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Optimisation of the role of families of chronic hypertension patients based on the mcmaster model of family functioning in self-care agency

Jujuk Proboningsih[1]*, Sriyono Sriyono[2], Rini Ambarwati[1], Sri Hardi Wuryaningsih[1], and Anita Joeliantina[1]*

[1] Nursing Departement, Poltekkes Kemenkes Surabaya, Surabaya, Indonesia

[2] Faculty of Nursing, Universitas Airlangga, Surabaya, Indonesia

*Correspondence: Jujuk Proboningsih. Address: Nursing Departement, Poltekkes Kemenkes, Surabaya, Indonesia. Email: jujuk@poltekkesdepkes-sby.ac.id

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ABSTRACT

Introduction: Hypertension, often symptomless, poses a deadly risk if poorly managed, especially when family support in helping patients adhere to treatment and maintain a healthy lifestyle is insufficient. This study aims to analyse the impact of the McMaster Model of Family Functioning (MMFF) on the self-care agency of patients with chronic hypertension in Surabaya.

Methods: This study employs an analytical observational design with a cross-sectional approach, involving 300 respondents from families of patients with hypertension who meet the inclusion criteria. The independent variables examined include the six dimensions of the McMaster Model of Family Functioning (MMFF): problem-solving, communication, family roles, affective responsiveness, affective involvement, and behaviour control. Meanwhile, the dependent variable is self-care agency, which consists of medication, physical activity, and diet. Hypothesis testing was conducted using SEM-PLS, which was processed with SmartPLS 4.0.4 software.

Results: The analysis results indicate that the MMFF has a positive and significant effect on self-care agency, with a coefficient of 0.340 (CI = 0.247 – 0.445). The effect size result obtained an effect size value of 0.131. Structured and adaptive family support, particularly in communication and affective involvement, has enhanced patients' motivation to adhere to medication and engage in self-care activities.

Conclusions: This study expands on previous research on the role of family support in self-care agencies, by involving the McMaster Family Function Model (MMFF) to analyse the specific role of family functions in improving self-care agencies in chronic hypertension patients, thus providing a more comprehensive, contextual, and relevant perspective for family-based interventions. These results also enrich other theoretical studies, namely the Family-Centred Care (FCC) Model, Social Support Theory, and Health Belief Model (HBM).

Keywords: McMaster model of family functioning, self-care agency, chronic hypertension, family

Introduction

Hypertension is a chronic disease that poses a significant risk factor for cardiovascular conditions, including heart disease and stroke (Ademe, Aga, and Gela, 2019; Suprayitno and Damayanti, 2020). It is often referred to as a "silent killer" due to its asymptomatic nature until serious complications arise (Kalehoff and Oparil, 2020). The prevalence of hypertension is rising globally, including in Indonesia, where the WHO estimates that cases will reach 1.5 billion by 2025 (WHO, 2021; Marbun and Hutapea, 2022). Risk factors include age, gender, smoking, and high salt intake (Choi *et al.*, 2023). Low awareness further exacerbates its management, with 46% of adults unaware of their condition and an estimated 25% of cases in Indonesia undiagnosed (WHO, 2021; Kassie *et al.*, 2023). Control efforts emphasise a healthy lifestyle and effective treatment (Alsaqer and Bebis, 2022), where family support is crucial in aiding patient self-management to

ensure adherence to sustainable treatment and lifestyle changes (Lambrinou, Hansen and Beulens, 2019; Trivedi and Asch, 2019). By providing emotional, instructional, and material support, families can effectively aid in patient self-management (Kassie *et al.*, 2023), such as by helping patients remember their medication schedules, preparing healthy meals, or accompanying them during exercise, all of which strengthen motivation for therapy (Kassie *et al.*, 2023). Research indicates that family support is crucial in improving adherence to medical therapy and blood pressure control. A supportive home environment fosters patient commitment to treatment and reduces stress (Gunn and Eberhardt, 2019; Psihogios *et al.*, 2019). Close family relationships provide essential social support, enhancing patients' ability to cope with the mental burden of hypertension (Gawulayo, Erasmus and Rhoda, 2021). This support promotes a sense of security and motivation, encouraging healthier lifestyle choices such as adherence to a low-salt diet and regular exercise (Ding *et al.*, 2018; Chacko and Jeemon, 2020) Family adaptability and effective communication also contribute to successful hypertension management by creating a positive environment and reinforcing patient motivation (Zhang, 2018; Trivedi and Asch, 2019). A well-functioning family also provides emotional support, helping patients reduce stress and maintain overall well-being (Epstein, Baldwin and Bishop, 1983; Depaul, 2006; Tan *et al.*, 2021).

