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Structural Model for Explaining Quality of Life Based on Early Maladaptive Schemas and the Role of Treatment Adherence and Coping Strategies in Patients with Type 2 Diabetes

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A B S T R A C T

Objective: The objective of the present research was to explain the structural model for quality of life based on early maladaptive schemas and the role of treatment adherence and coping strategies in patients with type 2 diabetes.

Methods and Materials: This study, in terms of research methodology, falls into the category of descriptive-correlational research using structural equation modeling. The research population consisted of all patients with type 2 diabetes in Tehran who visited medical centers during the year 2021. The sample of the current study included 350 patients with type 2 diabetes in Tehran in 2021, selected through convenience sampling based on inclusion and exclusion criteria of the study. Data were collected using the short form of the World Health Organization Quality of Life Questionnaire, Young's Early Maladaptive Schemas Short Form Questionnaire, Treatment Adherence Questionnaire, and Young's Avoidance Coping Strategies Questionnaire. Data were analyzed using Structural Equation Modeling (SEM) and Pearson correlation statistical methods, employing SPSS 22 and AMOS 22 software.

Findings: The results showed that the fit indices PCFI=0.655, PNFI=0.661, CMIN/DF=2.90, RMSEA=0.089, IFI=0.917, CFI=0.914, and GFI=0.903 indicate a good fit of the proposed model with the data. The highest coefficient (-0.47) was attributed to the path from autonomy and impaired performance to quality of life. The coefficient of determination for the quality variable of marital relationship in the proposed structural model is 0.889, indicating that the external variables can predict 89 percent of the variance in quality of life, which is considered strong.

Conclusion: Therefore, it can be concluded that the structural model for explaining quality of life based on early maladaptive schemas and the role of treatment adherence and coping strategies in patients with type 2 diabetes fits appropriately.

Keywords: *Quality of Life, Early Maladaptive Schemas, Treatment Adherence, Coping Strategies, Diabetes.*

1. Introduction

Diabetes has numerous negative psychological consequences, and one of the psychological attributes that diminishes as a result of the disease is the patients' quality of life (Prajapati et al., 2017). Nowadays, examining the quality of life has become an essential part of medical evaluation and health status assessment. Quality of life is a multidimensional concept that encompasses aspects such as physical health, mental health, economic conditions, personal beliefs, and interaction with the environment. Some studies have shown that diseases like diabetes significantly impact patients' quality of life as an independent factor (Prajapati et al., 2017; Thiel et al., 2017). The concept of quality of life is of significant importance among patients with type 2 diabetes and is considered a multidimensional concept that includes physical, psychological, social functioning, and well-being. The occurrence of chronic diabetes complications, reduced life expectancy, and mortality impose a substantial economic burden on the patient and their family, potentially leading to a decrease in quality of life (Jalali et al., 2023; Reddy et al., 2020).

Schemas are the deepest cognitive structures (Young, 2014). Schema is one of the strongest mechanisms and concepts used in the cognitive domain, introduced to cognitive sciences at the research and clinical level since Bartlett, Piaget, and later Beck and Nasir (Bach et al., 2018; Borges & Dell'Aglio, 2020). Young (1994) suggests a subset of schemas called early maladaptive schemas. In the schema-focused approach, instead of focusing on automatic thoughts and underlying assumptions, the main emphasis is on the deepest level of cognition, namely early maladaptive schemas. Generally, early maladaptive schemas are self-damaging emotional and cognitive patterns formed early in development and expand throughout a person's life with a degree of dysfunction (Bach et al., 2018; Mason et al., 2005; Stiles, 2004).

