ORIGINAL ARTICLE

A Prospective Cohort Study of Medication Beliefs and their Impact on Medication Adherence in Aboriginal and Non-aboriginal Patients

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ABSTRACT

Introduction: Most research has primarily focused on the influence of patients' beliefs on medication adherence in non-aboriginal populations. This study compared medication beliefs among aboriginal and non-aboriginal patients with hypertension and/or diabetes mellitus, predictors of medication beliefs, and their impact on medication adherence. **Methods:** A prospective cohort study was conducted using the Beliefs about Medicines Questionnaire-Specific on a randomly selected sample of 38 patients for each group. Medication adherence was measured by pill counts and prescription refill history. **Results:** Over half of the aboriginal and non-aboriginal patients believed that the medications are necessary for their health. In particular, aboriginal patients had higher necessity score (mean 21.32, SD 2.90) than non-aboriginal patients (mean 19.45, SD 3.68, $p<0.05$). More aboriginal patients worried about the long-term effects of their medications (78.9%) and drug dependence (81.6%). In aboriginal group, greater disease knowledge was associated with higher necessity scores [$F(1,36)=12.67$, $p<0.05$, $R2=0.26$] and positive necessity-concerns differential (NCD) [$F(1,36)=6.092$, $p<0.05$, $R2=0.145$]. In non-aboriginal group, older patients were associated with higher necessity scores [$F(1,36)=5.855$, $p<0.05$, $R2=0.140$] while females were associated with greater concerns scores [$F(1,36)=6.170$, $p<0.05$, $R2=0.146$] and negative NCD, which had also been observed in the employed patients [$F(2,35)=7.314$, $p<0.05$, $R2=0.295$]. Medication non-adherence was more prevalent among aboriginal patients (73.7%) and was predominantly associated with higher concerns in both groups. **Conclusion:** Despite strong medication necessity beliefs, levels of concerns were substantial in both groups and were associated with medication non-adherence. More patient-centred approaches should be designed to address patients' concerns and improve treatment outcomes.

Keywords: Prospective study, Medication adherence, Medicine, Hypertension, Diabetes Mellitus

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INTRODUCTION

The aboriginal peoples of Peninsular Malaysia or also known as Orang Asli are ethnic minorities, comprising approximately 0.6% of the total Malaysian population in 2017 (1). Researchers from Monash University Malaysia found that aboriginal peoples of Peninsular Malaysia suffer greater health risks than the rest of the Malaysian population (2). A recent study by Phipps et al. (3) reported a variable prevalence of diabetes, obesity, high blood pressure and high cholesterol among the seven aboriginal communities of Malaysia in contrast to the large ethnic groups such as Malays, Chinese and Indians. These differences may be due to their socioeconomic effects, lifestyle changes, and even genetic predispositions. Life expectancy for the aboriginal people was also found to lie 20 years below the general Malaysian population with an average age of 53 years (4). The cause of this life expectancy differential is heterogeneous and complex. It is known that medication therapy can significantly increase life expectancy and quality of life. However, poor adherence to long-term therapies remains a major obstacle to the effective delivery of health care.

Aboriginal people are often said to be poorly adherent as there is global evidence demonstrated a lower rate of medication adherence amongst the marginalized group (5). Nevertheless, medication non-adherence is not unique to this population. Approximately half of the general population with chronic diseases does not take their medication as directed (5). The reasons for non-adherence to medication are multifactorial. A recent meta-analysis of 94 studies involving over 25,000 patients across 19 countries and 19 types of long-term conditions demonstrated that medication non-adherence was

significantly associated with patients' beliefs about their medication (6). Horne et al. (6) proposed a recognition approach to address medication beliefs based on a Necessity-Concerns Framework. The framework postulates that patients who perceive high necessity and low concerns towards their medication are more likely to be adherent. In addition, beliefs about medicines were also found to be stronger determinants of medication adherence than any other socio-demographic or clinical factors (7). Therefore, assessing the balance between patients' necessity beliefs and concerns may help the clinicians to elucidate the medication-taking behaviour of patients with chronic diseases.