The McMaster Family Functioning Model (MMFF) offers a structured framework for examining the family's role in supporting individuals with hypertension, particularly in enhancing their self-care agency and ability to manage this chronic condition independently. MMFF's six core dimensions—problem-solving, communication, roles, affective responsiveness, affective involvement, and behavioural control—help families understand how to function as a comprehensive support system for the patient effectively (Jozefiak *et al.*, 2019; M. Zhang *et al.*, 2021; Hwang *et al.*, 2023; Suglia *et al.*, 2023). Each dimension is crucial in managing hypertension, fostering open and effective communication for sharing health-related information, and clarifying family roles in supporting treatment routines and a healthy lifestyle (B. Zhang *et al.*, 2021). Self-care agency, which includes managing routines such as a nutritious diet, medication adherence, and physical activity (Ademe, Aga, and Gela, 2019; O'Regan et al., 2019; Du et al., 2022), is significantly influenced by family support aligned with MMFF dimensions (Vargas-Escobar *et al.*, 2022). Self-care agency is a motivational capacity, which is the ability of an individual to independently make decisions and take responsibility for their care. This is in line with the concept that family functions can influence patients' motivation to carry out hypertension treatment consistently. Research indicates that patients with hypertension receiving support based on MMFF are more successful in adhering to treatment and maintaining a healthy lifestyle, thus reducing complications like stroke and heart disease (Vargas-Escobar *et al.*, 2022). Affective responsiveness and involvement within MMFF emphasise stable emotional support, where families demonstrate concern for the patient's health, thereby helping to reduce patient stress and anxiety (Zhang *et al.*, 2020). Additionally, structured role division and behavioural control enable each family member to contribute meaningfully by reminding patients to take their medication or providing healthy meals, thereby enhancing the patient's consistency in self-care (Epstein, Baldwin, and Bishop, 1983).

Previous research has not specifically examined the relationship between the McMaster Model of Family Functioning (MMFF) and self-care agency in patients with chronic hypertension. Existing studies highlight family support in general towards self-care agencies (Vargas-Escobar *et al.*, 2022) or focus on medical adherence and long-term quality of life without directly linking them to self-care agencies (Jozefiak *et al.*, 2019; Du *et al.*, 2022; Suglia *et al.*, 2023). Additionally, no studies have examined how each dimension of MMFF, such as communication and affective engagement, contributes to the self-care agency of hypertensive patients. Furthermore, many previous studies have been conducted abroad, so it is not known how the application of MMFF can be adapted to the social and cultural context of patients in Indonesia.

The study's novelty, "The Role of Family Based on the McMaster Model of Family Functioning in Self-Care Agency of Chronic Hypertension Patients," lies in several key aspects underexplored in previous research. Firstly, applying the McMaster Model of Family Functioning in the context of patients with chronic hypertension offers a fresh perspective. While this model is typically used in general family health studies, it has rarely been explicitly applied to chronic hypertension, a condition requiring long-term management and consistent self-care. This study connects the six dimensions of the McMaster Model—problem-solving, communication, roles, affective responsiveness, affective involvement, and behavioural control—with patients' self-care agency in managing their hypertension. This approach provides new insights into how family dynamics affect the effectiveness of blood pressure management. Secondly, the study introduces self-care agency as a primary focus, highlighting an individual's ability to manage health independently. In the context of chronic hypertension, self-care agency is crucial, as patients must monitor blood pressure, follow recommended diets, and adhere to treatment. This research investigates how the McMaster-based family role enhances this ability, making a significant contribution to the literature on the family's role in chronic illness. Thirdly, the study emphasises a family-centred approach to managing chronic disease,

traditionally focusing on individual interventions. This study may pave the way for more effective prevention and management strategies by examining the structured role of family in supporting patients with chronic hypertension. Through this model, the research offers more profound insights into how optimal family support can enhance patients' independent self-care, reducing the risk of complications. By integrating various dimensions of family functioning within the McMaster Model, this study offers a comprehensive approach to examining how family roles influence patients' self-care agency. Additionally, the study contributes to hypertension management by introducing family-based interventions as a crucial tool in fostering patient independence. Thus, this research makes an original and significant contribution to family health and the management of chronic hypertension.

Materials and Methods

Design

This research is an analytical cross-sectional observational research. Cross-sectional studies have limitations in determining causality, cannot observe changes over time, are susceptible to selection bias and respondents, and may not identify latent factors that affect the relationship between variables. This observational analytical research will observe the research subjects and will not manipulate or treat the subjects to be studied. Observational or explanatory research explains the causal relationship between research variables and the testing of hypotheses. Observations were made on the lives of hypertensive patients, focusing on adherence to diet, medication, and physical activity. Based on the time of data collection, this study uses a cross-sectional approach, namely observing the McMaster Model of Family Functioning and Self-Care Agency simultaneously.

The independent variable is the McMaster Model of Family Functioning, which includes problem-solving, communication, family roles, affective response, affective involvement, and behaviour control. It is most commonly practised by hypertension patients in Surabaya. Meanwhile, the dependent variable is Self-Care Agency, which includes medication, physical activity, and diet. This study aims to analyse the influence of the McMaster Model of Family Functioning on Self-Care Agency.

