ORIGINAL ARTICLE

Medication adherence and medication concordance among chronic illness patients in selected suburban areas in Johor, Malaysia: A cross-sectional study

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ABSTRACT

Introduction: Inadequate medication adherence is a significant problem globally, affecting up to 50% of chronic illness patients. The complications can also be significant, with increased rates of disease complications and hospitalisations due to lack of adherence. This research study seeks to find the medication adherence rate across select suburban areas in Johor, Malaysia, and to identify the relationship between medication adherence and treatment concordance.

Materials and Methods: A community-based cross-sectional study was conducted among patients with chronic diseases across various locations in Johor. A validated questionnaire, the Malaysia Medication Adherence Assessment Tool (MyMAAT) and a Modified Concordance Scale were used to explore the study objectives.

Results: Medication adherence is defined as a MyMAAT score of ≥54. A total of 82 chronic illness patients participated in this study, with males (48.8%) and females (51.2%). The mean age of the participants is 57.5 years old. The study reported 41.5% adherence (MyMAAT ≥54). Female vs male OR was calculated via logistic regression adjusting for confounding factors, with adherence (MyMAAT≥54) as a binary factor (OR=4.23; 95% CI 1.38-12.91; p=0.011). A statistically significant weak correlation was found between the MyMAAT score and the Modified Concordance Scale score (SR ρ=0.286, p=0.009).

Conclusion: In conclusion, the study shows a potential relationship between medication concordance and improved patient adherence in the Malaysian setting. More research should be conducted to further verify these findings.

KEYWORDS:
Medication adherence; medication concordance; chronic illness; Malaysia; shared decision making

INTRODUCTION

Optimal adherence to prescribed medication regimens is the key to sustaining good health outcomes, as it ensures the effective management of medical conditions and minimizes the risk of disease progression or complications. Authorities at all levels have invested significant effort to improve public health outcomes; however, in developed countries, patient adherence to chronic disease management averages only 50%.[1] The World Health Organization (WHO) has defined medication adherence as the degree to which an individual's actions regarding medication intake, dietary control, or lifestyle modifications align with agreed prescriptions from healthcare professionals.[1] Poor medication adherence results in reduced clinical effectiveness, allowing the disease to deteriorate, which can lead to more complications, increase hospitalisations and elevate mortality rates. Consequently, inadequate medication adherence has become a costly economic burden worldwide, with a reported amount of a few million ringgit per year of unused subsidised medications from a single hospital in Malaysia.[2] Reduced adherence may stem from an individual's health literacy, socioeconomic factors, and the complexity of the treatment regimen. A patient with chronic illness with complex medication regimens was reported to be adherent at a rate of only 30%.[3] Medication concordance, therefore, is a process of shared decision-making that considers a patient's ideas, concerns, and expectations to tailor the treatment to the individual better. The 2015 European Patients Forum position paper describes medication concordance as an approach in which patients and prescribers work together and the degree to which the prescription represents a shared decision.[4] When the recognition of the patient's views is paramount, evidence shows that improved concordance leads to better patient satisfaction and medication adherence.[5-6]

Several studies have explored medication adherence within the Malaysian setting, including a 2022 scoping review and meta-analysis that included 64 studies.[7] The included studies were designed to measure the prevalence of poor medication adherence, validate medication adherence scales, and

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evaluate interventions to improve medication adherence. Other studies focused on different sub-populations such as older adults,[8] people with hypertension,[9] type 2 diabetes mellitus[7] and subsidized versus self-paying patients.[10] There is limited quantitative evidence on the relationship between medication adherence and concordance in Malaysia.

This study examines the relationship between medication concordance and adherence in Malaysia using a quantitative approach. Limited quantitative evidence exists on this topic within the Malaysian context. Only 2 qualitative studies have been done, one in 2018 by Ng et al.[11] and one in 2022 by Abdullah et al.[12] which touched on the topics of patient-centered care and the importance of communication between healthcare professionals and patients for better medication adherence. This is a significant gap that this study addressed.

