 30 patients (not included in the main study), yielding a Cronbach's alpha value of 0.81, which indicates good internal consistency. Third, the Morisky Medication Adherence Scale (MMAS-8), a validated and widely used instrument, was employed to assess the level of patient compliance in taking medication as prescribed.

Data Analysis Technique

Data analysis was conducted in stages. First, a normality test (Shapiro-Wilk) was performed on the data for both variables. Since the data were not normally distributed ($p < 0.05$), a non-parametric test was chosen. Univariate analysis was used to describe the frequency distribution of respondent characteristics, their perception of the nurse educator's role, and their level of medication compliance, presented in frequency tables and descriptive statistics. Next, Bivariate analysis was performed to test the relationship between the independent variable (role of nurses as educators) and the dependent variable (level of medication compliance). Given the ordinal nature of the data and the non-normal distribution, the Spearman Rank test was used to measure the strength and direction of the correlation between the two variables. A significance level (α) of 0.05 was set.

Ethical Consideration

This study received ethical approval from the Health Research Ethics Committee of Dr. Moewardi Regional Hospital, Surakarta, with approval number 2.656/XI/HREC/2024. Before participation, each respondent was given a clear explanation of the study's purpose, procedures, benefits, and their rights as participants. Written informed consent was obtained from all respondents prior to their inclusion in the study.

Results

This section presents the main findings of the research, corresponding to the research question and objectives. The results are presented in descriptive and analytical forms, including tables and a graph to facilitate reader understanding.

Table 1. Distribution of Respondent Characteristics, Nurses' Roles as Educators, and Medication Compliance of Diabetes Mellitus Patients at Dr. Moewardi Surakarta Regional Hospital

Characteristics	f	%
Age		
18-25	1	0,8
26-35	9	7,0
36-45	24	18,6
46-55	47	36,4
56-65	48	37,2
Gender		
Male	50	38,8
Female	79	61,2
Education		
Elementary School	28	21,7
Junior High School	34	26,4
Senior High School	41	31,8
Diploma	10	7,8
Bachelor's Degree	16	12,4
Employment		
Private employees	32	24,8
Civil servants	8	6,2
TNI/Polri	0	0,0
Others (Homemaker, entrepreneur)	89	69,0
Long Treatment		
<1 year	41	31,8
1-3 year	56	43,4
>3 year	32	24,8
Blood Sugar Monitoring		
Every Pain	8	6.2
Each Month	80	62.0
Not Routinely Every Month	6	4.7
Every month and every illness	35	27.1
Role of Nurses	f	%
Good	126	97.7
Average	3	2.3
Bad	0	0.0
Medication Compliance		
Compliant	59	45,7
Moderate	51	39,5
Non-Compliant	19	14,7
Total	129	100,0

Source: Primary data

The distribution of respondent characteristics is shown in Table 1. The most dominant age group was 56-65 years, with 48

people (37.2%). The majority of respondents were female, 79 people (61.2%). In terms of education, the most common level was senior high school (SMA), with 41 respondents (31.8%). The largest employment group was "Others" (homemakers, entrepreneurs, pensioners), totaling 89 respondents (69.0%). Most respondents (56 people, 43.4%) had been undergoing treatment for 1-3 years. Finally, the majority (80 respondents, 62.0%) monitored their blood sugar every month.

Table 2. Relationship between the Role of Nurse Educators and Compliance in Taking Medication in Diabetes Mellitus Patients at Dr. Moewardi Surakarta Regional Hospital'

Role of Nurses	Medication Compliance						Total		P.Value	Rho
	Compliant		Moderate		Non-Compliant					
	f	%	f	%	f	%	f	%		
Good	59	46,8	50	39,7	17	13,5	126	100	0,001	0,634
Average	0	0,0	1	33,8	2	66,7	3	100		
Bad	0	0,0	0	0,0	0	0,0	0	0		
Total	59	45,7	51	39,5	19	14,7	129	100		

***Source:** Primary data.*

Table 2 shows the relationship between the role of nurses as educators and medication compliance. The majority of respondents (126 people, 97.7%) rated the role of nurses as "good." Within this group, 59 people (46.8%) were compliant, 50 (39.7%) were moderately compliant, and 17 (13.5%) were non-compliant. In the "average" category (3 respondents), 1 person (33.3%) was moderately compliant, and 2 (66.7%) were non-compliant. The Spearman Rank statistical test yielded a p-value of 0.001 and a correlation coefficient (Rho) of 0.634, indicating a significant and strong positive relationship between the two variables.

To further illustrate the findings, Figure 1 visualizes the distribution of medication compliance levels across different age groups. This helps to identify trends, such as whether compliance tends to decrease with older age, which was a notable pattern in the data. The research found a significant and strong positive relationship between the role of nurses as educators and the level of medication compliance (p=0.001, Rho=0.634). Although an overwhelming majority of patients (97.7%) perceived the role of nurses as educators to be "good," a significant portion (54.2%) still exhibited only moderate or non-compliant behavior. This suggests that while the educational role of nurses is a critical factor, it is not the sole determinant of medication compliance. Other factors, such as age, duration of illness, and individual patient motivation, likely also play a substantial role in influencing adherence to medication regimens.

