



Research article

Association of coping mechanisms with medication adherence among young People living with HIV (PLHIV) in Klang Valley

A.N.I. Zainal-Abidin^{a,b}, H.N. Miptah^{a,b}, F. Ariffin^{a,b}, S. Razali^{b,c}, S.F. Badlishah-Sham^{a,b,*}^a Department of Primary Care Medicine, Faculty of Medicine, Universiti Teknologi MARA, Selangor, Malaysia^b Hospital Al-Sultan Abdullah (HASA), UiTM Puncak Alam, Selangor, Malaysia^c Department of Psychiatry, Faculty of Medicine, Universiti Teknologi MARA, Selangor, Malaysia

A B S T R A C T

Background: As young People Living with HIV (PLHIV) will need to take antiretroviral therapy (ART) for life, there is a need to understand their coping mechanisms in living with the disease. Lack of coping mechanisms leads to poor medication adherence and hospital follow-up, poor health outcomes and shortened life expectancy.

Objectives: This study aimed to determine the pattern of coping mechanisms in young PLHIV and its association with medication adherence.

Methods: This study was a cross-sectional study amongst young PLHIV patients (aged 20–39 years old) attending two HIV clinics in Klang Valley. Data was collected between February to August 2022. The pattern of coping strategies was assessed using the 28-item Brief Coping Orientation to Problems Experienced (COPE) questionnaire in English and Malay language, which was validated and found to have good internal consistency. Self-reported medication adherence was measured using the one-item Medical Outcomes Study (MOS) Specific Adherence Scale. Statistical analysis included descriptive statistics, single and multiple logistic regression.

Results: A total of 395 respondents were recruited for the study. The mean scores for each coping mechanism were: 1) problem-focused coping 2.98 (SD 0.62), 2) emotion-focused coping 2.40 (SD 0.48), 3) dysfunctional coping 1.84 (SD 0.44) and 4) religion/spirituality coping 3.07 (SD 0.97). The majority of the respondents (66.8%) were adherent to their ART. Respondents who had a longer duration of medication [OR:1.014 (95% CI: 1.002,1.026)] and those who adopted less religion/spirituality coping mechanisms [OR: 0.495 (95% CI:0.246, 0.997)] were found to be significantly associated with medication adherence.

Conclusion: This study revealed an overall medication adherence rate of 66.8%. Patients with longer ART duration and who adopted less religion or spirituality coping had better medication adherence. These study findings provide input into the design of intervention by clinicians and healthcare policy makers for young PLHIV in clinical practice.

1. Introduction

The prevalence of Human Immunodeficiency Virus (HIV) is increasing rapidly worldwide with the majority of cases involving young adults who contracted the disease via sexual transmission. In Malaysia, there is an estimated 81,942 PLHIV by the end of year 2021, in which it is reported that more than 70% of these new infections are occurring amongst young adults ranging from the age of 20–39 years old [1]. The advances in HIV treatment, including the introduction of antiretroviral therapy (ART) in 1995, early treatment and access to care, have reduced the gap in life expectancy between HIV-infected and HIV-uninfected individuals. The gap

* Corresponding author. Department of Primary Care Medicine, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor, Malaysia.

E-mail addresses: daizanur@uitm.edu.my (A.N.I. Zainal-Abidin), hayatul@uitm.edu.my (H.N. Miptah), farnaza@uitm.edu.my (F. Ariffin), drsalmi@gmail.com (S. Razali), sfatimah31@uitm.edu.my (S.F. Badlishah-Sham).

<https://doi.org/10.1016/j.heliyon.2024.e25740>

Received 14 August 2023; Received in revised form 9 January 2024; Accepted 1 February 2024

Available online 8 February 2024

2405-8440/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

has narrowed from 44.3 years in 1996–1997 to 8 years in 2008–2011 [2]. While the life expectancy of People Living with HIV (PLHIV) is currently near-normal, young adult PLHIV face considerable life stress, stigma and discrimination, which still exist and may arise from family members, work colleagues, healthcare professionals [3–6], religious and cultural perceptions and even the judiciary system [7–10].

Post-ART era, HIV is no longer considered as an acute terminal illness but has shifted to a chronic condition similar to other debilitating non-communicable diseases. Therefore, the focus of treatment encompasses the physical, emotional, mental and social well-being, which includes their coping mechanism [11]. Hence, there is a need to understand how young PLHIV live and cope with the disease. Coping is fundamental to lessen the impact and difficulties faced by PLHIV. It is defined as all the cognitive and behavioural efforts to master, reduce, or tolerate external or internal demands by alleviating the impacts. To adapt to a stressful situation, coping has been categorised into problem-focused, emotion-focused, meaning-making, social coping and dysfunctional coping mechanisms [12–14].