One of the disease-related behaviors that predict successful treatment and reduce negative complications and disease severity is adherence to the treatment plan (Negesa et al., 2017; Siengsukon et al., 2020). Treatment adherence is the extent of an individual's behavior conforming to health recommendations and medicinal treatments. Treatment adherence behaviors in diabetes include behaviors related to medication regime, dietary recommendations, physical activity, self-monitoring of blood glucose, and foot care (Goudarzi et al., 2022). Non-adherence to treatment in patients with diabetes is associated with frequent hospitalizations and high treatment costs (Negesa et al., 2017; Siengsukon et al., 2020; Tegegne & Zeru, 2022). The mortality rate in patients who do not adhere to their treatments is twice as high as in other patients (Buster & Ozsaker, 2022; Cullen et al., 2021; da Rocha et al., 2020). The rate of not following treatment instructions in patients with diabetes has been reported between 33 to 93 percent (Negesa et al., 2017; Siengsukon et al., 2020). A review of studies in Iran indicates non-adherence to treatment in diabetic patients, resulting in doubling the complications of this disease and increasing treatment costs. Moreover, more than one-third of hospital admissions are due to not following the medication regimen (Tunnell et al., 2019; Zalewski et al., 2021).

Coping strategies are a set of cognitive and behavioral efforts used by an individual to change, interpret, and correct a stressful situation, leading to the reduction of resulting distress. There are two main coping strategies: emotion-focused coping, which includes efforts to regulate the emotional consequences of a stressful event, maintaining emotional and affective balance through the control of emotions arising from the stressful situation, and problem-focused coping, which involves constructive actions by the individual related to the stressful conditions and attempts to eliminate or change the source of stress (Sajadinejad et al., 2012). Evidence suggests that increasing patients' information alone is not sufficient; rather, enhancing patients' abilities to effectively cope with the stresses arising from diabetes in daily life is of special importance since a significant portion of the disease management burden falls on the patients (Alizadeh et al., 2018; Bassi et al., 2021). Gregoria et al. (2018) found in their study that poor metabolic control and low quality of life in diabetic individuals are significantly associated with the greater use of emotion-focused coping methods. Problem-focused coping methods are positively associated with better metabolic control and higher quality of life in diabetic individuals (Akbari et al., 2020; Mojahed et al., 2019).

This research aims to present a structural model for explaining the quality of life based on early maladaptive schemas and the mediating role of treatment adherence and coping strategies in patients with type 2 diabetes, attempting to improve the quality of life in patients with type 2 diabetes and demonstrate how the quality of life in these individuals is explained based on early maladaptive schemas and the mediating role of treatment adherence and coping strategies.

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2. Methods and Materials

2.1. Study Design and Participants

This study, in terms of its research methodology, is classified as descriptive-correlational research employing structural equation modeling. The population of the study comprised all patients with type 2 diabetes in Tehran who visited medical centers during the year 2021. The sample for this study included 350 individuals with type 2 diabetes in Tehran in 2021, selected via convenience sampling based on inclusion and exclusion criteria. According to Klein, if structural equation modeling is used, approximately 15 samples per manifest variable are needed. Furthermore, a minimum sample size of 200 is defensible (Kline, 2023). In this study, 20 manifest variables were examined, and according to Kline's theoretical basis for sample selection, 15 samples per component were considered, necessitating 300 subjects. However, to account for potential attrition and to achieve more reliable results, the sample size was increased to 350 individuals. The criterion for selecting participants in this study was the diagnosis of type 2 diabetes by a specialist. Inclusion criteria included: diagnosis of type 2 diabetes by a doctor, age range between 30 to 50 years, A1C value less than 9, a history of diabetes for at least one year, education level from high school diploma to master's degree, and the absence of chronic diseases and mental disorders as confirmed by a psychologist. Non-response to all questionnaire items and non-cooperation were considered as exclusion criteria.

In the current study, negotiations were first held with medical centers in Tehran, and after obtaining consent from the center authorities and the researcher signing an ethical agreement, the sample group members were selected. Participants were then briefed on the general process, and if they agreed to participate in the research, after providing some basic information about the study, the research questionnaires were given to them to complete. The ethical considerations of the research were as follows: 1- All individuals received written information about the research and participated in the study if they wished. 2- Participants were assured that all information is confidential and will be used for research purposes only. 3- To respect privacy, participants' names and surnames were not recorded. In this research, descriptive statistics such as mean and standard deviation were used to organize, summarize, and describe the characteristics of subjects and research variables.

