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The İnfluence of Beliefs About Medicines On Medication Nonadherence Among Hemodialysis Patients: A Multicenter Study From Malaysia

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ABSTRACT

Medication nonadherence can be caused by erroneous medication beliefs. This study aimed to assess the prevalence of medication nonadherence among hemodialysis patients and its association with beliefs about medicines.
A cross-sectional multicenter study among hemodialysis patients was performed. Data was collected by using the 5 items-medication adherence report scale (MARS-5) and the Beliefs about Medicine Questionnaire (BMQ). The correlation of medication nonadherence with patients' beliefs about medicine was assessed by multiple logistic regression.
A total of 325 patients were interviewed. The majority of patients were aged 55 years or more (69.0%) and received 6-10 prescribed medications daily (58.1%). The prevalence of medication nonadherence was 69.5% based on the MARS-5 score. Considering the BMQ score, the total mean score for the Specific–Necessity and Specific–Concern domain was 18.42 ± 2.30 and 13.16 ± 3.13 respectively. Whereas, the General–Overuse and the General–Harm domains showed a total mean score of 11.37 ± 1.98 and 9.44 ± 1.81 respectively. The patients with the belief of medication will protect them from becoming worse showed significantly less medication nonadherence (adjusted OR = 0.543). Medication nonadherence was significantly more prominent among patients who worried about taking medications (adjusted OR = 1.500) but less prominent among patients who perceived medications as addictive to them (adjusted OR = 0.637).
In conclusion, medication nonadherence was prevalent among hemodialysis patients. There is a need to address hemodialysis patients' necessity, concern, and harm perception towards their prescribed medication to overcome medication nonadherence.

Keywords: Hemodialysis patients, medication nonadherence, medication beliefs

Introduction

End-stage kidney disease (ESKD) is one of the chronic diseases that increasing rapidly worldwide due to the high prevalence of non-communicable diseases such as hypertension and diabetes mellitus (1). Globally, the number of ESKD patients commencing renal replacement therapy was estimated between 4.902 and 7.083 million (2). In Malaysia, the prevalence of ESKD was increased about 96 % over the past decade (3). The most common type of renal replacement therapy in Malaysia is hemodialysis which is usually performed at a hospital or hemodialysis center on an outpatient basis (4).

ESKD patients are at high risk of developing multiple clinical complications such as hypocalcemia, hyperphosphatemia, hyperkalemia, metabolic acidosis, anemia, hyperlipidemia, hypertension, and uncontrol diabetes mellitus (5). The goal of the treatment is to treat or prevent those complications. Thus, hemodialysis patients often required an average of 10 to 12 regular medications daily which included phosphate binder, iron supplement, calcimimetics agent, vitamin D supplement, antidiabetics agent, and antihypertensives agent (6). The resulting large pill burden and the complexity of the regimen increase the risk of adverse events and subsequent medication nonadherence (7, 8). The most common adverse events encountered were gastric disturbance from phosphate binders and post-dialysis hypotension from the antihypertensive medications (9, 10).

A systematic review showed that the prevalence of medication nonadherence among hemodialysis

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patients was ranged from 12.5% to 98.6% (11). This is a motive of worry because medication nonadherence can lead to treatment failure, poor quality of life, and increased healthcare expenditure (12,13). Studies found that one of the important factors of medication nonadherence among hemodialysis patients is erroneous medication beliefs (14-16). Patients can make their own implicit beliefs about medicines which are often related to intentional medication nonadherence (17, 18). The intentional medication nonadherence is often related to the doubt and concern of the adverse side effects from their medication (19).

A meta-analysis showed that medication nonadherence was related to patients' beliefs about medicines, measured by the Belief about Medicine Questionnaire (BMQ) (20). BMQ was widely used to assess patients' cognition representation of medication in multiple chronic illnesses (21-23). In the BMQ analysis, it proposed that patients with a perception of the low necessity of medication, high concern about the medication side effect, perceive overuse of medication, and believe medication is harmful will more likely to be nonadherent (17, 21). A study from Norway showed that one-third of the hemodialysis patients had concerns about the side effect of their prescribed medication. The patients perceived that their doctors have overprescribed the medications. These perceptions were found to have caused medication nonadherence among the patients (22). Besides, the necessity-concerns framework derived from BMQ was widely used to correlate with medication nonadherence (20, 24). A study found that positive necessity-concerns differential was correlated with medication adherence among hemodialysis patients (24). Another study showed that the medication nonadherence behaviors among hemodialysis patients were potentially modifiable by using psycho-educational interventions after the screening of patients' beliefs about medicine (25).