The global literature is increasingly moving towards treatment concordance, yet literature in this area is minimal in Malaysia. The objective of this study is to determine the medication adherence rate across selected suburban areas in Johor and to investigate the relationship between medication concordance and adherence using a quantitative method in the Malaysian setting. Our primary research question is, "What is the relationship between medication concordance and medication adherence in Malaysia?" This will provide evidence to support clinicians in engaging with treatment concordance to improve adherence rates.

MATERIALS AND METHODS

Design, Setting, and Participants.

A community-based cross-sectional study was conducted among patients with chronic illnesses across various locations in Johor, including Iskandar Puteri, Kluang, Pontian, Taman Mount Austin, and Johor Bahru. The participants were recruited from the community using convenience sampling. The data collection period was from May 2024 to September 2024. The data were collected by the investigators, who were final-year medical students at Newcastle University Medicine Malaysia. They were guided by a supervisor who was a lecturer and an MMC-registered medical practitioner. A 30-minute Zoom session was held prior to data collection to educate the investigators on data collection methodology. No specific quality control procedures were implemented, and a total of 8 investigators were involved in data collection. The five regions above were chosen because they were the locations where the investigators were posted for their medical postings. The investigators would visit houses door-to-door in nearby neighbourhoods to source respondents. Only odd-numbered houses were visited to randomize data collection. Data collection happened between 9 am to 8 pm and included both weekdays and weekends. The target sample size was 383, calculated with Cochran's formula.

A total of 82 responses were collected face-to-face using physical questionnaires, and informed consent was taken. The target sample size was not achieved due to difficulties with sourcing appropriate respondents. This study did not involve medication review, and only patients were interviewed to evaluate medication concordance. Inclusion criteria were being aged 18 years or older, physically residing in Johor, having a diagnosed chronic condition, and being on medications for at least 1 month. Patients on only dietary control regimens and those with memory impairments were excluded; respondents were screened for memory impairment by asking whether they had any diagnosed conditions that could affect short- or long-term memory, such as Alzheimer's disease, Parkinson's disease, or space-occupying lesions of the brain. A 1-month cutoff for medication use was used as an adherence measure, consistent with adherence studies that often use a 1-month observation window.[13] Furthermore, evidence shows that medication adherence behaviour in the first 1 month strongly predicts subsequent behaviour over the next year,[14] which supports our decision to operationalize chronic illness as medication use for at least 1 month.

The primary outcome was to measure the relationship between medication concordance (measured using the Modified Concordance Scale) and medication adherence (measured using the MyMAAT), the secondary outcome is the prevalence of poor medication adherence as measured by the MyMAAT.

Study instruments

The first part of the questionnaire collected demographic information such as age, sex, race, education level, source of medications, the diagnosed chronic disease, and number of medications. All diagnoses were self-reported by respondents, and medical records or prescriptions were not requested. The source of medications question consisted of 3 options: "public hospitals and clinics," "private hospitals and clinics," and "private pharmacies." This categorization is based on 3 main factors: the healthcare sector, access to doctors, and funding mechanisms. Public hospitals and clinics are very affordable for Malaysian citizens, which extends coverage to those with low socioeconomic status. However, patients often experience long wait times and limited consultation time due to high patient volume, which may affect a doctor's ability to involve patients in decision-making. Private hospitals and clinics are more expensive because they require out-of-pocket payments or insurance coverage, and doctors in these settings usually have adequate time for patient consultations. Some patients are also known to continue prescriptions at private pharmacies without seeing their doctors, which limits contact with doctors and reduces chances for counselling on medication adherence.

The validated Malaysia Medication Adherence Assessment Tool (MyMAAT), developed by Hatah et al.[15] used to assess medication adherence. The Cronbach's alpha value was 0.910, and the instrument consisted of 12 questions with a 5-point Likert scale from "Strongly Disagree" to "Strongly Agree". A MyMAAT score cut-off of ≥54 was used to define adherence, in line with the validation study by Hatah et al., which reported a statistically significant correlation with HbA1c levels.[15]

The Modified Concordance Scale was adapted from the Concordance Scale by Clucas et al.[6] The Concordance Scale was created with HIV-specific wording, which the researchers modified to suit chronic illnesses. The Cronbach's alpha value was 0.910 for the Concordance Scale. The Modified

Table I: Demographic and clinical characteristics of Participants (n =82)