Up to now, many of the aboriginal people are still holding strong beliefs in the spirit of nature. The aboriginal people living in the state of Perak, Malaysia believe that the forest could furnish natural remedies when they need medicines to alleviate illnesses (8). To them, natural remedies using plants found in their surroundings were safe compared to modern medications as this practice has been passed on through the generations (9). However, contrary to this, a recent qualitative in-depth interview study from the Pahang state of Peninsular Malaysia demonstrated that the sub-tribe of the aboriginal communities, namely the Jakun people had been adapting themselves to the mainstream health care system (10). Interestingly, the study found that the Jakun people preferred modern medications over traditional aboriginal medicine due to the lack of access to the forest products and deteriorating faith in traditional medicine (10). The disparity between traditional aboriginal health beliefs and western medical system appears to exacerbate the challenges of providing health services to aboriginal communities and greatly affects the adherence to medication in this population.

In the past, many research studies have focused on the aboriginal health awareness and inequalities in access to health care for the local aborigines (8,10,11). Little is known about the impact of medication beliefs on adherence to medications in the aboriginal patients receiving medical treatment in health clinics or hospitals. Therefore, this study was conducted to compare medication beliefs among aboriginal and non-aboriginal patients with chronic diseases, predictors of medication beliefs, and their impact on medication adherence in both groups of patients.

MATERIALS AND METHODS

Study design and setting

This prospective cohort study was conducted between May 2018 and February 2019 at a government primary healthcare clinic located in Kahang town, a suburban area of Kluang district in the Johor state of Peninsular Malaysia. This clinic was selected due to its high attendance of aboriginal patients compared to other clinics in the area.

This study was approved by Medical Research and Ethics Committee, Ministry of Health Malaysia (NMRR-18-1573-41728). Permission to collect data was received from the director of the Kluang District Health Office.

Estimation of sample size

Sample size calculation was done using Power and Sample Size Calculation version 3.1.2 (12). Based on previous study (13), the population standard deviation (SD) was 3.13. If the estimated real difference in the aboriginal and non-aboriginal group means was 2.3, we would have to study 30 aboriginal patients and 30 non-aboriginal patients to reject the null hypothesis that the population means of both study groups were equal at a power of 0.80 and an alpha of 0.05. Adjusting for an estimated attrition rate of 20%, the target sample size was 38 patients per group.

Study population and sampling

This study involved both aboriginal and non-aboriginal patients aged 18 years and above presenting at the attended clinic. The simple random sampling technique was used to sample 38 patients from each aboriginal and non-aboriginal group. Prior to randomization, a list of aboriginal and non-aboriginal patients who visited the clinic was determined. The patients in each group were assigned a unique number. Each number was written on a separate sheet of paper, which was then shuffled and removed from a box at random. Study participants were selected separately from the two populations using the lottery method. Patients were included if they were diagnosed with hypertension or diabetes mellitus, or both, and had been taking medication for more than a year. Only patients who were willing to give written consent to participate in the study were recruited. Meanwhile, caregivers and those who were unable to understand spoken words due to hearing loss, having severe visual impairment that hinders reading, having psychiatric illness not written in the file, or having insulin mono-therapy for diabetes were excluded from the study.

Data collection and measurement tools

The data collection process is summarized in Fig. 1. The study period was ten months (May 2018 – February 2019), with an active recruitment phase of five months. Each patient was followed up for a minimum period of five months from the date of enrolment. Following enrolment, participants were asked some demographic questions on the survey, such as gender, age, highest level of education and current employment status. The participants were also asked several questions relating to their health conditions, such as types of chronic diseases, disease duration and disease-related knowledge on diabetes and hypertension. The questionnaire was prepared in both English and Malay languages and was administered by two well-trained interviewers at the study site. A standardized 31-item questionnaire (14) utilizing closed-ended questions was used to measure