Currently, the assessment of hemodialysis patients' beliefs about medicines is not being incorporated in the Malaysian healthcare setting due to limited local supporting data. Therefore, there is a need to gain insight on whether the use of beliefs about medicines assessment tools in medication adherence assessment would be a promising approach to solve the issues of medication nonadherence among hemodialysis patients. Thus, this study was conducted to explore the prevalence of medication nonadherence and beliefs about medicines among hemodialysis patients. Additionally, the association between the beliefs about medicines and medication nonadherence was also assessed.

Materials and Methods

Study Design, Sampling Method and Data Collection Procedure: This was a multicenter, cross-sectional study conducted between September 2019 to January 2020 in eight hemodialysis centers in Penang, Malaysia. The centers were conveniently selected which included one government hospital hemodialysis center and seven non-government organization hemodialysis centers (Table 1). A pre-announcement of the study was performed a day before the data collection in the centers. The sample was recruited by using purposive sampling. The researcher (the first author) visited the centers and personally approached the patients who fulfil the inclusion criteria to invite them for participation in the study. The patients who agreed to participate were interviewed using a validated questionnaire. Written informed consent was obtained from the patients before study participation. The data were collected during a researcher (the first author) administered structured interview. The interview was conducted by a single researcher (the first author) at the time before initiation of the hemodialysis session.

Inclusion Criteria, Exclusion Criteria and Sample Size: The inclusion criteria were ESKD patients aged more than 18 years old and undergoing hemodialysis for at least 6 months. Meanwhile, the exclusion criteria were patients who were cognitively and physically not stable for medication adherence assessment. The sample size was calculated by using the formula for prevalence study. The sample size was determined by using an estimation of a 30% prevalence of medication nonadherence among hemodialysis patients from a previous Malaysian study (26). The calculated required sample size was 323 patients. With an estimation of 85% response rate, a total of 380 patients were required to be recruited.

Data Collection Form: The data collection form consisted of four sections including demographic data and medical status; patient's current medications list; medication adherence report scale (MARS-5) and Beliefs about Medicine Questionnaire (BMQ). Baseline information such as demographic data, medical status, and current medication list was obtained from the patient's medical record. Meanwhile, social history, medication nonadherence, and beliefs about

medicine assessment were obtained from the patient's structured interview.

Medication Adherence Report Scale (MARS-5): The medication nonadherence was assessed by using MARS-5. The approval to use MARS-5 was obtained from the copyright holder. The reliability test for MARS-5 showed Cronbach's alpha of 0.67-0.89 across all patient groups which were hypertension, asthma, and diabetes mellitus patients in London and the south-east of England (27). The MARS-5 comprises five statements concerning "forgetting", "changing of dosage", "stopping", "skipping" and "using medication less than what is prescribed". The answers are on a 5-point Liker scale. The patients indicated the frequency ('always', 'often', 'sometimes', 'rarely', or 'never') for each question with ascending score from always (1 point) to 'never' (5 points) (17). A lower score of MARS-5 indicates high levels of medication nonadherence. The perfect adherence to medication was defined as a maximum score of 25 (17, 27). A score of less than 25 was categorized into nonadherent groups (27-29). The English version of MARS-5 was translated to Malay language version by using forward-backward translation procedure.

Beliefs About Medicine Questionnaire (BMQ): The BMQ is a reliable validated tool to assess beliefs about medicine in chronic illness groups (21). The permission to use both English and Malay versions of BMQ in this study was obtained from the copyright holder. A total of 18 questions in the questionnaire were scored on a 5-point Likert scale. The questionnaire consisted of two sections which are BMQ-Specific and BMQ-General. The BMQ-Specific is divided into domains of Necessity and Concern. The total scores for the Specific-Necessity and Specific-Concern domains are range from 5 to 25, with a midpoint of 15 (21). A higher score reflects higher beliefs in necessity of the medication and more concern of medication adverse effect respectively among the patients. The second section, BMQ-General is divided into two domains of Overuse and Harm. The total scores are range from 4 to 20 with a midpoint of 12 (21). A higher score reflects patients believe of medications to be more overused and harmful. Considering the reliability of the BMQ, a previous study showed the Cronbach's alpha value for each scale in renal patients (n = 47) were 0.55 for Specific–Necessity, 0.73 for Specific–Concern, 0.77 for General–Overuse, and 0.83 for General–Harm (21). In Malaysia, previous studies showed that the internal consistency of BMQ among diabetes mellitus and hypertensive patients were 0.75 and 0.86 respectively (30, 31).