Sample and Sampling Methods

The population in this study consists of families caring for hypertensive patients in Surabaya who visit the Health Centre. The limitation of the research, which was only conducted in Surabaya, was that the results could not be generalised to other regions due to demographic, social, economic, and cultural differences that could affect the variables studied. The selection of this family is based on the opinion of Psihogios et al. (2019) that the assessment of family functions can be carried out at the level of the family unit. The sample in this study is part of the families that treat hypertension patients in Surabaya who visit the Health Centre. For hypertension patients themselves, the criteria are as follows: ≥ age 35 years, suffering from hypertension for >1 year, having no comorbidities, and willing to be a respondent by signing a consent form. The number of respondents for family members who treat hypertension patients is 300 people in the city of Surabaya, using a purposive sampling technique. The purposive sampling method allows the study results to experience selection bias because the sample is selected based on specific criteria, so it is less representative of the population as a whole and reduces the generalization of findings.

Instruments

Data were collected using a questionnaire. The measurement instruments for the McMaster Model of Family Functioning and Self-Care Agency were adapted from several studies, including Chobanian (2003), Pescatello *et al.* (2004), and Adinkrah *et al.* (2020). The measurement scale in this study is a Likert scale ranging from 1 to 4, where scale 1 indicates "never," scale 2 indicates "rarely," scale 3 indicates "often," and scale 4 indicates "always." Before data collection, the validity and reliability of MMFF and self-care agency questionnaires were tested on 30 research respondents. The results showed that the corrected item to total correlation score of MMFF treatment dimension was 0.330 - .793 with Cronbach alpha 0.887. The patient's diet was 0.315 - 0.641, with Cronbach's alpha 0.796. Patient Activity 0.359 - 0.764 with alpha Cronbach 0.794, Problem-Solving 0.674 - 0.822 with alpha Cronbach 0.936, Communication 0.614 - 0.807 with alpha Cronbach 0.897. Family Role 0.487 - 0.801 with Cronbach's alpha 0.895. Affective Engagement 0.660 - 0.840 with Cronbach's alpha 0.893. Behavioural Control 0.685 - 0.886 with Cronbach's alpha 0.922. Cronbach's alpha value of > 0.70 is considered acceptable, > 0.80 is good, and > 0.90 is excellent. (George & Mallery, 2003). In the data processing, the total scores for each variable were then categorised as high (76-100%), medium (56-75%), and low (≤55%) for both the McMaster Model of Family Functioning and Self-Care Agency.

Data Collection

The data collection procedure involved distributing physical questionnaires to the families of patients with hypertension at health centres (Puskesmas). The researchers coordinated with Puskesmas staff to obtain data that met the inclusion criteria. Once the appropriate data was obtained, the questionnaires were handed over to the Puskesmas staff to assist in the distribution process. The questionnaire distribution took place over one month after the questionnaires were provided. Once the questionnaires were completed and the desired

sample size was reached, they were collected from the Puskesmas for further processing.

Data Analysis

This study employs Structural Equation Modelling-Partial Least Squares (SEM-PLS) as the analytical method. SEM-PLS was chosen for its ability to handle models with latent variables and indicators, enabling the exploration of causal relationships between variables while testing the model's reliability and validity. The analysis with SEM-PLS begins with evaluating the outer model to assess convergent validity, discriminant validity, and indicator reliability, ensuring that each indicator accurately reflects its latent variable. Next, the inner model is tested to determine its predictive power in explaining the relationships between latent variables. The final step is hypothesis testing using bootstrapping, which evaluates the significance of the relationships between variables in line with the proposed hypotheses.

Ethical consideration

This study was conducted in accordance with human rights principles and ethical guidelines. Researchers provided prospective respondents with information on the study's purpose, benefits, risks, and their right to withdraw, and offered compensation. Participation was entirely voluntary, and informed consent was obtained before participation. Confirmation has been obtained that this study adhered to ethical procedures in accordance with applicable standards, having received approval from the Health Research Ethics Commission to safeguard the rights and well-being of respondents throughout the study. Ethical approval letter No. EA/2202/KEPK-Poltekkes-sby/V/2024, issued on April 11, 2024, by Poltekkes Surabaya. Respondents who participate in this study will have their information kept confidential. Because respondents fill out questionnaires by self-assessment, it is possible to have response biases, one of which is social conformity bias.

Results

Respondent's Characteristics

This study involved a diverse group of respondents with various demographic characteristics. The demographic characteristics analyzed include age, gender, educational level, marital status, and occupation. This data is essential for understanding the respondents' social background and its influence on the variables being studied.