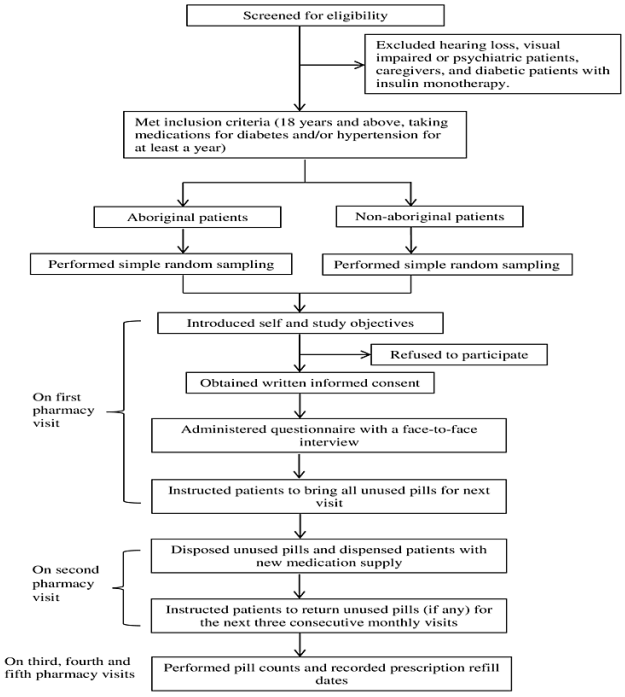

Figure 1: Flowchart of data collection process

participants' knowledge about the diseases based on five domains: lifestyle, diet, common knowledge, risk factors and complications of the diseases. A correct answer would get a point, and a wrong or missing answer would get no point. According to Song et al. (14), a participant who scored at least 60% of the total points was considered as having higher knowledge about their disease. In this study, the scale had acceptable reliability with Cronbach's alpha value of 0.79.

Beliefs about medicines

The Beliefs about Medicines Questionnaire-Specific (BMQ-Specific) (15) was used to evaluate patients' beliefs about their medication. It consists of two 5-item subscales that assess patients' beliefs about the need for their prescribed medications (Necessity scale) and their concerns about the consequences of taking medication (Concerns scale). Respondents were asked to express their level of agreement with each statement using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The total score for each BMQ subscale ranged from 5 to 25, a higher score indicating greater belief in the concepts represented by the subscale. The BMQ-Specific was presented both in its original English version (15) and the Malay translated version (16). The Cronbach's alpha was 0.769 for the Necessity scale and 0.724 for the Concerns scale, implying good level of internal consistency of the items measured in the study sample. The patients' overall belief in their medication was determined by the difference between the necessity and concerns scores, which was known as necessity-concerns differential (NCD). If the total score of the 5-item medication Necessity scale was higher than the total score of the 5-item medication Concerns scale, the patient was considered to have positive medication belief. Otherwise, patient's belief was considered as negative. A positive differential score indicated a stronger belief in the need for medication than concerns over the medication and on the contrary, a negative differential indicated stronger concerns. Patients' concerns about their medication were equal to the perceived necessity of therapy when they had a zero differential score.

Medication adherence

Medication adherence was measured using the pill counts and prescription refill history during three consecutive monthly visits to pharmacy for prescription refills. During the follow-up period, participants were requested to collect their prescribed medications at the pharmacy of the study site. At each prescription refill appointment, all participants were instructed to bring their medication bottles, and a pill count of unused medication was performed. Pill count adherence was calculated as the number of pills taken (total number of pills dispensed during the previous visit – total number of pills left in the bottle) divided by the number of pills dispensed (total pills per day multiplied by the total number of days' supply) and multiplied by 100% (17). Patients were considered adherent if they demonstrated over 90% of pill count adherence (17).

Prescription refill adherence was measured as the cumulative medication gap (CMG) which was performed simultaneously with pill count. The CMG was calculated as the cumulative number of days in which a patient was late for medication pick up appointments between each filling, divided by the total number of days between the first and last filling (18). The gap length was zero when the prescription was refilled on or before the expected refill date. However, when the prescription was refilled later than expected, the interval between the actual and expected refill date was calculated and recorded as the gap length. The gap was adjusted for medication changes and the possible surplus of previous supplies (19). Accordingly, patients with an overall CMG of less than 20% were considered to have adequate prescription refill adherence (18). In this study, we required a pill count of at least 90% and CMG less than 20% for a patient to be considered adherent.

Data analysis

Statistical analyses were done using SPSS software version 18.0. Prior to data analysis, data distributions were assessed by performing the normality tests. Categorical variables were described as frequencies and percentages (%), while continuous variables with normal distribution were reported as mean and standard deviation (SD). For continuous variables not normally distributed, data were presented as median and interquartile range (IQR). A two independent samples t-test was used to compare the mean necessity and concerns scores between the aboriginal and non-aboriginal patients. Univariable linear regression analysis was used to evaluate the

possible association between the necessity scores, concerns scores and NCD scores with the patients' demographic and treatment characteristics. Variables with a p-value of less than 0.2 in the univariable analysis were selected for inclusion in the multivariable linear regression analysis with backward stepwise regression in order to determine the independent predictors for each of the BMQ subscales and for NCD. The relationship of medication adherence to necessity, concerns and NCD scores was analysed using the two-independent samples t-test. Chi-Square test was used to further investigate the association between those who had positive, neutral or negative medication beliefs with their adherence to medication. Analyses with p-values below 0.05 were considered as statistically significant.