Necessity-Concern Differential: A Necessity-Concern differential was calculated to identify if patients believed the necessity of their medication outweighs the concern of medication adverse effect, as suggested by Horne and Weinman (17). The differential was determined by subtracting the total mean score of Specific-Concern from the total mean score of Specific-Necessity (17). The differential score was varied from the lowest score of -20 to the highest score of +20. The positive differential indicates that patients rated their beliefs in the benefit of medications higher than concern in having adverse effects from their medicines (17). Besides, the Necessity-Concern differential can be split at the mid-point to form the four attitude groups, which are accepting group (patients with high necessity and low concerns); ambivalent group (patients with high necessity and high concerns); indifferent group (patients with low necessity and low concerns); and skeptical group (patients with low necessity and high concerns) (17).

Stastistical Analysis: All the data was processed with IBM SPSS® version 27.0. Before analyzing the data, a normality test was performed by using the Kolmogorov-Smirnov method. The prevalence of medication nonadherence was presented as a percentage. Categorical data such as demographic data were presented as frequency and percentage. The dependent variable was medication nonadherence with a dichotomous pattern whereas the independent variables were all the 18 variables in BMQ. The correlation of BMQ variables with medication nonadherence was analyzed by multiple logistic regression. In all steps of analysis, $P < 0.05$ was considered statistically significant.

Ethical Approval: The study was conducted according to the Declaration of Helsinki and was approved by the Medical Research Ethics Committee, Ministry of Health Malaysia (ethics approval number: NMRR-19-280-46289(IIR)).

Results

Demographic Characteristic and Social History: Out of 380 patients who fulfil the inclusion criteria, 55 patients disagreed to participate in the study. Hence, a total of 325 patients were recruited (response rate 85.5%) and completed the survey. The required sample size was achieved. Most of the patients were aged between 65 to 74 years (36.0%) with ethnic distribution of mainly

Table 1. Distribution of Patients According to Hemodialysis Centers

Characteristics	n (%)		
	Total (n = 325)	Nonadherence (n = 226; 69.5%)*	Adherence (n = 99; 30.5%)*
Dialysis centers			
Balik Pulau Hospital	18 (5.5)	15 (6.6)	3 (3.1)
Buddhist Tzu Chi Merit Dialysis Center	104 (32.0)	70 (31.0)	34 (34.3)
Zakat Dialysis Center (Balik Pulau)	15 (4.6)	11 (4.9)	4 (4.0)
Zakat Dialysis Center (Bayan Lepas)	16 (4.9)	10 (4.4)	6 (6.1)
Zakat Dialysis Center (Georgetown)	25 (7.7)	15 (6.6)	10 (10.1)
Amal NKF – Fo Yi Dialysis Center (Unit I)	36 (11.1)	28 (12.4)	8 (8.1)
NKF – Fo Yi Dialysis Center (Unit II)	50 (15.4)	36 (16.0)	14 (14.1)
CAT Balik Pulau Dialysis Center	61 (18.8)	41 (18.1)	20 (20.2)

Table 2. Demographic Characteristics and Social History of The Hemodialysis Patients

Characteristics	n (%)		
	Total (n = 325)	Nonadherence (n = 226; 69.5%)*	Adherence (n = 99; 30.5%)*
Age			
18-34	13 (4)	12 (5.3)	1 (1.0)
35-44	35 (10.7)	28 (12.4)	7 (7.0)
45-54	53 (16.3)	35 (15.5)	18 (18.2)
55-64	86 (26.5)	62 (27.4)	24 (24.3)
65-74	117 (36.0)	73 (32.3)	44 (44.4)
≥ 75	21 (6.5)	16 (7.1)	5 (5.1)
Gender			
Male	178 (54.8)	122 (54.0)	56 (56.6)
Female	147 (45.2)	104 (46.0)	43 (43.4)
Ethnicity			
Malay	117 (36.0)	85 (37.6)	32 (32.3)
Chinese	186 (57.2)	129 (57.1)	57 (57.6)
Other	22 (6.8)	12 (5.3)	10 (10.1)
Level of education			
Primary or no formal education	130 (40)	85 (37.6)	45 (45.5)
Secondary	179 (55.1)	129 (57.1)	50 (50.5)
Tertiary	16 (4.9)	12 (5.3)	4 (4.0)
Employment status			
Employed	43 (13.2)	34 (15.1)	9 (9.1)
Unemployed	282 (86.8)	192 (84.9)	90 (90.9)
Marital status			
Single/Widowed/Divorced	103 (31.7)	76 (33.6)	27 (27.3)
Married	222 (68.3)	150 (66.4)	72 (72.7)