The gender distribution reveals that the majority of respondents in this study are female, comprising 263 individuals (87.7%), while male respondents account for 37 individuals (12.3%). Most respondents are from the Javanese ethnic group, with a total of 284 individuals (94.7%). Respondents from the Madurese ethnic group numbered only 16 individuals (5.3%). This indicates the dominance of the Javanese ethnic group within the study sample population. In terms of education level, respondents have diverse educational backgrounds. A total of 122 individuals (40.7%) holds a high school education (SMA), making them the largest group in this category. Meanwhile, 80 individuals (26.7%) have completed elementary school (SD), and 69 individuals (23.0%) have a junior high school (SMP) education. Respondents with a university degree (bachelor's or master's) numbered 19 individuals (6.3%), while only four individuals (1.3%) had a diploma. A small number of respondents, six individuals (2.0%), have never attended school. The majority of respondents, totalling 195 individuals (65.0%), are not employed or are housewives (IRT), while 105 respondents (35.0%) reported having a job. In terms of marital status, the majority of respondents are married, with a total of 214 individuals

Table 1. Demographic description of respondents among family members of hypertensive patients in Surabaya who visited the Community Health Centres from May to August 2023 (n = 300)

Demography	Frequency	%
Gender		
Male	37	12.3
Female	263	87.7
Ethnic		
Javanese	284	94.7
Madurese	16	5.3
Education		
No School	6	2.0
Elementary school	80	26.7
Junior high school	69	23.0
High school	122	40.7
Diploma	4	1.3
University (S1/S2)	19	6.3
Occupation		
Unemployed	195	65.0
Employee	105	35.0
Marital Status		
Unmarried	5	1.7
Married	214	71.3
Widow/widower	81	27.0

Table 2. Description of Mc Master Model Family Functioning among family members of hypertensive patients in Surabaya who visited the Community Health Centres from May to August 2023 (n = 300)

Dimension	Frequency	%
Problem-solving		
Poor	58	19.3
Moderate	118	39.3
Good	124	41.3
Communication		
Poor	57	19.0
Moderate	134	44.7
Good	109	36.3
Family Roles		
Poor	76	25.3
Moderate	140	46.7
Good	84	28.0
Affective Response		
Poor	55	18.3
Moderate	114	38.0
Good	131	43.7
Affective Involvement		
Poor	49	16.3
Moderate	94	31.3
Good	157	52.3
Behavior Control		
Poor	51	17.0
Moderate	117	39.0
Good	132	44.0

Table 3. Description of Self-Care Agency Research Variables Among family members of hypertensive patients in Surabaya who visited the Community Health Centres from May to August 2023 (n = 300)

Dimension	Frequency	%
Medication		
Poor	218	72.7
Moderate	64	21.3
Good	18	6.0
Diet		
Poor	200	66.7
Moderate	87	29.0
Good	13	4.3
Physical activity/Exercise		
Poor	47	15.7
Moderate	154	51.3
Good	99	33.0

(71.3%). A total of 81 individuals (27.0%) are widowed, while only five individuals (1.7%) are unmarried.

This study analysed the main variables of the respondents, which included the McMaster Model of Family Functioning and self-care agency with its constituent dimensions. Here are the results of the frequency and percentage descriptions for each dimension of the variable:

The McMaster Model of Family Functioning variable was analysed through six dimensions: problem-solving, communication, family roles, affective response, affective involvement, and behaviour control. The descriptive results for each dimension are as follows. The problem-solving dimension indicates that 124 respondents (41.3%) fall into the 'Good' category, 118 respondents (39.3%) into the 'Moderate' category, and 58 respondents (19.3%) into the 'Poor' category. For the communication dimension, 134 respondents (44.7%) are in the 'Moderate' category, followed by 109 respondents (36.3%) in the 'Good' category, and 57 respondents (19.0%) in the 'Poor' category. In the family roles dimension, the majority of respondents (46.7%, 140 people) are in the 'Moderate' category, followed by 84 respondents (28.0%) in the 'Good' category, and 76 respondents (25.3%) in the 'Poor' category. For the affective response dimension, less than 50% of respondents show a 'Good' affective response, with a total of 131 people (43.7%). A total of 114 respondents (38.0%) fall into the 'Moderate' category, and 55 respondents (18.3%) fall into the 'Poor' category. In the affective involvement dimension, more than 50% are in the 'Good' category, with 157 respondents (52.3%). A total of 94 respondents (31.3%) fall into the 'Moderate' category, while 49 respondents (16.3%) are classified as 'Poor'. For the behaviour control dimension, 132 respondents (44.0%) are in the 'Good' category, 117 respondents (39.0%) are in the 'Moderate' category, and 51 respondents (17.0%) are in the 'Poor' category.

The Self-Care Agency variable in this study was analysed through three main dimensions: medication, diet, and physical activity/exercise. The analysis results show that, in terms of medication, the majority of respondents fall into the 'Poor' category, with a frequency of 218 individuals (72.7%). A total of 64 respondents (21.3%) are in the 'Moderate' category, while only 18 respondents (6.0%) are in the 'Good' category. Regarding the dietary aspect, 200 respondents (66.7%) fall into the 'Poor' category. Respondents in the 'Moderate' category total 87 individuals (29.0%), while those in the 'Good' category number only 13 individuals (4.3%). The physical activity/exercise dimension shows that most respondents fall into the 'Moderate' category, with 154 respondents (51.3%). A total of 99 respondents (33.0%) are categorised as 'Good', and only 47 respondents (15.7%) are classified as 'Poor'.