Problem-focused coping strategies are also known as active coping, as direct action is taken to solve the problem. However, when the problem is beyond a patient's control, regulating their emotions is a coping strategy to deal with the problem, which is known as emotion-focused coping. Problem-focused coping, even though the least frequently used, was found to be more helpful and efficient in avoiding stress. Emotion-focused coping strategy was more frequently used by PLHIV due to the negative biopsychosocial impact faced by PLHIV [15,16], however is associated with depression in the long run [17]. Meaning-making coping is an example of a psychological process that explains the extent to which PLHIV have made sense of or found positive meaning from their HIV diagnosis [14]. It has been shown to be a useful coping strategy in helping their attitudes towards positive thinking in life, stopping self-blaming and supporting the patients' commitment to undergo HIV treatment [18,19]. Emotion-focused coping also highlights the role of religion and spirituality which is an area that is under-researched within the population of young PLHIV. Recent qualitative studies have shown that PLHIV are turning towards religion and spirituality at some point in their life [20,21].

Coping mechanism may be one of the factors associated with medication adherence, which is pivotal in determining disease outcomes amongst PLHIV. A systematic review revealed that a lack of emotion-focused coping and adopting dysfunctional coping are barriers to optimal medication adherence [22,23]. Other reasons contributing to poor medication adherence and compliance to medical follow-ups can be divided into individual, social and structural factors. They include financial constraints, homelessness, poor social support, stigma, depression, feeling tired and lazy due to work, falling asleep before taking medicine and the perceived healthy physical condition of other HIV-positive friends who did not take antiretrovirals [24,25]. Therefore, it is important for PLHIV to adopt coping mechanisms that improve long-term medication adherence and the well-being of patients.

There is a lack of studies determining the association between coping mechanisms and medication adherence, especially among young PLHIV. This study aimed to determine the pattern of coping mechanisms in young PLHIV and its association with medication adherence. The outcome of the study can be used to guide stakeholders in designing interventions in clinical practice and also guide the community, family and friends to be able to provide support to young PLHIV.

2. Methodology

2.1. Study design and setting

This was a cross-sectional study carried out in two HIV clinics in Klang Valley, Selangor, Malaysia between February to August 2022. One of the HIV clinics was based in a tertiary hospital, the largest referral centre for infectious diseases in the country. The other HIV clinic was located in a primary health clinic. Both clinics provided a good diversity of racial backgrounds of patients.

2.2. Study population

The participants recruited for this study were PLHIV who were diagnosed with HIV as per the Malaysian Consensus Guidelines on Antiretroviral Therapy [26] and were followed up at either one of the two HIV clinics. The inclusion criteria included PLHIV between 20 and 39 years old, has been on ART for a minimum of 6 months and consented to participate in the study. The age group was chosen for the purpose of this study as it has the highest prevalence of HIV new infection. Patients were excluded if they were diagnosed with mental health disorders or were not medically stable.

2.3. Study tool

The tool that was used in this study was the Brief COPE Malay version [27]. It is the simplified version of the COPE questionnaire, which was developed by Carver et al., in 1989 [28]. This self-administered questionnaire was designed to evaluate the coping responses of adults facing a broad range of diseases [12,28]. It was adapted and translated by forward and backward translation from English to the Malay language. The forward translation (English to Malay language) was done independently by a linguistic expert (L1) and medical expert (M1). Both transcripts L1 and M1 then underwent a process of reconciliation. The reconciliated transcript then underwent backward translation (Malay to English language) by another linguistic expert (L2) and a medical expert (M2). L2 and M2 translations then underwent a process of harmonisation to produce a harmonised Brief COPE survey in the Malay language. All items underwent Exploratory Factor Analysis (EFA) to determine the construct validity of the Malay Brief COPE. The items were found to have factor loading values of >0.3 and achieved the construction of 14 coping domains comparable to the original English Brief COPE questionnaire [27]. The Brief COPE Malay version was found to have an overall internal consistency of 0.83. The internal consistencies

of each of the 14 original coping mechanisms which have been categorised into the 4 main coping dimensions are shown in Table 1.

Therefore, the validated and reliable Brief COPE Malay version consists of 28 items, which measures 14 dimensions of coping mechanisms. These are self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioural disengagement, venting, positive reframing, planning, humour acceptance, religion/spirituality and self-blame. Each dimension has two items. Brief COPE interpretations are usually presented as three main coping mechanisms which are i) problem-focused/active coping ii) emotion-focused/passive coping and iii) dysfunctional coping. However, for this study, the 14 dimensions were re-categorised into four coping mechanisms where religion/spirituality coping was interpreted as a separate domain. This is supported by a systematic review that found religious coping items from the Brief COPE formed a separate factor and did not load on the domains of problem-focused, emotion-focused or dysfunctional coping [29].

Each item is rated by a four-point Likert scale. Score one indicates “I haven’t been doing this at all” and score four indicates “I have been doing this a lot”. The mean scores for each of the four domains of coping mechanisms will be reported. The higher the mean scores for each coping style means that there are more patients adopting that particular coping mechanism. The mean scores are not categorised as good or poor as one of the coping mechanisms is dysfunctional coping which is a maladaptive coping strategy. Permission to use both the English and Malay versions of the Brief COPE questionnaires was obtained from both authors.