2.2. Measures

2.2.1. Quality of Life

WHO-QOL-BREF Short Form Quality of Life Questionnaire consists of 26 items assessing four domains of individuals' quality of life including physical health, psychological health, social relationships, and environmental aspects (World Health Organization, 1996). Regarding the scale's reliability, the alpha Cronbach's coefficient reported by the developers ranged from .73 to .89 for the four subscales and the overall scale. In Iran, Nasiri and Rezvani translated this scale into Persian and reported its validity and reliability. The Cronbach's alpha coefficient of .84 indicates satisfactory internal consistency (Bagheri Sheykhangafshe et al., 2021). In this research, the reliability of this questionnaire was reported with Cronbach's alpha between .72 and .85 for the four subscales and the overall scale.

2.2.2. Avoidance Coping Strategies

It is a 40-item survey designed to assess avoidance coping strategies. Each question is scored from 1 to 6. Avoidance strategies assessed by this questionnaire include: not thinking about unpleasant issues, substance abuse, denial of discomfort, excessive control and rationality, suppression of anger, psychosomatic symptoms, isolation and avoidance of people, denial of memories, avoidance through sleeping/lack of energy, distraction through engaging in various activities, self-soothing (eating, shopping, etc.), passive restraint of unpleasant emotions, passive distraction, daydreaming, and avoidance of unpleasant situations. Higher scores indicate the predominant avoidance strategy of the patient. The questionnaire scale is based on Likert. The validity of the Young Avoidance Questionnaire in the research by Zargar et al. (2011) was reported as satisfactory by university professors (Rahmani et al., 2019). The reliability of this questionnaire in this study was reported with Cronbach's alpha as .77.

2.2.3. Early Maladaptive Schemas

Young's Early Maladaptive Schemas Short Form Questionnaire contains 75 items from the original 205 items created by Young in 1998 to measure early maladaptive schemas. This questionnaire uses a Likert scale from 1 to 6. In the first comprehensive study, Young, Klosko, and Weishaar (1986) obtained an alpha coefficient ranging from .83 to .96 for each early maladaptive schema and a test-retest

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reliability in a non-clinical population between .53 and .82. The standardization of this questionnaire in Iran was done by Ahi, Mohammadifar, and Besharat (2007) in universities of Tehran, obtaining an internal consistency using Cronbach's alpha of .97 for women and .98 for men (Ammari et al., 2023). In this research, the reliability of this questionnaire was reported with Cronbach's alpha between .76 and .82.

2.2.4. Treatment Adherence

In this study, the Treatment Adherence Questionnaire for diabetic patients created by Hernandez in 1997 was used. This questionnaire includes 13 items about adherence to the treatment plan for patients with diabetes. Items are scored on a 5-point Likert scale. The test has 65 points, and its content validity was confirmed and its reliability calculated with Cronbach's alpha as .78 (Jahan & Nematolahi, 2021). The reliability of this questionnaire in this study was reported with Cronbach's alpha as .78.

2.3. Data analysis

In the inferential statistics section, structural equation modeling and Pearson correlation statistical methods were used to analyze the data, employing SPSS 22 and AMOS 22 software.

3. Findings and Results

In this study, 250 men and women with diabetes, with an average age of 42.08 years and a standard deviation of 5.25, within the age range of 35-50 years, were examined. The results show that in terms of gender, 149 individuals (59.6%) were female and 101 individuals (40.4%) were male; in terms of education level, 119 individuals (47.6%) had high school and associate degrees, 49 individuals (32.8%) had a bachelor's degree, and 49 individuals (19.6%) had higher education levels; in terms of employment status, 55 individuals (22.0%) were employees, 116 individuals (46.4%) were self-employed, and 79 individuals (31.6%) were homemakers. Table 1 reports descriptive information (mean, standard deviation, skewness, and kurtosis) for the research variables.