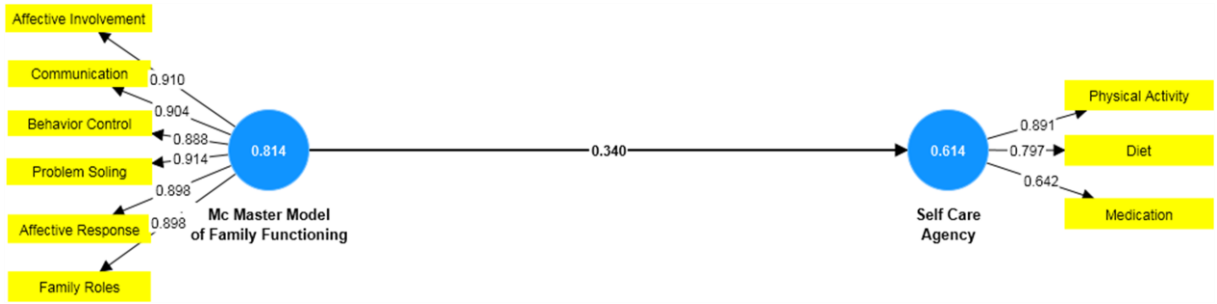

Figure 1. Final Outer Model (Measurement Model)
The Effect of the Mc Master Model of Family Functioning on the Self-Care Agency of Chronic Hypertension Patients

Table 4. Results of Outer Model (Measurement Model) Final Testing

Dimensions / Variables	Convergent Validity	Discriminant Validity		AVE	Composite reliability	R^2	Q^2
Self-care agency				**0.614**	**0.824**		
Physical activity/exercise	0.891	0.370	0.891				
Diet	0.797	0.189	0.797				
Medication	0.642	0.162	0.642				
Family Functioning				**0.814**	**0.963**		
Problem-solving	0.914	0.914	0.370			**0.116**	**0.477**
Family roles	0.898	0.898	0.273				
Affective Involvement	0.910	0.910	0.300				
Communication	0.904	0.904	0.278				
Behavior control	0.888	0.888	0.304				
Affective response	0.898	0.898	0.298				

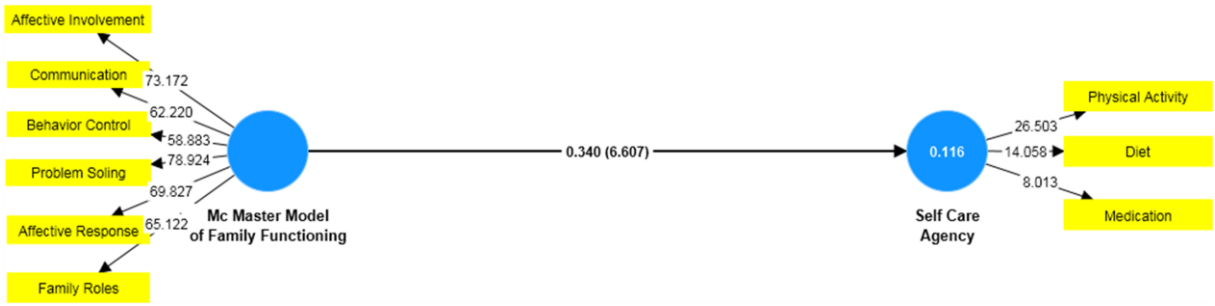

Figure 2. Final Inner Model (Structural Model)
The Effect of the Mc Master Model of Family Functioning on the Self-Care Agency of Chronic Hypertension Patients

Table 5. Coefficient Value, t, p-Value and Goodness of Fit Index Final Structural Model

Relationship Between Variables	Coefficient	t statistics	p-values
Family Functioning ➔ Self Care Agency	0.340	6.682	0.000
SRMR	0.069		
NFI	0.898		

Structural Equation Modelling Partial Least Square Test Results

In this study, Structural Equation Modelling (SEM) analysis, employing the Partial Least Squares (PLS) approach, was used to examine the relationships between latent variables. The analysis process involved two main stages: evaluation of the outer and inner models. The outer model evaluation aims to assess the validity and reliability of the indicators used to measure the latent variables. Several aspects are tested in the outer model evaluation, including:

Convergent validity was assessed by comparing the loading factor values of each indicator with the latent variable. Based on the analysis results, all indicators have loading factor values above 0.7, indicating that each indicator can effectively explain the latent variable. Additionally, the Average Variance Extracted (AVE) values for each latent variable are above 0.5, suggesting that these latent variables possess good convergent validity.