RESULTS

Patient characteristics

A total of 76 patients consented to join the study and completed the questionnaire with a response rate of 100%. An equal number of aboriginal and non-aboriginal patients were interviewed and assessed for their medication adherence. Table I describes the characteristics of the study participants as stratified by indigenous status. Generally, there were no significant differences between the groups in demographic characteristics, types of chronic diseases, disease duration and number of medication taken. However, aboriginal patients had lower education levels ($p < 0.001$) and poorer knowledge towards their disease ($p < 0.05$) as compared to non-aboriginal patients (Table I).

Table I: Characteristics of aboriginal and non-aboriginal respondents

	Aboriginal (n=38)	Non-aboriginal (n=38)	P value
Gender, n (%)			
Male	8 (21.1)	11 (28.9)	0.427
Female	30 (78.9)	27 (71.1)	
Age, years Mean ± SD	56.82 ± 10.45	59.63 ± 11.78	0.274
Education level, n (%)			
No formal education	31 (81.6)	4 (10.5)	0.000
Primary	6 (15.8)	17 (44.7)	
Secondary	1 (2.6)	16 (42.1)	
College/University	0 (0)	1 (2.6)	
Employment status, n (%)			
Employed	21 (55.3)	16 (42.1)	0.251
Unemployed/Retired	17 (44.7)	22 (57.9)	
Types of chronic disease, n (%)			
Hypertension	23 (60.5)	19 (50.0)	0.608
Diabetes	4 (10.5)	4 (10.5)	
Both	11 (28.9)	15 (39.5)	
Disease duration, years Median (IQR)	4.5 (1 – 10)	5.5 (3.75 – 11)	0.087
Number of medication Median (IQR)	3.5 (2.75 - 5)	4 (3 – 5)	0.966
Disease knowledge, % Median (IQR)	76.2 (69.78 – 84.8)	90.3 (78.15 – 93.5)	0.003

n= number; SD= standard deviation; IQR= interquartile range; % = percentage

Beliefs about medicines scores

As shown in Table II, over half of the respondents in each group believed that medications were necessary for controlling their diseases. Aboriginal patients scored higher than non-aboriginal patients on all items of the Necessity scale, except for the item "My medicines protect me from becoming worse" (aboriginal = 86.8% versus non-aboriginal = 94.7%). Compared to the non-aboriginal patients, a significantly higher percentage of the aboriginal patients (94.7%) agreed that their health at present relies on their medicines ($p < 0.05$). On the Concerns scale, both groups did not differ in their general beliefs about medicines. However, more aboriginal patients reported concerns on the long-term effects of their medications (78.9%) and the worries of being too dependent on their medicines (81.6%).

Table III compares the mean scores of BMQ-Specific subscales and the NCD scores between aboriginal and non-aboriginal respondents. Both groups of patients had lower concerns scores than necessity scores, indicating a stronger necessity belief than concern belief about medication. Aboriginal patients had greater beliefs in the necessity of treatment in which their mean necessity score was significantly higher compared with non-aboriginal patients ($p < 0.05$). In addition, the NCD scores were

Table II: Percentage of respondents agreeing / strongly agreeing with Belief about Medicines Questionnaire statements

BMQ-Specific subscale	Percentage agreeing or strongly agreeing, n (%)		P value
	Aboriginal (n=38)	Non-aboriginal (n=38)	
Necessity scale			
My health at present depends on my medicines	36 (94.7)	28 (73.7)	0.012
My life would be impossible without my medicines	31 (81.6)	24 (63.2)	0.073
Without my medicines I would become very ill	33 (86.8)	30 (78.9)	0.361
My health in the future will depend on my medicines	33 (86.8)	30 (78.9)	0.361
My medicines protect me from becoming worse	33 (86.8)	36 (94.7)	0.234
Concerns scale			
Having to take medicines worries me	24 (63.2)	29 (76.3)	0.212
I sometimes worry about the long term effects of my medicines	30 (78.9)	27 (71.1)	0.427
My medicines are a mystery to me	17 (44.7)	17 (44.7)	1.00
My medicines disrupt my life	16 (42.1)	17 (44.7)	0.817
I sometimes worry about becoming too dependent on my medicines	31 (81.6)	25 (65.8)	0.118

BMQ-Specific= Beliefs about Medicines Questionnaire-Specific; n= number; %= percentage