*Based on MARS-5 score

Table 3. Medical and Medication History of The Hemodialysis Patients

Characteristics	n (%)		
	Total (n = 325)	Nonadherence (n = 226)*	Adherence (n = 99)*
Duration of dialysis			
10 years or less	283 (87.1)	193 (85.4)	90 (90.9)
>10 years	42 (12.9)	33 (14.6)	9 (9.1)
Number of hospitalizations			
No hospitalization	126 (38.8)	93 (41.1)	33 (33.3)
1 to 2 times	127 (39.1)	84 (37.2)	43 (43.4)
≥ 3 times	72 (22.1)	49 (21.7)	23 (23.3)
Presence of hypertension			
Yes	286 (88.0)	198 (87.6)	88 (88.9)
No	39 (12.0)	28 (12.4)	11 (11.1)
Presence of hyperlipidemia			
Yes	184 (56.6)	129 (57.1)	55 (55.6)
No	141 (43.4)	97 (42.9)	44 (44.4)
Presence of diabetes mellitus			
Yes	179 (55.1)	121 (53.5)	58 (58.6)
No	146 (44.9)	105 (46.5)	41 (41.4)
Presence of cardiovascular disease			
Yes	110 (33.8)	76 (33.6)	34 (34.3)
No	215 (66.2)	150 (66.4)	65 (65.7)
Number of prescribed medications			
0-5	17 (5.2)	15 (6.6)	2 (2.0)
6-10	189 (58.1)	127 (56.2)	62 (62.7)
11-15	112 (34.5)	79 (35.0)	33 (33.3)
16-18	7 (2.2)	5 (2.2)	2 (2.0)

*Based on MARS-5 score

Chinese (57.2%). Approximately half of the patients were male (54.8%) and secondary school graduates (55.1%) (Table 2). The majority of patients received 6-10 prescribed medications per day (58.1%) and had a duration of dialysis of 10 years and less (87.1%). The patients mostly (61.2%) experienced at least one time of hospitalization in the past year. The most common concomitant illness was hypertension (88%) (Table 3).

Medication Nonadherence Analysis: A total of 226 patients (69.5%) was categorized as less adherence or nonadherence to prescribed medication. The total mean score of medication adherence was 23.41 ± 1.81. On the fifth scale of "never", the reported result for all the parameters was more than 80% except for the "forgetting" parameter which showed only 41.2% of patients reported that they never forget to take their medicines. This indicated that forgetfulness was the major contributor to medication nonadherence among hemodialysis patients. Majority of the patients claimed that they never alter the dose (83.7%) and never stop taking their medicines for a while (88.9%). Most (81.8%) of the patients never decide to miss a dose of their prescribed medication. Besides, 86.2% of the patients reported never taking less medication than instructed (Table 4).

Beliefs About Medicine Analysis: Table 5 illustrates the numerical and descriptive analysis of BMQ. In numerical analysis, the patients scored 18.42 ± 2.30 in the Specific-Necessity domain, and 13.16 ± 3.13 in the Specific-Concern domain. In the BMQ-General section, the patients scored 11.37 ± 1.98 in the General-Overuse domain and 9.44 ± 1.81 in the General-Harm domain. In terms of the percentage of patients scoring above the midpoint, 93.5% of patients perceived the high necessity of prescribed medication. A total of 28.9% of patients reported strong concerns about medication side effects. Meanwhile, 46.2% of patients perceived doctors overprescribed medication for them and only 13.8% believed that their medication brings harm to them. This indicated that hemodialysis patients in this study perceived the high necessity of medication, the low concern of medication side effects,