The latent variable self-care agency shows that the physical activity/exercise dimension has the highest loading factor value of 0.891, indicating that this indicator is the strongest in measuring the self-care agency variable. The diet dimension has a loading factor value of 0.797, while the medication dimension has a value of 0.642. Although the medication dimension has a lower loading factor value compared to the other dimensions, its value is still above the acceptable threshold, so it can still be considered convergently valid. Patient adherence to medication is often more challenging than adherence to diet. Patients may encounter obstacles such as medication side effects, forgetting to take their medication regularly, or holding personal beliefs about medication that hinder adherence (Krousel-Wood *et al.*, 2004).

The discriminant validity test shows that each dimension can distinguish the latent variable it measures from other latent variables. For the self-care agency variable, the dimensions of physical activity/exercise, diet, and medication have loading factor values higher than their cross-correlations with the McMaster Model of Family Functioning variable, indicating good discriminant validity. Similarly, the McMaster Model of Family Functioning variables' dimensions of affective involvement, communication, behaviour control, problem-solving, family roles, and affective response also show higher loading factor values than their cross-correlations with the self-care agency, demonstrating good discriminant validity.

The analysis results show that the variable has an AVE value of 0.814. This value is well above the threshold of 0.5, indicating that this construct has excellent convergent validity. With this AVE value, it can be concluded that most of the variance explained by the indicators within this construct is accounted for by the latent variable, meaning that the indicators effectively measure the intended construct. The Self-Care Agency variable has an average variance extracted (AVE) value of 0.614. This value is also above the 0.5 threshold, indicating that this construct has adequate convergent validity. With this AVE value, it can be concluded that the indicators used to measure Self-Care Agency account for most of the variance in this construct.

The reliability test results show that the McMaster Model of Family Functioning variable has a Cronbach's alpha value of 0.954 and a Composite Reliability (rho c) value of 0.963. These values are very high, well above the recommended threshold of 0.7, indicating that the indicators used to measure this variable have excellent internal consistency. In other words, the McMaster Model of Family Functioning variable is reliable for consistently measuring the intended construct. Similarly, Cronbach's alpha value is 0.710 for the Self-Care Agency variable, and the Composite Reliability (rho c) is 0.824. Although Cronbach's alpha value for this variable is around the threshold of 0.7, it still indicates that the indicators have sufficient internal consistency. The higher Composite Reliability value of 0.824 further suggests that the indicators for the Self-Care Agency

variable can be considered reliable and consistent in measuring the intended construct.

After the outer model is declared valid and reliable, the next step is to evaluate the inner model. The inner model tests the structural relationships between latent variables and measures the model's ability to explain endogenous variables. The evaluation of the inner model includes the following aspects:

The path coefficient indicates the strength and direction of the relationship between the latent variables. The analysis results indicate that most of the path coefficients are statistically significant, with t-values exceeding 1.96 and p-values less than 0.05. This indicates that the relationship between latent variables in structural models has considerable strength.

In this study, Structural Equation Modelling (SEM) analysis was used to investigate the relationship between the latent variables of the McMaster Model of Family Functioning and self-care agency. The analysis revealed a significant relationship between the McMaster Model of Family Functioning and self-care agency, with a coefficient of 0.340. A coefficient value of 0.340 indicates that the McMaster Model of Family Functioning has a positive influence on self-care agency. This means that the increase in the McMaster Model of Family Functioning tends to be followed by an increase in self-care agencies. Additionally, the statistical test results revealed a statistically significant relationship, with a t-statistic value of 6.682 and a p-value of 0.000. This very small P-value (less than 0.05) indicates that the association is statistically significant, so it can be concluded that the McMaster Model of Family Functioning has a significant effect on self-care agency.

The test results yielded an R-squared value of 0.116, indicating that the McMaster Model of Family Functioning variable explained approximately 11.6% of the variability in Self-Care Agency. Although this value is relatively low, it still indicates a significant contribution from the McMaster Model of Family Functioning to the Self-Care Agency.

Based on the analysis results, the F-squared value obtained is 0.131. According to Cohen's criteria (1988), the value of the f-square is interpreted as < 0.15: Small effect, if 0.15 – 0.35: Medium effect and > 0.35: Large effect. With an F-square value of 0.131, the effect produced by exogenous variables on endogenous variables can be categorised as a small to moderate impact. Although it does not show a powerful effect, this value still shows that exogenous variables (McMaster Model of Family Functioning) significantly contribute to the variability of endogenous variables.

The goodness-of-fit test showed that the SRMR value for both the saturated and estimated models was 0.069. An SRMR value below the threshold of 0.08 indicates that the model has a reasonable degree of accuracy, and the difference between the observed data and the data predicted by the model is relatively small. Thus, SRMR indicates that the resulting model fits the data well. The NFI values for the saturated model and the estimation model are 0.898. An NFI close to a value of 1 indicates that the model has a good fit. Although the NFI value is slightly below the recommended threshold (0.90), it still shows that the model has a pretty good match with the data.