Variables		Frequency, N (Percentage, %)
Gender	Male	40 (48.8)
	Female	42 (51.2)
Race	Chinese	34 (41.5)
	Malay	31 (37.8)
	Indian and other	17 (20.7)
Age	Adult (18-47)	18 (21.4)
	Older adult (48-67)	42 (50.0)
	Senior (≥68)	22 (26.2)
Source of medication*	Government Hospitals and Clinics	58 (70.7)
	Private Hospitals and Clinics	28 (34.1)
	Private Pharmacies	14 (17.1)
Number of Types of Medications	1-4	59 (72.0)
	>4	23 (28)
Education level	Primary school and below	16 (19.5)
	Secondary school and higher	66 (80.5)
Types of chronic illness**	Hypertension	52 (63.4)
	Dyslipidaemia	37 (45.1)
	Type 2 diabetes mellitus	34 (41.5)
	Others***	47 (57)

*Multiple responses allowed for source of medications question
**Many participants had more than one chronic health issue; as such, the total percentages will not add up to 100. The denominator is equal to the total sample size of 82.
***Other conditions include depression, asthma, anemia, rheumatoid arthritis, hyperthyroidism, heart failure, benign prostatic hyperplasia, ischaemic heart disease and end-stage renal failure.

Table II: MyMAAT Scores obtained by respondents (n =82)

Question Number	Question	Mean±SD
1	In the past one month, I frequently failed to take my medication in accordance with the doctor's instruction.	4.01±1.27
2	In the past one month, I reduced my medication intake when I felt better.	3.66±1.48
3	In the past one month, I took my medication alternately.	3.88±1.40
4	I was often late on / missed the appointment date to get the supplies of my follow-up medication at the pharmacy counter.	3.99±1.35
5	I have excess supply of the prescribed medication at home.	3.78±1.43
6	I did not fully comply with the prescriptions because I felt it was unnecessary/insignificant.	4.27±1.27
7	In the past one month, I frequently failed to remember to take my medication.	3.94±1.31
8	I regularly take less medication than prescribed for fear of the side effects to my body.	4.04±1.40
9	I will miss/not take my medication if no one reminds me to do so.	4.15±1.25
10	I am uncertain about my daily medication doses.	4.37±1.20
11	I am unable to manage my medication intake properly.	4.29±1.21
12	Without support or help from the loved ones, I lack motivation to take my medication as prescribed by the doctor.	4.22±1.24

Concordance Scale consists of 10 items with a 4-point Likert Scale. The options ranged from "Did not happen" to "Very good". The Modified Concordance Scale was used to measure doctor-patient concordance from the patient's perspective. No pilot testing was done prior to administering this questionnaire. Permission was obtained from the authors of both questionnaires for use in this study for the MyMAAT and Modified Concordance Scales, respectively.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics software (version 29; IBM Corp., Armonk, NY). A Kolmogorov–Smirnov test was conducted to assess the normality of data, as both the Modified Concordance Scale and MyMAAT scores were non-normal. A Spearman's rank correlation was performed to determine the relationship between concordance scores and medication adherence scores. Subgroup means by sex, age, race, source of medications, number of medication types, and education level were also compared using Kruskal-Wallis tests to assess statistical differences in medication adherence. Demographic and patient characteristic factors were then included in a final logistic regression to adjust for confounding variables. Responses with missing data were excluded from the analysis, in line with a complete-case analysis.

RESULTS

Sociodemographic Characteristics of the Respondents.

A total of 82 responses were collected over five months. The sample distribution across the different regions is as follows: 24.4% from Iskandar Puteri, 14.6% from Kluang, 13.4% from Pontian, 26.8% from Taman Mount Austin, and 20.7% from Johor Bahru. The sample consisted of almost equal numbers

Table III: Modified Concordance Scale Scores obtained by respondents (n = 82)