Self-reported medication adherence was measured using the one-item Medical Outcomes Study (MOS) Specific Adherence Scale [30,31]. Participants were asked to rate “how often did you take medication as prescribed (on time without skipping doses) in the past four weeks?” on a scale from 0 (none of the time) to 5 (all of the time). This scale was shown to have good construct validity (factor analysis and multitrait scaling analysis) [30]. For the purpose of analysis, participants who rated five were categorised as adherent and those rating 0–4 were non-adherent.

2.4. Sample size calculation

The sample size for this study was calculated using the without-replacement sampling calculation based on the number of HIV patients enrolled in both HIV outpatient clinics, constituting a population of about 1200 patients. This population was considered as the universe for the calculation of the sample. The formula for finite populations was used and the criteria adopted were a confidence level of 95%, sample error of 5%, and percentage of population proportion was 50%, resulting in a sample size of 385. Considering an additional refusal and attrition rate of 10%, this study aimed to approach approximately 433 participants.

2.5. Sampling method, data collection and study procedures

PLHIV were recruited through convenient sampling. They were approached by the research assistant at the observation room after their vitals were taken. They were given a patient information sheet describing the study, information on the voluntary nature of participation and that their participation in the study did not impact the treatment they received in the hospital. Participants who agreed were then screened for eligibility (whether they fulfilled the inclusion and exclusion criteria). Eligible participants were then recruited into the study and written consent was obtained.

2.6. Administration of questionnaire

A self-administered questionnaire, which consisted of two parts, was given to the participants by the research assistant. Part one comprised a standardised case report form (CRF) with socio-demographic background details i.e., age, gender, level of education, occupation, employment status, monthly income and marital status, while Part two was the Brief COPE Malay version. The participants were given the questionnaire with clear instructions on how to fill it in. They were then directed to the counselling room in the HIV clinic while they were answering the questionnaire to allow privacy. Most of the participants took approximately 5–10 min to complete

Table 1
Internal consistencies of the coping mechanisms in the Brief COPE Malay version.

No.	Coping mechanisms	Dimension of coping mechanism	Cronbach's Alpha
1)	Problem focused coping	Active coping	0.73
		Use of instrumental Support	0.77
		Positive reframing	0.75
		Planning	0.69
2)	Emotion focused coping	Use of emotional support	0.67
		Venting	0.44
		Humour	0.51
		Acceptance	0.02
		Self-blame	0.83
3)	Dysfunctional coping	Self-distraction	0.58
		Denial	0.34
		Substance use	^a
		Behavioural disengagement	0.82
4)	Religion/spirituality coping	Religion	0.84

^a Cannot be calculated by SPSS due to less than two non-zero variance items.

the questionnaire. They were asked to circle the options that suited them best. Participants were advised to seek clarification from the research assistant should any queries arise. Once the questionnaire was completed, it was handed back to the research assistant to be checked for completeness. Confidentiality of the study findings was assured in that only the main researcher had access to the data, which was kept in a secure room in the department of the main researcher.

2.7. Statistical analysis

The data obtained was analysed using the Statistical Package for Social Sciences (SPSS) version 28. Variables were described as mean \pm standard deviation (\pm SD) for continuous data and number (n) and percentage (%) for dichotomous or nominal data. The mean scores for the Brief COPE were tabulated according to the four domains of coping mechanisms. The association of coping mechanisms with medication adherence was analysed by simple logistic regression (SLogR) followed by multiple logistic regression (MLogR) for data consisting of categorical variables. Variables with a p-value of less than 0.25 in the SLogR were included in the MLogR as described in literature [32,33]. A p-value of less than 0.05 was considered statistically significant in the MLogR.

3. Results

Out of 428 patients who were approached, 413 agreed to participate (96.5%). Out of 413, 395 (95.6%) fulfilled the eligibility criteria, completed the questionnaire and were included in the final analysis. Fig. 1 outlined the flow chart of conduct of the study.

The sociodemographic characteristics of the participants are shown in Table 2. The mean age of the participants was 33.2 years old (SD 4.068) and the mean duration of being on ART was 65.52 months (SD 38.375). The majority of participants were male (92.2%) and Malay (58.7%) followed by Chinese ethnicity (31.4%). Two-thirds of the participants were Muslim (60.3%) and most were single (82.5%). The majority were from the middle-income group (60.0%), lived with their families (58.0%), practiced a healthy lifestyle (87.6%) and had good adherence to ART (66.8%).

Table 3 shows the mean scores of each domain of coping mechanism of the participants. Religion/spirituality coping attained the highest mean score of 3.07 (\pm 0.967), while the lowest mean score of 1.84 (\pm 0.444) was observed in dysfunctional coping.

One variable was found to have a P-value of less than 0.25 in the SLogR, which is medication duration (0.002). The association of each coping dimension with medication adherence when assessed with SLogR found that all coping dimensions achieved a p value of $>$ 0.25 when entered without the other coping dimensions. However, all variables including socio-demographic characteristics and mean scores of the Brief COPE coping dimensions were entered simultaneously into the MLogR. These were deemed important variables evident by literature [22,34]; hence they were included in the model in the prediction of factors associated with medication adherence in the MLogR [33]. Table 4 shows the results of the MLogR analysis using the stepwise method. Two variables were found to be significantly associated with medication adherence, which are duration of medication and religion/spirituality coping mechanism. Those who were on ART for a longer duration were more likely to be adherent to their medications [OR:1.014 (95% CI: 1.002, 1.026)]. On the other hand, PLHIV who adopted religion/spirituality coping mechanisms were less likely to be adherent to the medications [OR: 0.495 (95% CI: 0.246, 0.997)].