Table III: Patients' beliefs about medicines

Variables	Aboriginal (n=38)	Non-aboriginal (n=38)	P value
BMQ-Specific subscale			
[a]Necessity, mean (SD)	21.32 (2.90)	19.45 (3.68)	0.016
[a]Concerns, mean (SD)	17.11 (4.05)	17.08 (4.44)	0.979
[b]Necessity-concerns differential score, mean (SD)	4.21 (5.39)	2.37 (6.31)	0.175
Overall beliefs about medication			
Positive belief, n (%)	30 (78.9)	24 (63.2)	0.314
Negative belief, n (%)	7 (18.4)	12 (31.6)	
[c]Neutral, n (%)	1 (2.6)	2 (5.3)	

BMQ = beliefs about medicines; n = number; SD = standard deviation; % = percentage
[a]Scale ranges from 5 to 25 where high scores indicate strong belief.
[b]Scale ranges from -20 to 20 where positive scores imply that patient perceives the benefits of medication to outweigh the risks.
[c]Neutral refers to patients who had zero necessity-concerns differential scores, where their necessity beliefs about medicines were equal to their concerns

higher for aboriginal patients (mean 4.21, SD 5.39) than for non-aboriginal patients (mean 2.37, SD 6.31) but the difference was not statistically significant (p=0.175). Overall, more aboriginal patients (78.9%) had positive beliefs about medicines than the non-aboriginal patients (63.2%). However, Pearson chi-square analysis showed that the overall patients' beliefs about their medications were not significantly associated with their indigenous status (P = 0.314).

Predictors of beliefs about medicines

Univariable linear regression analyses were performed to predict patients' beliefs about medication based on their demographic characteristics, disease duration, number of medication taken and disease knowledge (Table IV). Accordingly, in the aboriginal group, disease duration and patients' disease knowledge were possibly associated with the Necessity scale and NCD when selecting those with a p value below 0.2. For the Concerns scale, it was possibly associated with gender and disease duration of the aboriginal patients. In the non-aboriginal group, age, education level and employment status were possible predictors of the Necessity scale, while gender was the only predictor associated with the Concerns scale. The demographic variables of the non-aboriginal patients such as age, gender and employment status were possibly associated with the NCD.

Variables with a p-value of less than 0.2 in the univariable analysis were selected for inclusion in the multivariable linear regression analysis. The results are summarized in Table V. In the aboriginal group, disease knowledge was the significant predictor for both Necessity scale [$F(1,36)=12.67$, $p<0.05$, $R2=0.26$] and NCD [$F(1,36)=6.092$, $p<0.05$, $R2=0.145$]. Aboriginal patients' predicted necessity score was equal to 14.866 + 0.087 (disease knowledge), where knowledge was measured in percentage. On the other hand, the predicted NCD in aboriginal patients was -4.74 + 0.120 (disease knowledge). Thus, the analyses suggested that a one per cent increase in disease knowledge was associated with a 0.087 unit increase in necessity score and a 0.12 unit increase in NCD score in an aboriginal patient. However, none of the possible factors associated with Concerns scale for the aboriginal group in the univariable analyses reached statistical significance in the multivariable analysis.

Based on the multivariable analyses, age was the significant predictor for the Necessity scale [$F(1,36)=5.855$, $p<0.05$, $R2=0.140$] in non-aboriginal patients (Table V). The regression equation for Necessity scale was 12.479 + 0.117 (age), indicating an additional year of age resulted in a 0.117 unit increase in necessity score. On the other hand, gender was the only significant

Table IV: Univariable linear regression analysis between Beliefs about Medicines Questionnaire-Specific and patients' general characteristics

