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Association Analysis of Individual Characteristics with Dietary Adherence of T2DM Patients as an Effort to Control Blood Glucose Levels

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ABSTRACT

Diabetes mellitus is a chronic metabolic disease that requires individual dietary therapy to control blood glucose levels. Diabetic patients tend to adhere to their dietary arrangements more actively after suffering medical complications due to untreated diabetes. Several individual characteristics have a possible relationship with the patient's non-adherence to their diet. This study aimed to analyze the relationship between nutritional knowledge, formal education, and emotional intelligence with dietary adherence in type 2 diabetes mellitus (T2DM) patients. The research design used was cross-sectional. Data were collected through three questionnaires on nutritional knowledge, emotional intelligence, and dietary adherence in 100 T2DM outpatients at Dr. Soetomo General Hospital who were treated in 2021. The collected data was analyzed using bivariate analysis with the Rank Spearman test. This study shows that formal education was not significantly related (correlation coefficient r = 0.159, p-value = 0.114) to dietary adherence. Meanwhile, there was a moderately significant and positive linear relationship (r = 0.444, p = 0.000) between nutritional knowledge and dietary adherence. Similarly, to emotional intelligence, there was a moderately significant and positive linear relationship (r = 0.423, p = 0.000) between emotional intelligence and dietary adherence. To be concluded, there was no relationship between formal education and dietary adherence in T2DM patients. In contrast, nutritional knowledge and emotional intelligence have a moderately significant and positive linear relationship with the dietary adherence of T2DM patients.

Keywords: dietary adherence; formal education; nutritional knowledge; emotional intelligence; type 2 diabetes mellitus; T2DM

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder with multiple etiologies characterized by increased blood glucose levels [1]. As many as 90% of diabetes cases are DMT2 [2]. Excess blood glucose levels in diabetic patients can increase deaths by 2.2 million due to complications in cardiovascular and other diseases [3]. Blood glucose levels are influenced by a person's lifestyle and diet [4]. The Indonesian Ministry of Health recommends lifestyle and dietary control as an integrated therapy for diabetes mellitus patients. Diet therapy is individual, so the challenge that must be faced is to determine a healthy diet pattern and remain in accordance with the patient's characteristics. Many patients follow dietary recommendations selectively and more actively adhere to their therapy after suffering complications [5].

For at least two decades, treatment adherence has been becoming a relevant object of study for behavioral sciences, especially in health psychology, known by the term health behavior. Human behavior can be modulated to form habits and lifestyles aimed at following long-term treatment, including dietary therapy. Three psychological dimensions determine a patient's attitude towards disease, namely cognitive (the patient's knowledge of the disease and the treatment process), emotional (emotions experienced by the patient related to the disease), and behavior (actions taken by the patient for the disease and the treatment process) [6]. The psychological dimension describes a person's individual character. Individual characteristics are interests, attitudes toward oneself, individual needs, abilities or competencies, knowledge about emotions, moods, feelings, and beliefs values [7].

Individual characteristics are abilities, biographical characteristics, learning, attitudes, personality, perceptions, and values [8].

One of the demographic factors, namely education, is considered to be able to encourage a healthy diet by increasing one's health literacy and self-efficacy [9]. The emotional burden of diabetes therapy can lead to poor self-management behaviors, including diet, so it will also impact poor glycemic control [10]. Patient's cognition of therapy and disease is a crucial predictor of adherence [11]. This study discusses the relationship between individual character, which is a psychological dimension of dietary adherence in T2DM patients. The individual characteristics examined in this study were formal education, nutrition knowledge, and the patient's emotional intelligence. the study was formal education, knowledge of nutrition, and patient's emotional intelligence.