Question Number	Question	Mean±SD	Correlation with MyMAAT scores*
1	Doctor described the reason you need long-term medication.	3.32±0.887	0.001**
2	Doctor clarified that there is more than one treatment option.	2.49±1.189	0.018**
3	Doctor outlined all the options available.	2.67±1.187	0.037**
4	Doctor provided information in a format you found useful.	3.12±1.011	0.025**
5	Doctor checked your full understanding of all the issues.	2.89±1.077	0.141
6	Doctor explored your concerns, expectations and options.	2.67±1.077	0.169
7	Doctor checked the role you wanted to take in making decisions.	2.76±1.182	0.020**
8	Doctor gave you time to talk to others before reaching a decision.	2.79±1.214	0.250
9	Doctor made a final decision	3.18±0.970	0.973
10	Doctor reviewed the decision after a while.	3.23±1.010	0.084

*Correlation calculated via Spearman Rho
** Statistically significant correlation

Table IV: Subgroup Comparison of MyMAAT Score means

Variables		Mean MyMAAT Score	p-value
Gender	Male	45.8	0.014*
	Female	51.24	
Race	Chinese	48.09	0.962
	Malay	48.81	
	Indian and other	49.18	
Age	Adult (18-47)	47.28	0.975
	Older Adult (48-67)	48.57	
	Senior (≥68)	49.68	
Source of medication	Government Hospitals and Clinics	47.64	0.158
	Private Hospitals and Clinics	48.64	0.447
	Private Pharmacies	43.36	0.214
Number of Types of Medications	≤4	49.00	0.214
	≥5	47.52	
Education Level	Primary school and below	46.19	0.304
	Secondary school and higher	49.17	
Types of chronic illness	Hypertension	48.77	0.774
	Dyslipidaemia	50.32	0.436
	Type 2 diabetes mellitus	47.40	0.183
	Others	47.10	0.340

of male and female respondents, as shown in Table I: 51.2% female and 48.8% male. The mean age of the participants was 57.5 years.

The MyMAAT Score

The MyMAAT total score can range from 12 to 60. Adherence is defined as a MyMAAT score of ≥54. We can see an adherence rate of 41.5% (95% CI 31%-52%). The mean MyMAAT score is 48.59. Table II shows the mean scores by question.

Modified Concordance Scale Scores

The total scores can range from 10 (low concordance) to 40 (high concordance), with an average score of 29.12. 45.1% (95% CI 34%-56%) of patients achieved high concordance scores (30-40). The Modified Concordance Scale had a Cronbach Alpha of 0.852. Table III shows the mean scores by question.

Correlation between treatment concordance and medication adherence

Spearman's rank correlation was used to identify the correlation between medication adherence and treatment concordance. This was because the medication adherence scores, as measured via the MyMAAT, showed a left-skewed distribution, and the one-sample Kolmogorov-Smirnov test was significant ($p<0.001$). As the data were not normal, a non-parametric test was chosen. There is a statistically significant weak correlation between the MyMAAT score and the Modified Concordance Scale score ($\rho=0.286$, 95% CI 0.06584-0.4799; $p=0.009$).

Items 1, 2, 3, 4 and 7 from the Modified Concordance Scale have statistically significant correlations with MyMAAT scores. Item 1 also has the largest effect size, Rs 0.35, indicating a weak correlation.

Impact of demographic factors on medication adherence

There is a statistically significant difference in MyMAAT scores between males and females, as shown in Table IV. Female vs male OR was calculated via logistic regression adjusting for confounding factors, with adherence (MyMAAT≥54) as a binary factor (OR=4.23; 95% CI 1.38-12.91; $p=0.011$), the model is presented in Table V. The "Other" race category in this study includes 2 respondents of Siamese origin.

Table V: Logistic regression of demographic factors and clinical characteristics of participants with adherence defined as MyMAAT ≥54