Table 1

Descriptive Indices (Mean and Standard Deviation) of Research Variables (n=300)

Variable	Mean	Standard Deviation	Range	Skewness	Kurtosis
Quality of Life	69.10	16.02	130-26	0.143	0.411
Treatment Adherence	28.84	11.97	65-1	0.173	0.370
Coping Strategies	145.72	42.79	240-40	-0.160	-0.478
Disconnection and Rejection Domain	86.44	26.58	150-25	0.016	-0.060
Impaired Autonomy and Performance Domain	67.75	16.79	120-20	0.016	-0.060
Impaired Limits Domain	35.83	9.77	60-10	-0.073	-0.390
Other-Directedness Domain	47.18	10.08	58-13	0.153	-0.666
Overvigilance and Inhibition Domain	34.57	7.79	59-10	0.020	1.101

Based on the contents of Table 1, considering that the skewness and kurtosis for all the research variables fell between -2 and 2, it can be concluded that the data are normally distributed.

Table 2

Correlation Matrix between Predictor, Mediator, and Dependent Variables of the Proposed Research Model

Research Variables	1	2	3	4	5	6	7	8
Quality of Life	1							
Treatment Adherence	0.34*	1						
Coping Strategies	0.58*	0.20*	1					
Disconnection and Rejection Domain	-0.80*	-0.43*	-0.54*	1				
Impaired Autonomy and Performance Domain	-0.34*	-0.24*	-0.35*	-0.43*	1			
Impaired Limits Domain	-0.71*	-0.28*	-0.82*	-0.67*	-0.48*	1		
Other-Directedness Domain	-0.67*	-0.33*	-0.36*	-0.73*	-0.21*	-0.41*	1	
Overvigilance and Inhibition Domain	-0.67*	-0.20*	-0.60*	-0.47*	-0.37*	-0.73*	-0.37*	1

*p<0.01

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Table 2 shows the Pearson correlation information between the research variables.

Fit indices PCFI=0.655, PNFI=0.661, CMIN/DF=2.90, RMSEA=0.089, IFI=0.917, CFI=0.914, and GFI=0.903 indicate a good fit of the proposed model with the data. Therefore, the proposed model enjoys satisfactory fitting.

The results showed that the highest coefficient (-0.47) was assigned to the path from autonomy and impaired functioning to quality of life, and the lowest coefficient (-0.11) belonged to the path from other-directedness to treatment adherence. The R^2 index indicates the variance explained by the latent variables within. Cohen (1992) describes R^2 values of 0.26, 0.13, and 0.02 in structural equations as strong, medium, and weak, respectively. The coefficient of determination for the quality variable of marital relationships in the proposed structural model is 0.889, indicating that external variables can predict 89% of the variance in quality of life, which is considered strong. The results from the direct relationships of the research variables in the proposed model show that all path coefficients were statistically significant in the entire sample. In Table 3, the standardized coefficients for all paths are stated.

Table 3

Standardized Path Coefficients of the Proposed Model with Mediator

Path from/to	Standardized Coefficients	Standard Error	Critical Ratio	p
Treatment Adherence to Quality of Life	0.246	0.122	3.511	0.002
Coping Strategies to Quality of Life	-0.332	0.179	-3.116	0.002
Disconnection and Rejection to Quality of Life	-0.389	0.087	-2.096	0.003
Impaired Autonomy and Performance to Quality of Life	-0.370	0.032	-2.398	0.009
Impaired Limits to Quality of Life	-0.404	0.080	-2.254	0.005
Other-Directedness to Quality of Life	-0.287	0.161	-3.587	0.006
Overvigilance and Inhibition to Quality of Life	-0.311	0.201	-2.664	0.002
Disconnection and Rejection to Treatment Adherence	-0.280	0.087	-2.088	0.002
Impaired Autonomy and Performance to Treatment Adherence	-0.471	0.032	-2.877	0.009
Impaired Limits to Treatment Adherence	-0.419	0.080	-2.102	0.007
Other-Directedness to Treatment Adherence	-0.112	0.161	-3.522	0.006
Overvigilance and Inhibition to Treatment Adherence	-0.249	0.201	-3.326	0.008
Disconnection and Rejection to Coping Strategy	0.232	0.113	2.172	0.003
Impaired Autonomy and Performance to Coping Strategy	0.201	0.020	2.264	0.001
Impaired Limits to Coping Strategy	0.264	0.072	2.521	0.005
Other-Directedness to Coping Strategy	0.241	0.213	3.002	0.004
Overvigilance and Inhibition to Coping Strategy	0.178	0.199	2.423	0.002