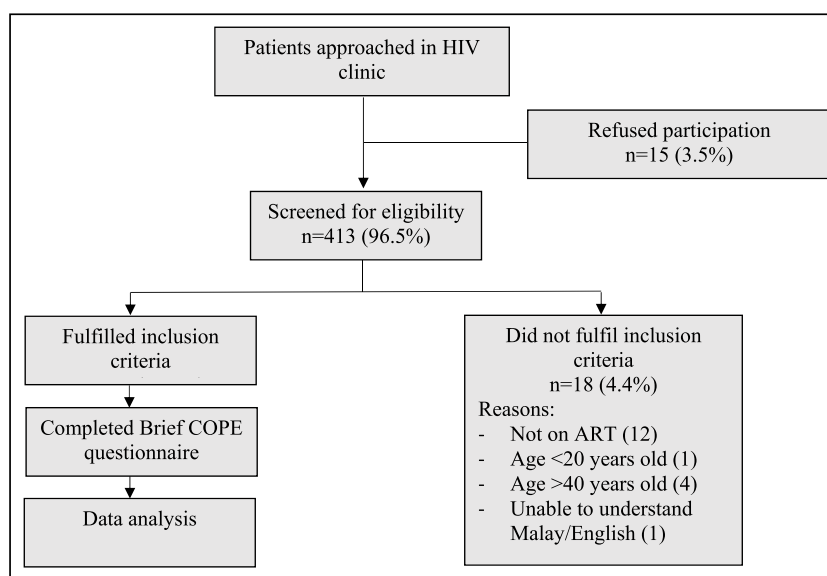


Fig. 1. Flow chart of conduct of the study.

Table 2
Socio-demographic characteristics of the participants (N = 395).

Variables	Frequency, n (%)	Mean (\pm SD)
Age (years)		33.20 (\pm 4.068)
Medication duration (months)		65.52 (\pm 38.375)
Gender		
Female	31 (7.8)	
Male	364 (92.2)	
Ethnicity		
Malay	232 (58.7)	
Chinese	124 (31.4)	
Indian	24 (6.1)	
Others	15 (3.8)	
Religion		
Islam	238 (60.3)	
Christian	32 (8.1)	
Buddha	92 (23.3)	
Hindu	23 (5.8)	
Others	10 (2.5)	
Marital status		
Single	326 (82.5)	
Married	60 (15.2)	
Widowed/separated/divorced	9 (2.3)	
Education		
No formal schooling	4 (1.0)	
Primary school	8 (2.0)	
Secondary school	82 (20.8)	
Certificates/STPM/diploma or equivalent	113 (28.6)	
Degree	156 (39.5)	
Masters/PhD	32 (8.1)	
Income		
< MYR3000 (low income)	139 (35.2)	
MYR3001 – MYR13,147 (middle income)	237 (60.0)	
\geq MYR13,148 (high income)	16 (4.1)	
Not disclosed	3 (0.8)	
Household members		
None	79 (20.0)	
Family	229 (58.0)	
Friends	86 (21.8)	
Not disclosed	1 (0.3)	
Practicing healthy lifestyle		
Yes	346 (87.6)	
No	43 (10.9)	
Unsure	6 (1.5)	
Medication adherence		
Yes	264 (66.8)	
No	131 (33.2)	

Notes: SD= Standard deviation; MYR = Malaysian Ringgits; STPM = Malaysian Higher School Certificate (*Sijil Tinggi Pelajaran Malaysia*).

Table 3
Mean scores for Brief COPE according to four domains of coping mechanism.

Coping mechanisms [mean score (\pm SD)]	Dimension of coping mechanism	Mean score (\pm SD)
Problem focused coping 2.98 (\pm 0.622)	Active coping	3.11 (\pm 0.796)
	Use of instrumental Support	2.49 (\pm 0.969)
	Positive reframing	3.26 (\pm 0.787)
	Planning	3.04 (\pm 0.783)
Emotion focused coping 2.40 (\pm 0.480)	Use of emotional support	2.43 (\pm 0.954)
	Venting	2.25 (\pm 0.798)
	Humour	1.66 (\pm 0.802)
	Acceptance	3.53 (\pm 0.630)
Dysfunctional coping 1.84 (\pm 0.444)	Self-blame	2.09 (\pm 0.914)
	Self-distraction	3.02 (\pm 0.872)
	Denial	1.73 (\pm 0.821)
	Substance use	1.17 (\pm 0.447)
Religion/spirituality coping 3.07 (\pm 0.967)	Behavioural disengagement	1.44 (\pm 0.629)
	Religion	3.07 (\pm 0.967)

Table 4
Factors independently associated with ART adherence (MLogR).