Table 4. Analysis of Medication Nonadherence by Using MARS-5 Parameter

Items of MARS-5	(1) n (%)	(2) n (%)	(3) n (%)	(4) n (%)	(5) n (%)	Mean score (SD)
I forget to take my medicines	0 (0)	1 (0.3)	55 (16.9)	135 (41.5)	134 (41.2)	4.24 (0.73)
I alter the dose of my medicines	0 (0)	1 (0.3)	16 (4.9)	36 (11.1)	272 (83.7)	4.78 (0.54)
I stop taking my medicines for a while	0 (0)	1 (0.3)	14 (4.3)	21 (6.5)	289 (88.9)	4.84 (0.49)
I decide to miss out a dose	0 (0)	1 (0.3)	20 (6.2)	38 (11.7)	266 (81.8)	4.75 (0.57)
I take less than instructed	0 (0)	0 (0)	17 (5.2)	28 (8.6)	280 (86.2)	4.81 (1.81)
Total mean score						23.41 (1.81)

1 = Always; 2 = Often; 3 = Sometimes; 4 = Rarely; 5 = Never

moderately overuse of prescribed medication, and medication brings less harm.

In the Specific-Necessity domain, majority of the patients believed that their medicines could protect them from becoming worse (88%). In the Specific-Concern domain, the majority disagreed that medicines disrupt their life (79.4%). However, in the General-Overuse domain, the patients mostly disagreed that their doctors overuse medication for them (65.2%). Whereas, in the General-Harm domain, 87.7% of patients disagreed that they should stop their treatment for a while now and again.

Necessity-Concern Differential Analysis: In the analysis of the Necessity-Concern framework, the Necessity-Concern differential was 5.26 ± 3.91. This positive value indicated that the patients have high necessity beliefs of their prescribed medication with less concern about medication side effects. A total of 67.1% of hemodialysis patients were categorised having an accepting attitude, followed by 26.5% were ambivalent, 3.7% were indifferent and 2.8% were skeptical towards prescribed medication (Figure 1).

Correlation of beliefs about medicine with medication nonadherence: Table 6 illustrates the multiple logistic regression analysis for correlation between beliefs about medicines and medication nonadherence. In the dependent variable, the category of medication nonadherence was act as the reference group. In the Specific-Necessity domain, the risk of medication nonadherence was found to be 0.543 times significantly lower in patients with the perception of "medication will protect them from becoming worse" (P= 0.019). For the Specific-Concern domain, the risk of medication nonadherence was 1.500 times significantly higher in patients with the perception of 'having to take medicines worries me' (P= 0.008). Meanwhile, in the General-Harm domain, the risk of medication nonadherence was found to be 0.637 times significantly lower in patients with the belief of 'most medications are addictive' (P = 0.011).

Discussion

The prevalence of self-report medication nonadherence among the patients was 69.5% with a MARS-5 score of less than 25. The prevalence of medication nonadherence in this study was comparable to the finding from a study from Saudi Arabia which showed that the medication nonadherence prevalence was 71.9% by using the self-report Morisky Medication Adherence Scale (MASS-8) in hemodialysis patients (32). However, a local study found that the self-report medication nonadherence was only 33.5% by using a modified dialysis diet and fluid non-adherence questionnaire which involved the measurement of medication nonadherence (26). The difference in nonadherence prevalence might be due to the variability of the medication adherence evaluation method.

This study found that forgetfulness was the major contributor to medication nonadherence. Patients' forgetfulness might be the root cause of the high prevalence of medication nonadherence in this study. Forget taking medication can be considered as intentional medication nonadherence in the absence of cognitive impairment (33). Thus, the healthcare provider needs to always confirm with patients regarding the factors of forgetfulness. Counselling needs to be given and suggestions of reminder methods such as pillbox, support of a caregiver, and time alarm should be given to the patients. The emphasis of the need for and importance of taking medication to prevent