Variable	Necessity				Concerns				Necessity-concerns differential			
	Aboriginal		Non-aboriginal		Aboriginal		Non-aboriginal		Aboriginal		Non-aboriginal	
	Beta [95% CI]	P value	Beta [95% CI]	P value	Beta [95% CI]	P value	Beta [95% CI]	P value	Beta [95% CI]	P value	Beta [95% CI]	P value
Age	-0.036 [-0.129, 0.057]	0.436	0.117 [0.019, 0.215]	0.021	0.034 [-0.096, 0.165]	0.596	-0.067 [-0.193, 0.058]	0.283	-0.070 [-0.243, 0.102]	0.414	0.184 [0.014, 0.354]	0.034
Gender	-0.233 [-2.601, 2.134]	0.843	-0.138 [-2.845, 2.569]	0.918	2.192 [-1.034, 5.418]	0.177	3.694 [0.678, 6.709]	0.018	-2.425 [-6.757, 1.907]	0.264	-3.832 [-8.284, 0.621]	0.089
Education	-1.189 [-3.648, 1.270]	0.333	3.691 [-0.110, 7.492]	0.057	-0.221 [-3.701, 3.259]	0.898	-0.088 [-4.912, 4.735]	0.971	-0.968 [-5.592, 3.657]	0.674	3.779 [-2.953, 0.512]	0.262
Employment	-0.465 [-2.401, 1.471]	0.629	2.068 [-0.318, 4.455]	0.087	-1.468 [-4.136, 1.2]	0.272	-1.159 [-4.132, 1.813]	0.434	1.003 [-2.596, 4.601]	0.575	3.227 [-0.890, 7.345]	0.121
Disease duration	0.157 [0.001, 0.313]	0.049	0.017 [-0.228, 0.262]	0.888	-0.156 [-0.38, 0.068]	0.168	0.024 [-0.272, 0.320]	0.870	0.312 [0.024, 0.600]	0.034	-0.007 [-0.427, 0.413]	0.974
Number of medication taken	0.105 [-0.488, 0.698]	0.722	0.468 [-0.548, 1.484]	0.356	-0.111 [-0.941, 0.718]	0.787	0.460 [-0.769, 1.690]	0.453	0.216 [-0.888, 1.320]	0.694	0.008 [-1.753, 1.768]	0.993
Disease knowledge	0.087 [0.037, 0.136]	0.001	0.017 [-0.057, 0.091]	0.643	-0.034 [-0.113, 0.046]	0.397	-0.053 [-0.140, 0.035]	0.229	0.120 [0.021, 0.219]	0.018	0.070 [-0.055, 0.194]	0.263

95% CI= 95% confidence interval

Table V: Summary of backward stepwise multiple regression analysis

Indigenous status	BMQ-specific subscale	Factors	Beta [95% CI]	P value
Aboriginal	Necessity scale	Disease knowledge (%)	0.087 [0.037,0.136]	0.001
	Necessity-concerns differential	Disease knowledge (%)	0.120 [0.021,0.219]	0.018
Non-aboriginal	Necessity scale	Age (years)	0.117 [0.019,0.215]	0.021
	Concerns scale	Female gender	3.694 [0.678,6.709]	0.018
	Necessity-concerns differential	Female gender	-7.653 [-12.259,-3.046]	0.002
		Employed	-6.836 [-11.068,-2.605]	0.002

A p value <0.05 was considered statistical significant. None of the factors associated with Concerns scale for the aboriginal group reached statistical significance. BMQ-Specific= Beliefs about Medicines Questionnaire-Specific; 95% CI= 95% confidence interval

predictor for the Concerns scale [F(1,36)=6.170, p<0.05, R2=0.146] among the non-aboriginal population where women scored 3.694 points more than men. The regression equation for the Concerns scale was 14.455 + 3.694 (female gender). As for the NCD, both gender and employment status of the non-aboriginal patients were significant predictors of the differential scores [F(2,35)=7.314, p<0.05], R2=0.295]. The non-aboriginal patients' predicted NCD score was 10.684 – 7.653 (female gender) – 6.836 (employed group). Females scored 7.653 points less than males and those employed scored 6.836 points lower than unemployed patients on the NCD. Other variables did not reach statistical significance (p>0.05) in the multivariable regression model.

Association between medication adherence and beliefs about medicines

Overall, a greater proportion of the aboriginal patients (73.7%) were non-adherent to their medications as compared with the non-aboriginal patients (50%) (Table VI). The necessity scores did not differ significantly between the adherers and the non-adherers for the two populations studied (p>0.05). In the aboriginal group, the mean concerns scores were significantly lower for the adherers (14.70, SD 4.57) than for the non-adherers (17.96, SD 3.54, t(36)=-2.316, p = 0.026). Likewise, mean concerns scores of the non-aboriginal patients were significantly lower in the adherent group (15.00, SD 4.47) compared with the non-adherent group (19.16, SD 3.37, t(36) = -3.236, p=0.003). The results suggested that patients with less medication concerns were more likely to be adherent. No significant association was discovered between medication adherence and the NCD scores in the aboriginal population (p>0.05). However, in the non-aboriginal population, the NCD scores were significantly more positive for the adherers (mean +4.79, SD 5.60) than for the non-adherers (mean -0.05, SD 6.16, t(36)=2.535, p=0.016). Based on Chi-square test, non-aboriginal patients were 4.8 times more likely to comply with their medication regimens if they had positive beliefs about the necessity of their medication or if they were neutral (OR 4.80, 95% CI 1.04-22.10). Conversely, the overall beliefs about medication showed no significant impact on adherence in the aboriginal population.