MATERIAL AND METHODS

This research data was obtained through interviews with one hundred T2DM outpatients undergoing treatment at Dr. Soetomo General Hospital Surabaya in 2021. Interviews are conducted by phone for patients who agree to conduct research. The instruments used are questionnaires on nutritional knowledge [12], formal education, emotional intelligence [13], and dietary adherence [14], which have been tested for validity and reliability through IBM SPSS ver. 23. The collected questionnaire data was categorized through Excel using the ordinal scale for each variable. Formal education is categorized into low, middle, and higher education levels. Nutritional knowledge is categorized into less good, quite good, and good levels of nutritional knowledge. Emotional intelligence is categorized into low, medium, and higher levels of emotional intelligence. Dietary adherence was categorized into less good, quite good, and good levels of adherence. The data obtained were analyzed using IBM SPSS ver. 23, frequency descriptively tabulated, and the relationship between nutritional knowledge, formal education, emotional intelligence, and patient dietary adherence was tested through Rank Spearman. The independent variables (formal education, nutritional knowledge, emotional intelligence) are stated to be significantly related to the dependent variable (dietary adherence) if the $p < 0.05$. To determine the strength of the relationship, the *r*-value is compared with the interpretation of the Rank Spearman correlation coefficient according to the opinion of D.A. de Vaus in Table 1 [15]. If the *r*-value is +1 indicates a perfect positive linear relationship; as one variable increases in its values, the other variable also increases in its values through an exact linear rule.

If the *r*-value is −1 indicates a perfect negative linear relationship; as one variable increases in its values, the other variable decreases in its values through an exact linear rule [16].

TABLE 1: Interpretation of Correlation Coefficient.

Correlation coefficient (r)	Interpretation
0.00	No correlation
0.01 - 0.09	Non-significant correlation
0.10 - 0.29	Weak correlation
0.30 - 0.49	Moderate correlation
0.50 - 0.69	Strong correlation
0.70 - 0.89	Very strong correlation
> 0.90	Almost perfect correlation

RESULTS

Table 2 shows that out of 100 patients, the most extensive distribution of dietary adherence levels is the quite good category (68%). The most extensive distribution of educational levels is the medium category (39%). The most extensive distribution of the level of nutritional knowledge is a good category (45%). Meanwhile, the moderate category is the most extensive distribution of emotional intelligence (71%).

From the spearman rank correlation test, it is known that the p-value of the formal education variable is 0.114, meaning that there is no significant relationship between the formal education variable and dietary adherence. The nutrition knowledge variable has a p-value of 0.000, meaning there is a significant relationship between the nutritional knowledge variable and dietary adherence. The r-value of the nutritional knowledge variable is 0.444, so the strength of the relationship between the two variables is moderate and positively linear. Thus, the more nutritional knowledge increases, the more dietary adherence increases. The emotional intelligence variable has a p-value of 0.000, meaning there is a significant relationship between the emotional intelligence variable and dietary adherence. The r-value of the emotional intelligence variable is 0.423, so the strength of the relationship between the two variables is moderate and positively linear. Thus, the more emotional intelligence increases, the more dietary adherence increases.

TABLE 2: Interpretation of Correlation Coefficient.

Patient characteristics		Dietary adherence level			Total n (%)	Correlation coefficient (*r*)	*p*-value (*p*)
		Less good n (%)	Quite good n (%)	Good n (%)			
Education level	Low	3 (3%)	29 (29%)	4 (4%)	36 (36%)	0.159	0.114
	Medium	7 (7%)	25 (25%)	7 (7%)	39 (39%)		
	Higher	2 (2%)	14 (14%)	9 (9%)	25 (25%)		
Total		**12 (12%)**	**68 (68%)**	**20 (20%)**	**100 (100%)**		
Level of Nutritional knowledge	Less good	4 (4%)	13 (13%)	0 (0%)	17 (17%)	0.444	0.000*
	Quite good	8 (8%)	26 (26%)	4 (4%)	38 (38%)		
	Good	0 (0%)	29 (29%)	16 (16%)	45 (45%)		
Total		**12 (12%)**	**68 (68%)**	**20 (20%)**	**100 (100%)**		
Emotional intelligence level	Low	5 (5%)	8 (%)	0 (0%)	13 (13%)	0.423	0.000*
	Medium	7 (7%)	52 (52%)	12 (12%)	71 (71%)		
	Higher	0 (0%)	8 (8%)	8 (8%)	16 (16%)		
Total		**12 (12%)**	**68 (68%)**	**20 (20%)**	**100 (100%)**		