Table 5. Analysis of Beliefs about Medicine Questionnaire

	Statement	(1) n (%)	(2) n (%)	(3) n (%)	(4) n (%)	(5) n (%)	Mean (SD)
Specific –Necessity†							18.42 (2.30)¶
N1	My life would be impossible without my medicines	2 (0.6)	53 (16.3)	81 (24.9)	178 (54.8)	11 (3.4)	3.44 (0.82)
N2	Without my medicines, I would be very sick	1 (0.3)	52 (16.0)	70 (21.5)	184 (56.7)	18 (5.5)	3.51 (0.84)
N3	My health, at present, depends on my medicines	0 (0)	25 (7.7)	22 (6.8)	261 (80.3)	17 (5.2)	3.83 (0.63)
N4	My medicines protect me from becoming worse	0 (0)	16 (4.9)	23 (7.1)	268 (82.5)	18 (5.5)	3.89 (0.56)
N5	My health in the future will depend on my medicines	1 (0.3)	10 (3.1)	67 (20.6)	236 (72.6)	11 (3.4)	3.76 (0.58)
Specific – Concern‡							13.16 (3.13)¶
C1	I sometimes worry about the long-term effects of my medicines	1 (0.3)	189 (58.2)	17 (5.2)	109 (33.5)	9 (2.8)	2.80 (1.00)
C2	Having to take medicines worries me	3 (0.9)	229 (70.5)	10 (3.1)	78 (24.0)	5 (1.5)	2.55 (0.92)
C3	I sometimes worry about becoming too dependent on my medicines	3 (0.9)	209 (64.3)	17 (5.2)	91 (28.0)	5 (1.5)	2.65 (0.95)
C4	My medicines disrupt my life	4 (1.2)	254 (78.2)	9 (2.8)	51 (15.7)	7 (2.2)	2.39 (0.84)
C5	My medicines are a mystery to me	3 (0.9)	151 (46.5)	89 (27.4)	81 (24.9)	1 (0.3)	2.77 (0.85)
General –Overuse§							11.37 (1.98)¶
O1	If doctors had more time with patients, they would prescribe fewer medicines	1 (0.3)	149 (45.8)	88 (27.1)	84 (25.8)	3 (0.9)	2.81 (0.86)
O2	Doctors use too many medicines	2 (0.6)	210 (34.6)	28 (8.6)	80 (24.6)	5 (1.5)	2.62 (0.91)
O3	Doctors place too much trust in medicines	0 (0)	79 (24.3)	99 (30.5)	144 (44.3)	3 (0.9)	3.22 (0.82)
O4	Natural remedies are safer than medicines	5 (1.5)	139 (42.8)	123 (37.8)	57 (17.5)	1 (0.3)	2.72 (0.77)
General –Harm‖							9.44 (1.81)¶
H1	Medicines do more harm than good	1 (0.3)	212 (65.2)	72 (22.2)	38 (11.7)	2 (0.6)	2.47 (0.73)
H2	People who take medicine should stop their treatment for a while every now and again	5 (1.5)	280 (86.2)	14 (4.3)	26 (8.0)	0 (0)	2.19 (0.59)
H3	Most medicine are addictive	10 (3.1)	252 (77.5)	30 (9.3)	32 (9.8)	1 (0.3)	2.27 (0.69)
H4	All medicines are poisons	9 (2.8)	204 (62.8)	50 (15.3)	60 (18.5)	2 (0.6)	2.51 (0.85)

1 = Strongly disagree; 2 = disagree; 3 = Uncertain; 4 = Agree; 5 = Strongly agree
Percentage of patients scoring above midpoint (%): †93.5%; ‡28.9%; §46.2%; ‖13.8%
¶Total mean score (SD)
The Necessity-Concern differential is mean 5.26 (SD 3.91)

Table 6. Multiple Logistic Regression Analysis of Beliefs About Medicine with Medication Nonadherence

BMQ variables	Simple Logistic Regression			Multiple Logistic Regression		
	b	Crude odd ratio (95% CI)	P value	b	Adjusted odd ratio (95% CI)	P value
Specific - Necessity						
My medicines protect me from becoming worse	-0.555	0.574 (0.348, 0.946)	0.030	-0.611	0.543 (0.326, 0.903)	0.019
Specific - Concern						
Having to take medicines worries me	0.302	1.353 (1.022, 1.790)	0.034	0.405	1.500 (1.113, 2.020)	0.008
General - Harm						
Most medicine are addictive	-0.335	0.715 (0.515, 0.994)	0.046	-0.451	0.637 (0.450, 0.903)	0.011

b = Regression coefficient Constant: 3.216 Backward LR multiple logistic regression model was applied. Multicolinearity and interaction term were check and not found. Hosmer Lemeshow test (p = 0.841), classification table (overall classified percentage = 68.9%) and under the curve (63.3%) were applied to check model fitness. All the 4 items in General-Overuse scale were not significantly associated with medication nonadherence. Hence, the results are not included in the table

complications of ESKD should be prioritised in medication counselling.