DISCUSSION

This study found that majority of the aboriginal and non-aboriginal patients had strong beliefs in the necessity of their medication. However, more than half of the respondents from both study groups also expressed concerns about the long-term effects of taking medications and worries of being overly dependent on their medicines. Disease knowledge was the sole predictor associated with medication beliefs in the aboriginal patients, while these beliefs were associated with age, gender and employment status of the non-aboriginal patients. Non-adherence to medication was more prevalent among the aboriginal patients, with greater concerns being more likely to be non-adherent.

In Malaysia, the aboriginal people are often seen as backward, ignorant and resistant to modern health care (20). However, the results of this study revealed that aboriginal patients had a stronger perceived need for treatment than non-aboriginal patients. The high scores on the Necessity scale could be explained by changes in the beliefs and perceptions relating to health and illness of the aboriginal people (10). The extensive network of rural health clinics and the outreach services provided

Table VI: Association between medication adherence with beliefs about medicines

Variables	Aboriginal (n=38)			Non-aboriginal (n=38)		
	Adherent (n=10)	Non-adherent (n=28)	P value	Adherent (n=19)	Non-adherent (n=19)	P value
BMQ-Specific subscale						
Necessity, mean (SD)	21.50 (2.80)	21.25 (2.98)	0.818	19.79 (2.94)	19.11 (4.36)	0.574
Concerns, mean (SD)	14.70 (4.57)	17.96 (3.54)	0.026	15.00 (4.47)	19.16 (3.37)	0.003
Necessity-concerns differential, mean (SD)	6.80 (6.05)	3.29 (4.92)	0.076	4.79 (5.60)	-0.05 (6.16)	0.016
Overall beliefs about medication						
Positive belief or *neutral, n (%)	9 (29.0)	22 (71.0)	0.424	16 (61.5)	10 (38.5)	0.036
Negative belief, n (%)	1 (14.3)	6 (85.7)		3 (25.0)	9 (75.0)	

*Consisting of one aboriginal and two non-aboriginal patients who adhered to their medications. n= number; SD= standard deviation; %= percentage

by the mobile health teams enable the aboriginal people to have equal access to health infrastructure as the non-aboriginal people. In addition, educational programs on public health and "Know Your Medicine" campaigns have been conducted in the aboriginal villages to provide information on different issues relating to health and medicines (21). These outreach programs encourage frequent social interactions between the aboriginal people and people outside their community, thereby improving their understanding and appreciation of modern health care and modern medicines. Other than social interactions, the beliefs of health and illness were proven to be influenced by the education levels (10). Younger generation of the aboriginal community is now getting educational support provided by the government. Therefore, the older generation of the aboriginal people would get awareness from the educated, younger generation and subsequently they are more inclined towards the usage of modern health care.

Compared to other chronic illness groups, the average necessity score of our study participants particularly the aboriginal group appeared much higher than that observed among rheumatoid arthritis (13), liver transplant (22), psoriasis(23) and asthmatic (24) patients. Two previous studies on medication beliefs in patients with hypertension and diabetes also found that most participants reported more necessity for the prescribed medicine to control their disease now and in the future than concerns about taking these drugs (25,26). As antihypertensive and anti-diabetic agents are life-sustaining drugs, it is not surprising that most patients believed in the necessity of their medications more than their concerns. Nevertheless, the average concerns scores for both aboriginal and non-aboriginal patients in the present study were notably higher than patients with other chronic diseases (13,22-24). More than half of the study participants were especially concerned about the dependence potential of a medication and its long-term effects, and may therefore require a greater attention in drug counselling.

It is interesting to note that perceived need for treatment and concerns about the deleterious consequences of treatment had different determinants, as have also been described in other chronic conditions (13,23). Multivariable regression analyses revealed factors both positively and negatively associated with the Necessity scale, Concerns scale and NCD for patients in both groups. For the aboriginal group, higher disease knowledge score was positively associated with greater need for medication and positive NCD. Disease-related knowledge is an essential prerequisite for effective health behaviour change in patients with chronic diseases (27). As aforementioned, aboriginal communities nowadays have frequent social interactions and communication with the healthcare providers who may act as key informants in providing information and advises relating to diseases and prescribed medications. It was hypothesized that these interactions may in turn increase the disease-related knowledge of the aboriginal people, thereby enhancing their necessity beliefs.