Variables		B	S.E.	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
								Lower	Upper
Age	18-47	0.25	1.03	0.06	1	0.809	1.28	0.17	9.62
	48-67	0.23	0.71	0.11	1	0.743	1.26	0.31	5.08
Race	Malay	0.01	0.72	0.00	1	0.989	1.01	0.25	4.15
	Chinese	0.21	0.87	0.06	1	0.812	1.23	0.22	6.83
Education Level	Primary and lower	0.02	0.77	0.00	1	0.978	1.02	0.23	4.61
Gender	Female	1.44	0.57	6.41	1	0.011	4.23	1.38	12.91
Medication source	Government clinics and hospitals	-0.57	1.25	0.21	1	0.646	0.56	0.05	6.49
	Private hospitals and clinics	-0.11	1.26	0.01	1	0.933	0.90	0.08	10.58
	Private pharmacies	-0.74	0.77	0.91	1	0.339	0.48	0.10	2.18
Chronic medical conditions	Hypertension	-0.35	0.64	0.30	1	0.582	0.70	0.20	2.47
	Dyslipidemia	0.58	0.64	0.83	1	0.363	1.79	0.51	6.29
	Type 2 diabetes mellitus	-0.27	0.67	0.16	1	0.688	0.77	0.21	2.82
	Other medical conditions	-0.57	0.60	0.90	1	0.342	0.57	0.18	1.83
Number of medications	1-4	1.08	0.94	1.32	1	0.250	2.95	0.47	18.62
Constant	-	-0.52	1.49	0.12	1	0.727	0.59		

Notes:
1. Reference subcategories for the variables are as follows: Age: >67; Race: Indian and others; Education level: Secondary and higher; gender: male; medication source and chronic medical conditions: respondents who did not choose that option; number of medications: 5-8
2. Model Nagelkerke R2=0.22, Overall classification accuracy 69.5%

All other demographic factors did not have a statistically significant influence on MyMAAT scores. For the source of medications question and types of chronic illness question, respondents were allowed more than one response; as such, each subgroup was compared with respondents who did not choose that option. A number of subgroups were combined before comparison due to low numbers.

Chronic illnesses as reported by respondents

The top 5 chronic illnesses reported by respondents were hypertension (63.4%), dyslipidaemia (45.1%), type 2 diabetes mellitus (41.5%), asthma (7.3%) and heart failure (4.9%). 49% of respondents had 2 or more comorbidities. There is no statistically significant difference in MyMAAT scores between those with and without multiple comorbidities.

DISCUSSION

We have found that there is a statistically significant weak correlation between medication concordance as measured by the Modified Concordance Scale and medication adherence as measured by the MyMAAT scale (ρ=0.286, p=0.009). This is in line with a 2002 qualitative study that used a concordance-based consultation model to improve clinical outcomes in non-adherent patients, which showed improvement in 14 of the 22 study participants.16 However, the weak correlation points to limited clinical predictive value and must be interpreted with caution. A 2023 Systematic review on the impact of shared decision-making on medication adherence found no significant effect of shared decision-making interventions on adherence among patients with chronic illness. This systematic review included 2 studies, both of which used decision aids as an intervention to improve shared decision-making; however, the studies reported high medication adherence even before the intervention, which may explain the lack of a significant effect.[17] Another 2020 retrospective study[18] also found no significant effect of shared decision-making on medication adherence; this may be due to cultural differences, as the study was conducted in the USA. Furthermore, adherence was measured using the Medication Possession Ratio, calculated as the ratio of total days of medication supplied to the number of days in a specified time interval. This is a more objective measure of adherence compared to the MyMAAT questionnaire, which relies on patient self-reporting. While these studies focused on shared decision-making, medication concordance is a component of shared decision-making, and they remain a useful comparison for our findings.

Our analysis showed that Item 1 of the Modified Concordance Scale, "Doctor described the reason you need long-term medication," had the strongest correlation with MyMAAT scores among the items, with a p-value of 0.01. This demonstrates that when patients understand the rationale behind their prescriptions, adherence rates improve. This may provide evidence for the use of face-to-face health education and information flyers to improve adherence, in line with a 2025 review that identified studies with statistically significant outcomes for both interventions.[19] This is in contrast to technology-assisted methods to improve adherence, as was investigated by Pratiwi et al.[20] in their systematic review; these technology-assisted methods focus on improving memory and compensating for disabilities in the patient, which may impair adherence, in contrast to concordance, which is more concerned with understanding, cooperation, and partnership.