This was among the pioneer study to assess beliefs about medicines among hemodialysis patients in Malaysia. The result showed that hemodialysis patients perceived the high necessity of their prescribed medication with relatively low concern about their medication side effects. Besides, the patients perceived that medication was moderately overprescribed and their medications were less harmful. The total mean score of the Specific-Necessity domain was slightly lower in this study as compared to the previous study in the United Kingdom and Norway (14, 31). The dissimilarity of findings might be due to the cultural differences between the patients in Malaysia and the Western countries, which caused different perceptions towards their medications. However, the total mean Specific-Concern score, General-Overuse score, and General-Harm score were comparable with the previous study conducted in Norway (31).

Considering the first domain of Specific-Necessity, majority of the patients agreed that their prescribed medicines will protect them from becoming worse. This finding reflected that the patients might have experienced the recovery from complications of ESKD after taking the prescribed medication. Therefore, the patients become more alert about the benefit of their prescribed medication (25). For the Specific-Concern domain, less than half of the patients expressed concern about the side effects of their prescribed medication. The patients mostly disagreed that their medication disrupt their life. This finding indicated that long-term side effects of prescribed medication was not the main factor which influence the medication nonadherence among Malaysian hemodialysis patients. The hemodialysis patient might have experienced improved clinical outcomes after taking their prescribed medication together with dialysis treatment. Hence, they became less concerned about the medicine side effects. Conversely, a study conducted in the United Kingdom found that hemodialysis patients' concerns about the potential for dependence on prescribed medication and worry of long-term side effects were associated with medication nonadherence (14). The study suggested that identifying and alleviating such concern for individual patients is a possible target for interventions to increase medication adherence (14).

According to the results in the General-Overuse domain, the hemodialysis patients in this study believed that medications were moderately overprescribed by clinicians. A similar finding was expressed in a study conducted by Drangsholt et al. using the BMQ tool among dialysis and post-kidney transplantation patients in Norway (31). The reason for the patients to disagree that their medication is overprescribed could be due to fear. They might worry that this disagreement will be perceived by the clinician as a lack of confidence with the prescriber (20). Meanwhile, in the General-Harm domain, this study showed an

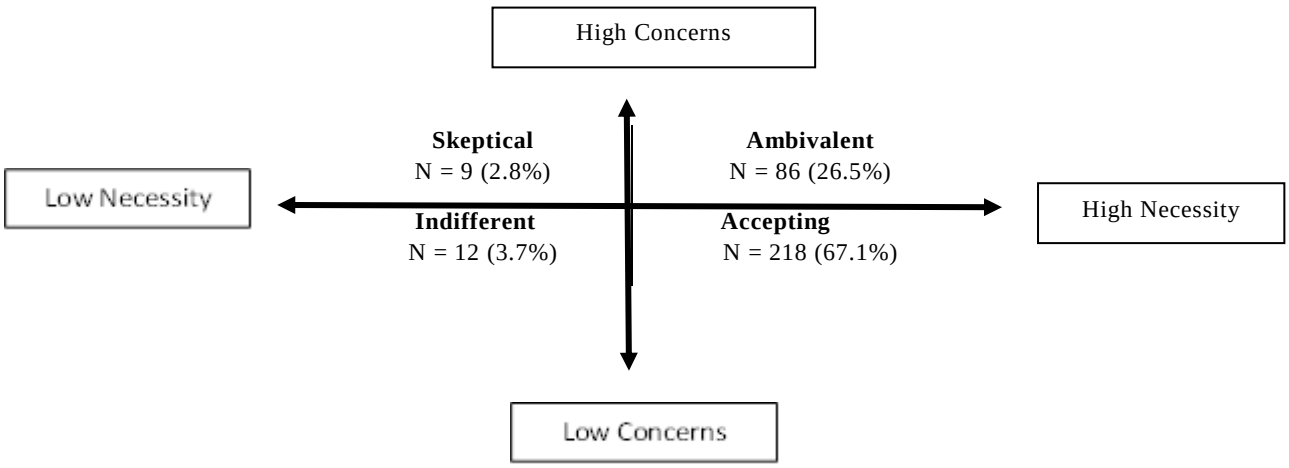

Fig 1. Distribution of Beliefs and Attitudes to Medication According To BMQ

encouraging finding that the majority of the hemodialysis patients disagreed with stopping their treatment for a while. This could be explained by the patients who might have experienced various disturbing symptoms which can be relieved by their prescribed medication (25). This study finding was deviated from a study conducted by Robert Horne et al., which reported a higher percentage of hemodialysis patients with the beliefs of medications as a harmful substance and should not be taken for long term (14). These misconceptions among medications should be removed in order to enhance the medication adherence among the hemodialysis patients.