For the non-aboriginal group, patients' age was a positive factor associated with higher necessity scores, while female gender was positively associated with higher concerns scores. In the current study, necessity scores increased with advancing age. This finding is expected because older patients tend to suffer more from chronic diseases and they have relied on medications for a longer period of time than younger patients, thus they are more likely to believe that medications are greatly needed for their disease control. This result was supported by Clyne et al. (28) who demonstrated that over 96.3% of the elderly patients aged 70 years and above believed in the need for their medication to maintain health. Meanwhile, women had expressed greater concern about their prescribed medications than did men and with a negative NCD. This study along with two previous studies (29,30) have proposed that gender may have an impact on the beliefs in medicine because women and men differ in their health behaviours and attitudes towards medicines. Another negative factor associated with the NCD in the non-aboriginal group was the employment status of the participants. The employed non-aboriginal patients reported greater concerns about their medicines than the unemployed non-aboriginal patients. Correspondingly, the concerns scores of the employed patients were higher than their necessity scores. This could mean that employed patients prone to have negative thoughts that the potential side effects of their medications would affect their working performance.

In the current study, non-adherence to the prescribed medication was observed in almost three quarter of the aboriginal patients and half of the non-aboriginal patients. This finding is in line with some previous studies (31-33), which showed that 45% to 75% of the hypertensive and diabetes patients were non-adherent to their medications. In contrast, the degree of non-adherence in the current study was higher than the studies done in India (34) and New York (35). The reason for this discrepancy could be partly explained by the different methods used to assess adherence and the delivery of health care. In addition, another possible reason could be that most of the patients in this study had a more unfavourable balance between beliefs in necessity and concerns over medication. The findings of this study specifically support that non-adherers of the two study groups expressed significantly greater concerns about their medications than adherers. This association was also found in a recent meta-analysis (6) which showed that higher adherence was associated with fewer concerns about treatment. However, the current findings contradict the pooled results in the meta-analysis (6) and the earlier research results from Niriayo et al. (36) and Liu et al. (22) which showed that non-

adherers had lower beliefs in personal need for treatment and lower scores on the NCD compared to adherers. This impact was not apparent in the present study as the specific necessity beliefs for both study groups were not associated with non-adherence. Nonetheless, subgroup analyses showed that the NCD scores were significantly more positive for the adherers than for the non-adherers in the non-aboriginal patients. Likewise, non-aboriginal patients who had a positive belief about the need for their medication or who had equally necessity beliefs and concerns were more likely to adhere to their medication. Since non-adherers expressed greater medication concerns than did adherers, the healthcare professionals should therefore focus more on reassuring patients about the safety of their medications when dealing with particularly anxious patients, rather than just convincing them of the need for treatment.

This study has several strengths and limitations. Unlike most previous studies that measured medication adherence using the self-reported adherence scales, the data measured by performing pill count and the CMG contribute to a more precise record of patient's medication-taking behaviour. Many researchers have identified that self-reported adherence may not be the best measurement for medication adherence in clinical practice as patients may over-report adherence or underestimate non-adherence due to recall bias, missing data, social desirability issues and lack of introspection (37-39). Other than that, we are not aware of any other study that examines the impact of patients' beliefs on medication adherence among the aboriginal population, so this study fills the research gap. On the other hand, selection bias was the major limitation of this study. The method of selection may have tended to favour positive views of medicine, since the patients who went to the clinic were mainly those who generally looked after their health. On top of that, we recognized that some of the study participants, particularly the aboriginal patients might not fully comprehend several questions that were delivered to them during the interview session. Therefore, arrangements were made with their family members who are educated to provide help in explaining the meaning of the questionnaire items.

CONCLUSION

In conclusion, both aboriginal and non-aboriginal patients had more convictions about the need for medical treatment than their concerns about the medication. In particular, a greater proportion of the aboriginal patients had positive beliefs about the need for medication. Higher disease knowledge and older patients were significantly associated with stronger necessity beliefs, while females and employed patients were much more likely to have higher concerns or negative NCD scores. Generally, levels of concern were substantial in both study population and were associated with medication non-adherence. Since medication beliefs have a significant impact on patient adherence, it may be worthwhile to measure BMQ-Specific routinely and identify patients with negative attitudes towards their medication. These patients should be closely monitored on medication adherence because they could be at higher risk of non-adherence. Future studies should focus on designing more patient-centred approaches to effectively address patients' concerns and improve treatment outcomes.

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