Furthermore, an adherence rate of 41.5% was reported (defined as a MyMAAT score of ≥54).[7,15] This is on the lower end of previous findings, which reported 65.8% (a meta-analysis of 12 studies in 2022 focusing on patients with Type 2 diabetes mellitus) [7], 49% (focusing on older adults in Pahang in 2024),[21] 60.3 (conducted in a Health Clinic in Pagoh, Johor in 2023).[22] This may be due to the smaller sample size in this study. Furthermore, this study was focused only on populations within Johor. This may indicate a lower regional prevalence of medication adherence. Moreover, this

study was conducted in a community setting with door-to-door visits, which may have allowed us to capture patients who had defaulted on their clinic follow-ups, in contrast to most existing studies, which were conducted in clinical settings.

Additionally, we found that sex had a statistically significant impact on medication adherence, with females 4.23 times more likely to be adherent than males. This contrasts with previous studies, which generally showed a lack of relationship between sex and medication adherence.[23-25] It is important to interpret this finding in context, as the study's small sample size reduces precision. Therefore, this finding is of limited clinical value. However, a 2021 study by Chang et al. in Taiwan shows that females have a higher rate of medication adherence.[26] They also note the conflicting past evidence when it comes to the relationship between sex and medication adherence.

The main implication for practice from this paper is the importance of achieving concordance with patients when prescribing medications to improve medication adherence. For example, in this study, based on the responses to the Modified Concordance Scale, 52.4% of respondents chose "Did not happen" or "Not very good" for the statement "Doctor clarified that there is more than one treatment option.", and 45.1% chose similarly for the statement "Doctor explored your concerns, expectations and options.". This shows that a significant number of patients feel that doctors are not fully explaining the available treatment options. Furthermore, patients perceive a lack of exploration of their concerns and expectations, which is crucial to patient-centered care. We therefore need to ensure adequate explanation and promotion of patient choice in treatment decisions to improve patient outcomes.

LIMITATIONS

The most significant limitation of this study is the small sample size of 82 respondents. This means that the study is underpowered and that there is an important limitation on its precision. There is also limited ability to accurately represent the Johor population, as our sampling methodology is convenience sampling rather than random. This was primarily due to the difficulty of sourcing respondents in the community. This study should be expanded to cover more respondents from different areas across Johor to improve representability and should be conducted in primary healthcare settings as a longitudinal analysis to further explore the observed findings.

Secondly, this study used patient-reported measures of concordance and medication adherence, which are likely subject to both recall bias leading to inaccurate reporting and social desirability bias which could skew results and inflate the adherence estimates. As the chronic illness diagnoses were also self-reported there is a further risk of misclassification bias. It would be fruitful to repeat this study with perspectives on medication concordance from physicians and independent observers.

Thirdly, medication concordance is built along with the doctor-patient relationship; as such, it is suboptimal to measure it based on a single consultation; a study with a longer time frame and follow-ups will be better able to capture this. More research can also be done on the relationship between gender and medication adherence in the local context.

Fourthly, the study uses a convenience sampling method, which may introduce selection bias. Participants who are willing to respond may be better informed about the underlying medical conditions and, consequently, have better medication adherence.

Fifthly, the Modified Concordance scale was adapted from the original study, where it was used in the context of HIV patients; it did not undergo pilot testing or validation prior to use in the chronic disease population, which serves as a limitation as to the reliability of this instrument.

STRENGTHS

This study has 3 primary strengths: firstly, with current clinical practice moving towards shared decision-making and medication concordance, it is both timely and relevant to address this topic. Secondly, this study helps fill a critical gap in the literature by providing quantitative evidence in the Malaysian context. Thirdly, this study has generated useful hypotheses for further exploration in larger-scale studies.

CONCLUSION

In conclusion, our study found that the rate of medication adherence across 5 suburban communities in Johor is approximately 41.5%. There is also a weak and statistically significant relationship between medication concordance and medication adherence. Furthermore, our study points to a statistically significant relationship between female sex and medication adherence, which should be interpreted with caution. This finding may have implications for clinical practice by highlighting the need for practitioners to include additional interventions for male patients in routine care to improve medication adherence. Future research on this topic can be enhanced by including larger sample sizes and by utilizing more objective measures of medication adherence, especially via the utilisation of electronic monitoring devices. Physician responses can also be solicited when measuring medication concordance.

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CONFLICT OF INTEREST
None.

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ETHICAL APPROVAL
Ethical approval was obtained from the Newcastle University Ethics Committee (Ref: 43616/2023) prior to the data collection.

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