In the Necessity-Concern framework, the positive value of Necessity-Concern differential indicated that the patients' believe about the medication benefits outweigh the adverse effects of their prescribed medication. Besides, majority of the patients were categorised as accepting attitudes towards their medication. This result reflected that Malaysian hemodialysis patients have a good acceptance attitude towards their prescribed medication. This finding was similar to a study conducted by Bai et al. using the BMQ tool among non-dialysis chronic kidney disease stage 3-5 patients in China (33), which also found a majority of patients having an accepting attitude towards medication. In addition, previous studies assessing Necessity-Concern differential in various chronic disease populations such as rheumatoid arthritis, diabetes mellitus, human immunodeficiency virus disease, cardiovascular disease, and transplant recipients also demonstrated similar findings of this positive belief (35-38). Nevertheless, the present study revealed that 2.8% of the patients were skeptical towards their medication. This small group of patients have high concern about the medication's side effects and low perceived necessity of medication. Counselling interventions attempting to improve the patients' understanding of their prescribed medication should be focused on this group of patients. Hence, Necessity-Concern differential is a useful method to understand hemodialysis patient's attitudes towards their medications and customized counselling program can be provided to the patients.

This study has superiority that analysis was carried out on association between the 18 BMQ items with medication nonadherence. The analysis would enhance the understanding on the medication beliefs factors which influencing the medication nonadherence in hemodialysis patients. This analysis was not performed in other previous studies. In the multiple logistic regression analysis, a total of three variables in BMQ were significantly correlated with medication nonadherence. The patients with the belief of medication will protect them from becoming worse showed significantly less medication nonadherence. This might be due to patients' experience of clinical improvement after taking the prescribed medication. Previous studies had shown that hemodialysis patients will experience clinical complications such as fluid overload, uncontrolled hypertension, uncontrolled blood glucose level, and anemia if they do not adhere to medication (12). Besides, this study found that medication nonadherence was significantly more prominent among patient who worries about taking medications. A review by Ghimire et al. found that the high pill burden among hemodialysis patients was correlated with the adverse effects which make the patients feel worried to continue the medication (25). Patient education by pharmacists is one of the strategies to address this problem. Educational intervention had previously been shown to have a beneficial effect on the use of prescribed medication (37).

Additionally, perceived prescribed medication as addictive was less influencing the medication nonadherence among the patients in this study. This might be due to the perception that medication addiction was important, and it can bring better treatment outcomes. This incorrect belief surprisingly has led to less medication nonadherence. This finding was inconsistent with many studies from overseas which found that general harm perception was associated with medication nonadherence (38-40). The inconsistency finding could be due to the cultural differences between the patients from Malaysia and other countries. Generally, patients need to know that their medications are not addictive and are safe for long-term use. Their understanding of medication should always be assessed and approaches should therefore be tailored to the individual need.

Limitation: The present study has a limitation of did not involve objective measurements such as pill count and biochemical measurement in the assessment of nonadherence. The biochemical measurement can accurately provide evidence that the patient had taken the medication. The self-report medication adherence only represents a person's cognition representation. By using this method, the patient might tend to underreport nonadherence to avoid disapproval from the clinician.

Recommendation for Further Studies: Further research can be conducted to develop a targeted counselling module based on the present study findings to improve the medication nonadherence among hemodialysis patients. A prospective interventional study can be performed to implement the targeted counselling module on the hemodialysis patients and assessing the impact of the patient counselling towards the medication nonadherence.

Conclusion: Medication nonadherence among Malaysian hemodialysis was prevalent. To overcome hemodialysis patients' medication nonadherence, there is a need to address patients' necessity, concern, and harm perception towards their medication. Medication nonadherence ware more prominent among patients who worries about taking medications but less prominent among those with beliefs of medication will protect them from becoming worse and perceived medication are addictive. Therefore, the BMQ tools should be incorporated in the current nephrology pharmacy practice to help in identifying medication adherence barriers and targeted counselling can be customized for the patients.

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