To investigate the questions related to the direct relationships between variables, using the standardized path coefficients in the final model of the research, the findings of the direct hypotheses (paths) are first examined. The direct effect of treatment adherence on quality of life is 0.246, meaning that treatment adherence explains 25% of the variance in the quality of life variable. The direct effect of coping strategies on quality of life is -0.332, meaning that coping strategies explain 33% of the variance in the quality of life variable. The direct effect of the domain of disconnection and rejection on treatment adherence is -0.280, meaning that the domain of disconnection and rejection explains 28% of the variance in the treatment adherence variable. The direct effect of the domain of impaired autonomy and performance on treatment adherence is -0.471, indicating that impaired autonomy and performance domain explains 47% of the variance in the treatment adherence variable. The direct effect of the domain of impaired limits on treatment adherence is -0.419, indicating that the impaired limits domain explains 42% of the variance in the treatment adherence variable. The direct effect of the other-directedness domain on treatment adherence is -0.112, indicating that the other-directedness domain explains 11% of the variance in the treatment adherence variable. The direct effect of vigilance on treatment adherence is -0.249, indicating that the vigilance domain explains 25% of the variance in the treatment adherence variable. The direct effect of the domain of disconnection and rejection on coping strategies is 0.232, meaning that the disconnection and rejection domain explains 23% of the variance in the coping strategies variable. The direct effect of the impaired autonomy and performance domain on coping strategies is 0.201, indicating that the impaired autonomy and performance

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domain explains 20% of the variance in the coping strategies variable. The direct effect of the impaired limits domain on coping strategies is 0.264, indicating that the impaired limits domain explains 26% of the variance in the coping strategies variable. The direct effect of the other-directedness domain on coping strategies is 0.241, indicating that the other-directedness domain explains 24% of the variance in the coping strategies variable. The direct effect of vigilance on coping strategies is 0.178, indicating that the vigilance domain explains 18% of the variance in the coping strategies variable.

4. Discussion and Conclusion

The aim of the present research was to explain the structural model for quality of life based on early maladaptive schemas and the mediating role of self-care in patients with type 2 diabetes. The results from the direct relationships of the research variables in the proposed model show that all path coefficients were statistically significant in the entire sample. The findings of this research are in line with previous studies (Abbasi et al., 2020; Ahmadi et al., 2020; Ashian, 2015; Coffman et al., 2022; da Rocha et al., 2020; Dickhaut & Arntz, 2014; Giesen-Bloo et al., 2006; Jahan & Nematolahi, 2021; Li et al., 2021; Moghadari Koosha et al., 2022; Mohammad Nezhady & Rabiei, 2015; Ostadzadeh et al., 2017; Riegel & Dickson, 2008; Roelofs et al., 2016; Saadati et al., 2017; Siengsukon et al., 2020; Tan et al., 2024; Thomas et al., 2021).

In explaining this finding, it can be said that chronic diseases, including diabetes, have a complex origin, a gradual onset, and unpredictable deterioration and improvement, which, due to their prolonged course, demand patient participation in self-care (da Rocha et al., 2020). This disease is associated with numerous short-term and long-term complications, many of which are irreversible. The pathogenesis and mortality from these complications are among the most significant health issues globally, which is why there is now a special focus on investing in diabetes control (Jalali et al., 2023; Reddy et al., 2020). Maintaining blood sugar levels is the basis of diabetes care and reduces the occurrence of diabetes complications. The International Diabetes Federation recommends that patients employ self-care measures and adhere to treatment to control blood sugar optimally. These measures include following a healthy diet, regular medication intake, regular physical activity, and blood sugar monitoring. Therefore, educating such patients about self-care to reduce problems arising from the disease seems essential, and if a patient does not want or is unable to control their condition, they cannot be helped (da Rocha et al., 2020; Moghadari Koosha et al., 2022; Riegel & Dickson, 2008). Self-care in diabetes is one of the most critical factors in controlling the disease. The capability and power of acceptance of the situation are personality factors that affect patients' conditions and enhance their ability to deal with problems, including diseases. According to the studies conducted, the most significant factor leading to the mortality of diabetic patients is the lack of self-care (Akbari et al., 2020; da Rocha et al., 2020; Jalali et al., 2023). On the other hand, these individuals' assessment of their ability to cope with stress is low. Therefore, when faced with a disease like diabetes, instead of focusing on effective behaviors for disease control and preventing complications, such as following the medical advice regarding self-care behaviors and lifestyle changes, they focus on the symptoms of the disease and its negative consequences, engaging in a kind of mental preoccupation that can lead to a decrease in the quality of life among these patients through increased stress and anxiety, reduced physical activity levels, and increased risk behaviors such as overeating, alcohol, and smoking to divert attention from disease symptoms and negative consequences, as well as avoiding social relationships.