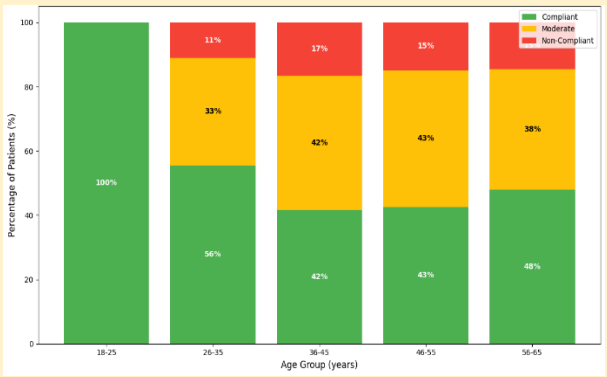

Figure 1. Distribution of Medication Compliance Levels Across Different Age Groups

Discussion

This study demonstrates a significant and strong positive relationship between the role of nurses as educators and medication compliance among diabetes mellitus patients. The statistical result (p=0.001, Rho=0.634) indicates that a better perception of the nurse's role as an educator is strongly associated with higher levels of medication compliance. This finding aligns with the research conducted by Husna (2023)[8] and Djibu (2021)[9], who also found significant positive relationships between nurse-led education and patient adherence. The results can be explained by Lawrence Green's theory[10], which posits that health behavior is influenced by predisposing factors, including knowledge and attitudes. Effective education from nurses enhances patients' knowledge and shapes positive attitudes towards their illness and treatment, which in turn fosters compliant behavior.

However, a notable contradiction exists within our findings: despite 97.7% of respondents rating the nurses' role as "good," 54.2% of patients were still only moderately or non-compliant. This suggests that while high-quality nursing education is a necessary condition for compliance, it may not be sufficient on its own. Other factors not measured in this study, such as medication side effects, complex dosing schedules, financial constraints, forgetfulness, or a lack of intrinsic motivation, could be significant barriers to adherence even when patients perceive the education they receive positively[11]. This highlights the multifactorial nature of medication compliance.

Our findings corroborate previous research that underscores the importance of the nurse's role as an educator. For instance, Husna (2023)[8] found a significant link between the role of nurses and medication compliance in hypertensive and diabetic patients, with a p-value of 0.000. Similarly, Aryani (2019)[11] reported a significant relationship (p=0.000) in type 2 diabetes patients. The consistency of these results across different settings and patient populations strengthens the evidence that nursing education is a cornerstone of effective chronic disease management. However, our study adds a layer of nuance by revealing the disconnect between positive perception of education and actual compliance, a point less emphasized in prior studies. This suggests that future research and interventions should look beyond just the quality of education and address the broader spectrum of barriers to adherence.

The results of this study have direct implications for nursing practice and hospital policy. The strong correlation found suggests that hospitals should continue to invest in training nurses to be effective educators. The hospital successfully used diabetes management books containing patient information, monthly blood sugar results, and medication details. This practice should be standardized and expanded to all diabetic patients[12]. Furthermore, to address the gap between education and compliance, a more holistic approach is needed. Nurses should be trained not only to provide information but also to assess for specific barriers to adherence (e.g., using motivational interviewing techniques) and to tailor their educational strategies accordingly. For example, for older patients who showed lower compliance rates in our study[13], simplified instructions, reminder tools (e.g., pillboxes, phone alarms), and involving family members in the care plan could be beneficial interventions[14].

The strengths of this study include the use of a validated instrument (MMAS-8) for measuring medication compliance and a clear, appropriate statistical analysis method (Spearman Rank) based on the data characteristics. The study also successfully identified a significant relationship in a real-

world clinical setting. However, several limitations must be acknowledged. First, the use of purposive sampling, while practical, limits the representativeness of the sample and the generalizability of the findings to all diabetic patients[15]. Second, the study was conducted at a single site, which may not reflect practices or patient populations in other hospitals. Third, the data on medication compliance were self-reported, which is susceptible to social desirability bias (patients may over-report compliance)[16]. Finally, the cross-sectional design prevents any causal inferences from being made.

Based on the findings and limitations, several recommendations for future research are proposed. Future studies should employ a longitudinal design to observe how the role of nurses and patient compliance evolve over time, which could provide stronger evidence for causality. To improve generalizability, researchers should use probability sampling methods, such as simple random sampling, across multiple hospitals or community health centers. It is also recommended that future research include a broader range of variables that may influence compliance, such as socio-economic status, presence of side effects, health literacy, and family support[17], to build a more comprehensive predictive model. A qualitative component could be invaluable for exploring the reasons behind the discrepancy between positive perception of education and non-compliance[18], providing deeper insights into the lived experience of diabetic patients[19]. For instance, factors like a lack of intrinsic motivation or forgetfulness, which are not captured by quantitative surveys, could be explored in depth[20,21,22]. Furthermore, research should investigate the impact of specific interventions, such as digital reminder tools or simplified dosing schedules, on compliance rates, particularly in older populations[23,24]. Understanding these complex interactions is crucial for developing more effective strategies to improve medication adherence and, consequently, health outcomes for patients with diabetes mellitus[25,26].

Conclusion

This study concludes that there is a significant and strong positive relationship between the role of nurses as educators and the level of medication compliance among diabetes mellitus patients at Dr. Moewardi Regional Hospital, Surakarta. The findings highlight that while nurses are effectively performing their educational roles, patient compliance is a complex issue influenced by multiple factors beyond education alone. The results provide a strong evidence base for the continued enhancement of nursing education programs and the development of more comprehensive, patient-centered strategies to address the diverse barriers to medication adherence. Future efforts should focus on integrating educational interventions with practical support systems to optimize diabetes management outcomes.

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