*denotes significant by p<0.05

DISCUSSIONS

Education is an effort to develop personality and abilities inside and outside of school and lasts a lifetime. The output of formal education is expected to have a positive attitude manifested in the form of skilled behavior, the ability to distinguish between what is good and what is bad, what is wrong and what is right, make the right decisions, and develop self-potential to improve personal quality [17]. The Rank Spearman correlation test showed no significant relationship between the patient's formal education and dietary adherence, as indicated by the *p*-value of 0.114 > 0.05. The results of this test are not in line with many theories related to formal education. Education level is a potential determinant of dietary adherence in T2DM patients. T2DM patients with a higher education level have a higher likelihood of better dietary adherence behavior. Higher education is related to knowledge and awareness of healthy eating habits. Someone with a higher level of education can make better judgments and decisions about choosing a healthy diet and eating behavior [18]. In line with this theory, research regarding the factors that influence diet adherence in T2DM patients at the Kedungmundu Public Health Center in Semarang City shows that there is a relationship between education level and adherence to diet in T2DM patients as evidenced by the results of the chi-square test obtained $p = 0.046$ [19]. However, several studies also showed results consistent with this study, which showed no significant relationship between education level and patient dietary adherence [20,21,22]. Formal education may shape a person's health behavior, but other factors besides the level of education also play a role in patient dietary adherence. Receiving and applying information or knowledge is not only facilitated by a high level of formal education but through non-formal education with various sources, such as electronic media and mass media can also contribute. Mainstream platforms such as social media have also been designed to make all information accessible to all users. In addition, knowledge related to the diet through health workers, colleagues, family, or trusted people around the patient can also make it easier for patients to accept it and apply it in their daily lives [23].

Nutritional knowledge enables T2DM patients to make food choices that optimize their metabolic system management and quality of life. The Spearman's Rank correlation test found a significant relationship between the patient's nutritional knowledge level and dietary adherence, as indicated by the *p*-value. 0.000 < 0.05. The strength level of relationship between nutritional knowledge and dietary adherence is quite strong, as evidenced by a correlation value of 0.444. The relationship between the two variables is positively linear, as evidenced by the positive correlation value, which means the more nutritional knowledge the patients have, the higher their dietary adherence will also increase. The results of this study are in line with many theories about nutritional knowledge. According to Olatona et al. (2019), knowledge of the various food groups, sources, and effects of each food on blood glucose levels is vital. This will enable T2DM patients to choose their foods properly, reduce certain foods or even avoid them completely to manage their blood sugar levels properly [24]. The results of this study are in accordance with the results of research conducted by Setyaningrum et al. (2019) and Nketia and Adobasom-Anane (2022) [25,26]. With good knowledge or understanding related to nutrition for diabetes mellitus patients, patients better understand the urgency and consequences of implementing a diet so that patients will tend to stick to their diet compared to patients who have low nutritional knowledge.

The results of the Spearman Rank correlation test showed a significant relationship between the patient's emotional intelligence level and dietary adherence, as indicated by the *p*-value 0.000 < 0.05. The strength level of the relationship between emotional intelligence and patient dietary adherence is quite strong, as evidenced by a correlation value of 0.423. The relationship between the two variables is positively linear, as shown by the positive correlation value, which means the more emotional intelligence the patient possesses, the higher his dietary adherence will also increase. This study's results align with many theories about emotional intelligence. Individuals with high emotional intelligence tend to have developed self-awareness, including awareness of behaviors that support health. In short, emotional intelligence is a potential precursor to health awareness, which ultimately relates to individuals' actions to improve their health, so emotional intelligence and health behaviors are linked [27]. Emotional intelligence has a role in the health outcomes of someone with a chronic illness that requires long-term adherence to treatment plans, restrictions, and follow-up, for example, in diabetes patients. T2DM patients require long-term adherence to a strict treatment schedule and lifestyle, including dietary adjustments. Individuals with lower emotional intelligence tend to find it more challenging to deal with frustration and discomfort, so they tend to be less likely to comply with treatment schedules and plans and therefore are at higher risk of experiencing long-term complications [28]. The results of this study are in accordance with the results of a study conducted by Sulistiani, which showed a significant relationship between emotional intelligence and dietary adherence in T2DM patients in the working area of the Tegalrejo Health Center [29].

The limitations of this study are that only three individual characters were observed. That means other individual characteristics may be related to T2DM patients' dietary adherence.

CONCLUSIONS

There was no relationship between formal education and dietary adherence in T2DM patients. In contrast, nutritional knowledge and emotional intelligence have a moderately significant and positive linear relationship with dietary adherence in T2DM patients.

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