Discussions

The results of this study indicate that the McMaster Model of Family Functioning (MMFF) has an impact on self-care agency in patients with chronic hypertension. MMFF emphasises the importance of family dynamics in supporting patients through good communication, clear roles, affective involvement, and the ability of families to adapt (Epstein, Baldwin and Bishop, 1983). Optimal family support can improve patient adherence to medical therapy as well as reduce stress, which is often an obstacle to the management of hypertension (Gawulayo, Erasmus and Rhoda, 2021).

In hypertension management, the six dimensions of the McMaster Model of Family Functioning (MMFF) - namely, problem solving, communication, family roles, affective responsiveness, affective involvement, and behaviour control - have varying levels of importance in influencing patient self-care agencies. Problem-solving and communication are often the most crucial dimensions, as the effectiveness of the family in solving problems, as well as clear communication, can improve the patient's understanding of their condition and adherence to treatment (Miller *et al.*, 2000). Patients from families with open communication tend to be more receptive to medical information and discuss the obstacles faced in carrying out therapy (Epstein, Baldwin and Bishop, 1983).

Meanwhile, family roles also play an essential role in ensuring that there are family members who actively support the management of hypertension, for example, by reminding patients to take their medication or prepare healthy meals (Trivedi and Asch, 2019). Affective responsiveness and affective involvement also contribute to building emotional support, which can increase patient motivation in undergoing treatment (Gawulayo, Erasmus, and Rhoda, 2021). When patients feel emotionally cared for and supported by their families, they are more likely to maintain healthy habits and reduce stress, which in turn contributes to blood pressure stability (Suglia *et al.*, 2023).

However, the impact of behaviour control can vary depending on how the family implements it. Excessive or too strict behavioural control can cause patients to feel depressed and lack autonomy in making health decisions, which can have a negative impact on self-care agencies (Kim, Sherman and Taylor, 2008). On the other hand, if applied flexibly and supportively, behaviour control can help patients maintain discipline with diet and

medication without causing excessive psychological pressure. Therefore, while all dimensions of MMFF contribute to hypertension management, their level of importance may vary depending on the family context and the specific needs of the patient.

This study uses the MMFF model. Theoretically, there are three other models related to approaches in health services: the Family-Centred Care (FCC) Model, Social Support Theory, and Health Belief Model (HBM). The FCC is an approach in healthcare that emphasises partnerships between patients, families, and healthcare professionals in patient care. This model posits that the family plays a crucial role in the healing process and the patient's overall well-being (Kuo *et al.*, 2012). In the context of hypertension, the FCC encourages family involvement in medical decision-making, the provision of emotional support, and the monitoring of patient compliance with medication and lifestyle changes. Compared to the McMaster Model of Family Functioning (MMFF), the FCC focuses more on the interaction between families and healthcare workers, rather than just the internal dynamics of the family itself. The second theory is the Social Support Theory. The theory of social support explains that support from family, friends, or the community can improve a patient's health by reducing stress, increasing motivation, and strengthening medication adherence (House, 1981). Several forms of social support play a role in improving self-care agency, including emotional support (empathy and care), instrumental support (physical or material assistance), and informational support (counselling and education related to disease) (Cohen and Wills, 1985). Although this theory highlights the importance of social support in the context of chronic disease, Social Support Theory does not explicitly address family dynamics as described in the MMFF.

Third is the Health Belief Model (HBM). HBM is a psychological model that explains how an individual's perception of disease and treatment affects their health behaviour (Rosenstock, 1974). This model emphasises that patient adherence to medical therapy is influenced by several primary factors, such as the individual's perception of susceptibility to the disease, the severity of the impact of the disease, the benefits of treatment, and barriers to carrying out therapy (Janz and Becker, 1984). In hypertension management, HBM focuses on how patients understand the risks and benefits of treatment, but lacks the role of family as a key supporting factor in improving *self-care agency*. In the context of this study, MMFF complements HBM by demonstrating that family support can influence patients' favourable perception of the importance of care, thereby enhancing their self-care agency (Vargas-Escobar *et al.*, 2022). Families that are able to provide motivation and create a conducive environment can help patients build healthy habits, such as a low-salt diet and adherence to medical therapy (Ding *et al.*, 2016).

This research was conducted in Surabaya, a city in Indonesia. Indonesia is known for its culture of collectivism, and there is still a culture of respect for parents if people with chronic hypertension are biological parents. Collectivism and respect for parents play an essential role in the *self-care agency* of chronic hypertension patients, especially in the context of family functioning based on the McMaster Model of Family Functioning (MMFF). In a more collectivistic culture, healthcare-related decisions are often made collectively within the family, which can increase social support for patients (Triandis, 1995). Family members tend to be more active in reminding patients to take their medication, prepare healthy meals, and provide emotional encouragement during treatment, thereby increasing patients' adherence to medical therapy and lifestyle changes (Markus and Kitayama, 1991). However, high levels of collectivism also have the potential to limit patients' independence in managing their health, as they are more dependent on their families in decision-making (Hofstede, 2001).