Variables	Adj Beta (SE)	Wald (df)	Adj. OR (95% CI)	P-value
Medication duration	0.014 (0.006)	5.617 [1]	1.014 (1.002, 1.026)	0.018
Religion/spirituality coping	-0.704 (0.357)	3.89 [1]	0.495 (0.246, 0.997)	0.049

Notes:OR Odds Ratio, CI Confidence Interval, df Degree of freedom.

The model reasonably fits well (Hosmer-Lemeshow test: $p = 0.464$).

Model assumptions were met.

No significant interactions and multicollinearity problem.

Model explained between 18% (Cox and Snell R Square) and 26% (Nagelkerke R Square).

Based on the area under the curve (AUC), the model discriminates 59.5% of the predicted of being adherence to ART.

4. Discussion

To our knowledge, this was the first study in Malaysia to determine the coping mechanism of young PLHIV and its association with medication adherence. As these PLHIV face stressors in relation to the disease and ART, identifying their coping mechanism through the widely-used and established Brief COPE questionnaire was pertinent. Our study participants were mostly male, Malay and Muslim. These findings reflect the current sociodemographic characteristics of PLHIV among key populations in Malaysia based on the recent Integrated Biological and Behavioural Surveillance Survey (IBBS) 2017 report [35] which showed that the majority of PLHIV in Malaysia were male, Malay and Muslim.

In this study, religion/spirituality coping was found to be the most adopted form of coping mechanism, while dysfunctional coping was the least adopted by the participants. Other studies assessing coping mechanisms among PLHIV included religion/spirituality items under emotion-focused coping and these studies found that it was the most employed coping mechanism [16,17]. Additionally, a qualitative study among young PLHIV found that these patients adopted religion/spirituality coping at some point of their life by performing prayers or doing charity and good deeds to help them in accepting the disease [21].

In this study, the majority of participants (66.8%) were found to be adherent to ART. This is in contrast to findings from a systematic review of studies conducted among PLHIV in India, which reported that 77% of patients had optimum adherence to ART [36]. Another study among young PLHIV in Nepal showed an overall adherence to ART of 87.4% [34]. Our study findings showed that ART adherence is much lower compared to other countries [34,36]. This may be attributed to medication side effects, inconvenience of the regime, and ART serving as a reminder of their HIV status, which are the most common reasons for young PLHIV not adhering to their medications [37]. Furthermore, a systematic review has shown that older adults were more likely to adhere to ART regimes compared to younger adults because older adults were deemed to have better financial stability and health awareness [38].

Duration of medication and religion/spirituality coping mechanism were the two variables found to be significantly associated with medication adherence in young PLHIV. Those who were on ART for a longer duration were more likely to be adherent to their medications. With regards to the duration of medication, there are inconsistent findings from various studies. Our finding is similar to a study involving young PLHIV in Nepal [34], which showed that optimal adherence is ten times more likely in those who have been on ART for more than 36 months. Furthermore, another study showed that HIV-positive children with a longer duration of ART were more compliant compared to children with a shorter duration of ART [39]. It is postulated that longer treatment duration leads to better quality of life; hence patients become more motivated to follow healthcare providers', advice including adhering to their medications [39]. In contrast, a study in Eastern China found men with longer ART duration were less likely to be adherent [40].

This study found that PLHIV who adopted religion/spirituality coping mechanisms were less likely to be adherent to their ART, which is conflicting with the majority of the current literature. Other studies reported a positive association between religion/spirituality coping and ART adherence [41–43]. A qualitative study reported that one of the reasons that religion increases adherence was that PLHIV motivated themselves to adhere to ART by believing that God was the one who granted humans knowledge regarding remedies for diseases [44]. In contrast, our finding is supported by some studies that showed PLHIV's religious faith was not in line with illness acceptance and treatment, resulting in them becoming passive and resistant to medication adherence [43]. Furthermore, PLHIV perceived that they could treat HIV by just believing in God and the chance of them to receive a cure was based on one's adequacy of religiosity or strength as a worshipper. To them, health is controlled by God; hence they decided to defer their ART [45, 46]. Additionally, PLHIV has also been found to miss their medications because they chose traditional and alternative medicine, including faith healing following their religious leaders who claim to have spiritual powers to heal ailments [47,48]. Further exploration of the reasons for the negative association between religion/spirituality coping and medication adherence is pivotal and would provide a better understanding of this behaviour locally.

However, coping strategies are not the only factors that contribute to ART adherence. There are many other factors that are found to be independently associated with high ART adherence among young PLHIV, including employment status, fewer side effects to ART, good family support [49] as well as better access to healthcare services and good social relationships with healthcare professionals [50]. Thus, if all these factors were taken into consideration in the development of health interventions, these may contribute to better ART adherence among young PLHIV.