Patients with diabetes who employ problem-focused coping strategies typically take responsibility for problem-solving when faced with a stressful situation, seek accurate information about the problem, seek help from others if necessary, and have an optimistic view of performing tasks and solving problems, thereby experiencing lower stress levels from diabetes (Alizadeh et al., 2018; Sajadinejad et al., 2012). Therefore, choosing a problem-focused coping style in response to disease-induced stress can reduce the impact of psychological stress on the mental health of patients with diabetes and lead to decreased disease stress in these patients. Patients with diabetes who use a problem-focused strategy deal with the disease realistically and logically. These individuals make more use of past experiences, are more realistic, and seek information and consultation with others to solve their problem, which helps them adapt to the disease (Akbari et al., 2020; Bassi et al., 2021). Furthermore, according to studies in this area, individuals who use a problem-focused coping strategy think more about positive aspects and points than negative and dark ones, which likely greatly helps them strengthen their adaptive spirit and reduce stress from diabetes.

It can also be said that the activation of early maladaptive schemas (through facing restrictions and stresses from the

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disease) generates a vast amount of negative and unpleasant emotions, and individuals employ maladaptive coping strategies to deal with the turmoil caused by schema activation. Since individuals feel comfortable with their schemas and need cognitive congruence, they fight for the survival and continuation of their schema, one of the mechanisms they use is employing maladaptive coping strategies (Rada et al., 2022). Following the use of maladaptive coping strategies, they experience more psychological disturbances, and their quality of life decreases. Early maladaptive schemas are related to the processes through which individuals assess and cope with stressful and problematic events. In other words, individuals with maladaptive schemas use maladaptive (emotion-focused) coping strategies when facing issues, leading to a lower quality of life.

5. Limitations & Suggestions

The results of the present study are limited to all patients with diabetes in Tehran and may not be generalizable to diabetic patients in other regions. The lack of sufficient research in this area in our country posed a challenge to this study. The complexity and abundance of the research variables' dimensions and consequently the large number of questionnaire items caused fatigue and frustration among some participants in responding to them. The cross-sectional and non-experimental nature of this study is one of the research limitations that limits the ability to draw causal conclusions. Another limitation of the current study is the self-reported nature of the used instruments. Considering the role of negative life stressors in future studies is suggested due to understanding the various pathways leading to quality of life within the framework of the stress-vulnerability model. It is recommended that qualitative research in this area be conducted. Given that health literacy is the product of literacy, education, experience, and learning, health education through media and the internet is suggested. The media, as the most popular communication tool, play a significant role in promoting healthy lifestyles and changing behavioral patterns by offering health promotion programs and teaching self-care behaviors and treatment adherence. Considering the findings of the present study, understanding health concepts in improving self-care, treatment adherence, and coping strategies in patients with type 2 diabetes is of high importance, and it is suggested that the World Health Organization provide readable, smooth, and health-related educational resources to the public and use health information to create an environment for controlling public health, especially for diabetic patients, to empower individuals in health and treatment matters. In line with the present research, it is also suggested that educational organizations and agencies create conditions for improving self-care, treatment adherence, and coping strategies in patients with type 2 diabetes and plan accordingly and receive financial support to enhance public culture regarding health literacy and provide health information to the general public to strengthen individuals for decision-making and maintaining health.

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Declaration of Interest

The authors of this article declared no conflict of interest.

Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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Authors' Contributions

All authors contributed equally.

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