Meanwhile, respect for parents, also known as filial piety, influences how patients and family members respond to disease management. In a culture that upholds these values, younger family members feel responsible for caring for sick parents, so their involvement in the management of hypertension becomes more active (Yeh and Bedford, 2003). This attitude can help improve patients' adherence to medication because they feel valued and cared for by their families (Cheng and Chan, 2006). However, in some cases, respect for parents can also be a barrier if the patient relies more on family decisions than develops personal initiative in managing his or her health (Kim, Sherman and Taylor, 2008). Therefore, the role of collectivism and respect for parents in *self-care agencies* needs to be understood in a balanced way so that family support can be utilised without reducing the patient's independence in managing their illness

A low R-squared value indicates the presence of possible *confounding variables* that may affect the relationship between MMFF and *self-care agencies*. Confounding variables can affect the relationship between the two main variables. The severity of hypertension can be an essential factor, as patients with more severe conditions may need greater support in carrying out self-care. In addition, the level of knowledge and education about patient and family health, particularly regarding hypertension, can also play a role in improving self-care agency, regardless of family function. Socioeconomic factors are also a consideration, as financial limitations and access to health services can impact patients' ability to engage in self-care. Support from health workers, such as doctors or nurses, can also

contribute to improved self-care without relying entirely on family roles. In addition, patient adherence to treatment is an important aspect, as patients who are more disciplined in following therapy tend to have better self-care behaviours, regardless of family support. Psychological factors, such as stress levels, anxiety, or depression, can also be an obstacle to self-care, even if the family provides good support. Ultimately, the culture and norms within the family can significantly influence how the family supports the patient in performing daily care.

The significant results of the study, although with a large determination coefficient of only 11.6%, have implications for nursing practice, especially in the family-based approach to the management of chronic hypertension. Nurses need to be more active in involving families in the patient care process, considering that family support in accordance with the McMaster Model of Family Functioning (MMFF) can improve patient self-care agency. In addition, health education must be extended not only to patients but also to family members so that they can communicate more effectively, divide roles in supporting treatment, and provide continuous motivation. In terms of nursing interventions, understanding the role of MMFF enables nurses to design more comprehensive, family-based strategies, such as communication training and family counselling, to enhance the emotional support and stress management of patients. Furthermore, the results of this study can be used as a basis for strengthening nursing policies that emphasize the importance of family involvement in chronic disease management. Thus, this study confirms that collaboration between nurses and patients' families plays a crucial role in improving the effectiveness of care and the quality of life of patients with chronic hypertension.

The calculation results yielded an R^2 value of only 0.116, indicating weak predictive power. The f^2 value (0.131) falls within the small to medium category, thereby reducing the practical significance of this study. The study did not test alternative models by adding moderation variables from socioeconomic factors and modifying the design to a longitudinal study.

Conclusion

These results highlight the crucial role of family support in managing chronic diseases like hypertension through a structured approach like MMFF. This model enhances patients' self-care agency and improves their overall quality of life. Therefore, the McMaster Family Function Model provides a solid foundation for family-based interventions in hypertension care, promoting better and more sustainable health outcomes. This study has demonstrated that the McMaster Model of Family Functioning (MMFF) has an impact on self-care agency in patients with chronic hypertension. However, several aspects remain to be explored further. Further research can investigate how contextual factors, such as different cultures and socioeconomic and family structures, impact the effectiveness of MMFF in enhancing self-care agency. In addition, comparative studies between MMFF and other models, such as Family-Centred Care (FCC), Social Support Theory, and Health Belief Model (HBM), can provide deeper insights into which models are most effective in improving patient adherence to hypertension treatment.

Furthermore, the development of family-based interventions designed based on MMFF needs to be tested empirically to measure their impact on improving the quality of life of hypertensive patients. Longitudinal studies are also required to observe how changes in family function over time affect the behaviour of patients' self-care agencies. With this follow-up research, it is hoped that a more comprehensive understanding of the family's role in hypertension management and more effective strategies for family-based nursing practice can be obtained.

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Availability of data and materials

Availability of data and materials: The data that support the findings of this study are not publicly available due to ethical considerations and participant confidentiality. However, the data can be obtained from the corresponding author upon reasonable request for clearly defined and legitimate research purposes, and may require approval from the relevant ethics committee.

Authors' contributions

Jujuk Proboningsih and Sriyono were primarily responsible for the conceptualization and design of the study, provided oversight and supervision throughout the research process, and conducted critical revisions to enhance the intellectual rigor of the manuscript. Rini Ambarwati, Sri Hardi Wuryaningsih, and Anita Joeliantina contributed substantially to data collection, literature review and analysis, initial drafting of the manuscript, and reference management. All authors engaged in the interpretation of findings, reviewed and approved the final manuscript, and assume full

accountability for the accuracy and integrity of the work presented.

Declaration of Interest

The authors declare no conflict of interest

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