5. Strength and limitation

This study was the first study in Malaysia that determined the association of coping mechanisms with medication adherence. The study utilised the Brief COPE Malay version, which is a valid and reliable tool to assess a broad range of coping responses towards different diseases. However, this study has several limitations. This study was conducted in only two centres in Klang Valley; hence the result may not be generalisable to PLHIV residing outside the region. Another limitation may be due to sampling bias, as participants were conveniently chosen. The Brief COPE questionnaire used in this study was either in Malay or English language versions and was administered only to patients who were able to read and understand the Malay or English language. Lastly, the Brief COPE questionnaire was not piloted in this study to determine its clarity and relevance which is a limitation of this study. Despite the limitations, this study aids healthcare policy makers to understand young PLHIV better and identify appropriate interventions to improve coping skills in dealing with stressors. This may enhance health outcomes in terms of medication adherence. Further research should include other centres and use randomised sampling to ensure generalisability of the findings to the Malaysian PLHIV population. The negative association between religion/spirituality coping with medication adherence in young PLHIV also warrants further exploration.

6. Conclusion

This study found that young PLHIV adopted religion and spirituality as a coping mechanism and that duration of medication was significantly associated with medication adherence. However, a negative association was found between religion/spirituality coping with medication adherence, which warrants further exploration as it will give input into the design of intervention for young PLHIV in clinical practice.

FUNDING disclosure

This study was funded by Universiti Teknologi MARA, Malaysia “Geran Penyelidikan Khas (GPK)” (600-RMC/GPK 5/3(200/2020)). The funding body did not play any role in the study design, data collection, data analysis, data interpretation or manuscript writing.

Ethics declarations

This study was reviewed and approved by the Research Ethics Committee of Universiti Teknologi MARA [600-TNCPI(5/1/6)] and Medical Research Ethics Committee (MREC) [NMRR-21-1792-61282 (IIR)] prior to the conduct of the study. All participants provided informed consent for the publication of their anonymised case details.

Data availability statement

Data of this study is kept at the Department of Primary Care Medicine, Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Jalan Hospital, 47000 Sungai Buloh, Selangor, Malaysia. Data will be shared by the corresponding author upon request and is subjected to data protection guidelines.

Additional information

No additional information is available for this paper.

CRediT authorship contribution statement

A.N.I. Zainal-Abidin: Writing – original draft, Formal analysis, Conceptualization. **H.N. Miptah:** Writing – review & editing, Formal analysis. **F. Ariffin:** Writing – review & editing, Funding acquisition, Conceptualization. **S. Razali:** Writing – review & editing, Funding acquisition, Conceptualization. **S.F. Badlishah-Sham:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

The authors would like to thank the Director General of Health, Ministry of Health Malaysia for permission to publish the findings of this study. We would also like to thank Dr Fauziah Ahmad, Dr Benedict Sim Ling Heng, nurses and support staff at the HIV clinics in Hospital Sungai Buloh and Klinik Kesihatan Sungai Buloh, who provided facilities and assistance during the data collection.

References

- [1] Global AIDS Monitoring 2022, Country Progress Report-Malaysia Portal Resmi Kementerian Kesehatan Malaysia, 2022 [Available from: https://moh.gov.my/moh/resources/Penerbitan/Laporan/Umum/MYS_country_report_2021.pdf].
- [2] J.L. Marcus, C.R. Chao, W.A. Leyden, L. Xu, C.P. Quesenberry Jr., D.B. Klein, et al., Narrowing the gap in life expectancy between HIV-infected and HIV-uninfected individuals with access to care, *Journal of acquired immune deficiency syndromes* (1999) 73 (1) (2016) 39.
- [3] Y.C. Tee, V.A. Earnshaw, F.L. Altice, H. Jin, A. Kamarulzaman, J.A. Wickersham, Evaluating physicians' intention to discriminate against patients living with HIV in Malaysia, *AIDS and Behavior* 23 (2019) 1039–1047.
- [4] Z.H.M. Yazdir, M. Ramly, A. Suleiman, HIV-related stigma and discrimination (S&D) among healthcare Workers (HCW) in Government healthcare facilities in Malaysia: is it real? *Global Journal of Health Science* 13 (11) (2021) 1–66.
- [5] N.K. Fauk, P.R. Ward, K. Hawke, L. Mwanri, HIV stigma and discrimination: perspectives and personal experiences of healthcare providers in Yogyakarta and Belu, Indonesia, *Frontiers in medicine* 8 (2021) 625787.
- [6] N.K. Fauk, K. Hawke, L. Mwanri, P.R. Ward, Stigma and discrimination towards people living with HIV in the context of families, communities, and healthcare settings: a qualitative study in Indonesia, *International journal of environmental research and public health* 18 (10) (2021) 5424.
- [7] Laws of Malaysia, act 574, Penal Code. Sect. 377D (2006). Outrages on decency).
- [8] (Male person posing as woman), Syariah Criminal Offences (Federal Territories) Act 1997. Sect. 25 (Liwat), 26 (Musahaqah), 1997, p. 28.
- [9] D.B. Mahamboro, N.K. Fauk, P.R. Ward, M.S. Merry, T.A. Siri, L. Mwanri, HIV stigma and moral judgement: qualitative exploration of the experiences of HIV stigma and discrimination among married men living with HIV in Yogyakarta, *International journal of environmental research and public health* 17 (2) (2020) 636.
- [10] N. Fauk, Risk Factors and the Impact of HIV Among Women Living with HIV and Their Families in Yogyakarta and Belu District, Indonesia, 2022.
- [11] N. O'Brien, Y.L. Chi, K.R. Krause, Measuring health outcomes in HIV: time to bring in the patient experience, *Annals of Global Health* 87 (1) (2021).
- [12] C. Carver, M. Scheier, J. Weintraub, Assessing coping strategies: a theoretically based approach, *Journal of Personality and Social Psychology* 56 (2) (1989) 267–283.
- [13] R.S. Lazarus, S. Folkman, C.D. Schetter, A. DeLongis, R. Gruen, Dynamics of a stressful encounter: cognitive appraisal, coping, and encounter outcomes, *Journal of Personality and Social Psychology* 50 (5) (1986) 992–1003.
- [14] S. Folkman, J.T. Moskowitz, Coping: pitfalls and promise, *Annu Rev Psychol* 55 (2004) 745–774.
- [15] B. Dibb, T. Kamalesh, Exploring positive adjustment in HIV positive African women living in the UK, *AIDS Care* 24 (1–2) (2012) 143–148.
- [16] R.T.S. Silva, R.A.R. Silva, I.D.C.V. Rodrigues, V.L.S. Neto, B.C.O.d. Silva, F.M.d.L.C. Souza, Coping strategies of people living with aids in face of the disease, *Rev Latino-Am Enfermagem*. 26 (2018) 2985.
- [17] L.A. Orban, R. Stein, L.J. Koenig, L.C. Conner, E.L. Rexhose, J.V. Lewis, et al., Coping strategies of adolescents living with HIV: disease-specific stressors and responses, *AIDS Care: Psychological and Socio-medical Aspects of AIDS/HIV* 22 (4) (2010) 420–430.
- [18] N.K. Fauk, M.S. Merry, L. Mwanri, Meaning-making as a coping strategy among transgender women living with HIV in Indonesia, *AIDS care* 33 (2) (2021) 167–171.
- [19] N.K. Fauk, H.A. Gesesew, L. Mwanri, K. Hawke, M.S. Merry, G.A. Asa, et al., Understanding coping strategies of mothers living with HIV who care for children living with HIV: a qualitative study in Indonesia, *BMC Women's Health* 23 (1) (2023) 1–10.
- [20] K. Tang, W.-T. Chen, HIV and religion in HIV-infected Asians and their families: a qualitative study, *Applied Nursing Research* 44 (2018) 18–24.
- [21] A.N.I. Zainal-Abidin, F. Ariffin, S.F. Badlishah-Sham, S. Razali, Exploring spiritual and religious coping among PLHIV in a Malaysian Muslim community: a qualitative study, *HIV/AIDS-Research and Palliative Care* (2022) 409–422.
- [22] A.E. Paramesha, L.K. Chacko, Predictors of adherence to antiretroviral therapy among PLHIV, *Indian Journal of Public Health* 63 (4) (2019) 367.
- [23] P. Arashiro, C.G. Maciel, F.P.R. Freitas, G.S.R. Koch, J.C.P. da Cunha, A.R. Stolf, et al., Adherence to antiretroviral therapy in people living with HIV with moderate or severe mental disorder, *Scientific Reports* 13 (1) (2023) 3569.
- [24] N.K. Fauk, M.S. Merry, A. Ambarwati, M.A. Sigilipoe, L. Mwanri, A qualitative inquiry of adherence to antiretroviral therapy and its associated factors: a study with transgender women living with HIV in Indonesia, *Indian Journal of Public Health* 64 (2) (2020) 116–123.
- [25] R.A. Lyimo, S.E. Stutterheim, H.J. Hospers, T.d. Glee, A.v.d. Ven, M.d. Bruin, Stigma, disclosure, coping, and medication adherence among people living with HIV/AIDS in northern Tanzania, *AIDS PATIENT CARE and STDs* 28 (2) (2014) 98–105.
- [26] Malaysian Society of HIV Medicine, Ministry of Health Malaysia. Malaysian Consensus Guidelines on Antiretroviral Therapy, 2022.
- [27] M.S.B. Yusoff, The validity of the Malay Brief cope in identifying coping strategies among adolescents in secondary School, *International Medical Journal, Health Psychology* 18 (1) (2011) 29–33.
- [28] C. Carver, You want to measure coping but your protocol too long: consider the Brief COPE, *Int J Behav Med* 4 (1) (1997) 92–100.
- [29] C.U. Krägeloh, A systematic review of studies using the Brief COPE: religious coping in factor analyses, *Religions* 2 (3) (2011) 216–246.
- [30] C.D. Sherbourne, R.D. Hays, L. Ordway, M.R. DiMatteo, R.L. Kravitz, Antecedents of adherence to medical recommendations: results from the Medical Outcomes Study, *Journal of behavioral medicine* 15 (5) (1992) 447–468.
- [31] M.R. DiMatteo, C.D. Sherbourne, R.D. Hays, L. Ordway, R.L. Kravitz, E.A. McGlynn, et al., Physicians' characteristics influence patients' adherence to medical treatment: results from the Medical Outcomes Study, *Health psychology* 12 (2) (1993) 93.
- [32] S.W. Grant, G.L. Hickey, S.J. Head, Statistical primer: multivariable regression considerations and pitfalls, *European Journal of Cardio-Thoracic Surgery* 55 (2) (2019) 179–185.
- [33] Z. Zhang, Model building strategy for logistic regression: purposeful selection, *Annals of translational medicine* 4 (6) (2016).
- [34] S. Neupane, G.P. Dhungana, H.C. Ghimire, Adherence to antiretroviral treatment and associated factors among people living with HIV and AIDS in CHITWAN, Nepal, *BMC Public Health* 19 (2019) 1–9.
- [35] Integrated Biological and Behavioral Surveillance Survey 2017, Ministry of Health Malaysia, 2019 [Internet]. Available from: https://www3.moh.gov.my/moh/resources/Penerbitan/Laporan/Umum/Laporan_Kajian_IBBS_2017.pdf.
- [36] A. Chakraborty, R.C. Hershov, D.M. Qato, L. Stayner, M.S. Dworkin, Adherence to antiretroviral therapy among HIV patients in India: a systematic review and meta-analysis, *AIDS and Behavior* 24 (2020) 2130–2148.
- [37] M. Belzer, G. Slonimsky, D. Tucker, Anti-retroviral adherence issues among HIV+ youth, *Journal of Adolescent Health* 2 (22) (1998) 160.
- [38] N. Soomro, G. Fitzgerald, J. Seeley, E. Schatz, J.B. Nachege, J. Negin, Comparison of antiretroviral therapy adherence among HIV-infected older adults with younger adults in Africa: systematic review and meta-analysis, *AIDS and Behavior* 23 (2019) 445–458.
- [39] F. GebreEyesus, D. Mitku, T. Tarekegn, B. Temere, T. Terefe, A. Belete, et al., Levels of adherence and associated factors among children on ART over time in Northwest, Ethiopia: evidence from a multicenter follow-up study, *HIV/AIDS-Research and Palliative Care* (2021) 829–838.
- [40] K. Jiao, M. Liao, G. Liu, Y. Bi, X. Zhao, Q. Chen, et al., Impact of antiretroviral therapy (ART) duration on ART adherence among men who have sex with men (MSM) living with HIV in Jinan of China, *AIDS Research and Therapy* 19 (1) (2022) 55.
- [41] T. Poteat, J.M. Lassiter, Positive religious coping predicts self-reported HIV medication adherence at baseline and twelve-month follow-up among Black Americans living with HIV in the Southeastern United States, *AIDS care* 31 (8) (2019) 958–964.
- [42] K.U. Amadi, U.C. Nduanya, J.I. Odinka, Open Access Religion and adherence to antiretroviral medication: is there a link, *Am J Humanit Soc Sci Res* 4 (2020) 425–433.
- [43] V.U. Oji, L.C. Hung, R. Abbasgholizadeh, F.T. Hamilton, E.J. Essien, E. Nwulia, Spiritual Care May Impact Mental Health and Medication Adherence in HIV+ Populations, vol. 9, *Dove Press-HIV/AIDS - Research and Palliative Care*, 2017, pp. 101–109.
- [44] M.A. Abdulai, F.E.F. Mevissen, R.A.C. Ruiter, S. Owusu-Agyei, K.P. Asante, A.E.R. Bos, A qualitative analysis of factors influencing antiretroviral adherence among persons living with HIV in Ghana, *Journal of Community & Applied Social Psychology* 32 (1) (2022) 135–150.

- [45] E. Glendinning, J. Spiers, J.A. Smith, J. Anderson, L.J. Campbell, V. Cooper, et al., A qualitative study to identify perceptual barriers to antiretroviral therapy (ART) uptake and adherence in HIV positive people from UK black African and Caribbean communities, *AIDS and Behavior* 23 (2019) 2514–2521.
- [46] H. Kremer, G. Ironson, M. Porr, Spiritual and mind–body beliefs as barriers and motivators to HIV-treatment decision-making and medication adherence? A qualitative study, *AIDS patient care and STDs* 23 (2) (2009) 127–134.
- [47] L. Kpobi, L. Swartz, Implications of healing power and positioning for collaboration between formal mental health services and traditional/alternative medicine: the case of Ghana, *Global health action* 11 (1) (2018) 1445333.
- [48] J. Mutambara, T. Sodi, J. Mtemeri, M. Makomo, Harmonizing religion and health: an exploration of religious reasons for defaulting ARVs among people living with HIV and AIDS in Gweru, Zimbabwe, *AIDS care* 33 (3) (2021) 383–388.
- [49] K. Suryana, H. Suharsono, I.G.P.J. Antara, Factors Associated with Adherence to Anti-retroviral Therapy Among People Living with HIV/AIDS at Wangaya Hospital in Denpasar, Bali, Indonesia: a Cross-Sectional Study, *HIV/AIDS-Research and Palliative Care*, 2019, pp. 307–312.
- [50] N.K. Fauk, M.S. Merry, T.A. Siri, F.T. Tazir, M.A. Sigilipoe, K.O. Tarigan, et al., Facilitators to Accessibility of HIV/AIDS-related Health Services Among Transgender Women Living with HIV in Yogyakarta, Indonesia, in: *AIDS Research and Treatment*, vol. 2019, 2019.