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ORIGINAL ARTICLE

Post-COVID-19 Health-Related Quality of Life in a Sample of Malaysian Population: Association between Internet Addiction and Sociodemographic Characteristics

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ABSTRAK

Pandemik COVID-19 telah mengubah cara komunikasi masyarakat, di mana terdapat peningkatan penggunaan internet yang menimbulkan kebimbangan terhadap ketagihan internet (IA). Kajian ini bertujuan untuk menilai kualiti hidup berkaitan kesihatan (HRQOL) dalam kalangan orang dewasa di Malaysia serta hubungannya dengan IA dan ciri-ciri sosiodemografi. Kajian keratan rentas ini telah dijalankan antara Jun dan September 2022. Peserta diberikan satu set soal selidik dalam talian yang merangkumi skala Short-Form-12 (SF-12). SF-12 mengukur dua domain HRQOL, iaitu ringkasan komponen fizikal (PCS) dan ringkasan komponen mental (MCS). Seramai 250 peserta dewasa mengambil bahagian dengan min umur 34.69 tahun [Sisihan piawai (SP) 11.39]. Kebanyakan peserta terdiri daripada wanita (n = 149, 59.6%) dan berbangsa Melayu (n = 203, 81.2%). Skor min bagi komponen HRQOL iaitu PCS dan MCS masing-masing adalah 46.94 (SP 7.46) (min=23.36, maks = 67.11) dan 46.18 (SP 10.12) (min = 9.32, maks = 72.70). Prevalen IA adalah 30.3% dengan skor min 39.09 (SP 12.28) (min = 20, maks = 87). Analisis multivariat menunjukkan bahawa etnik Melayu dikaitkan dengan skor PCS [β = 2.93, (95% CI 0.51, 5.35), p = 0.018] dan MCS [β = 3.16, (95% CI 0.28, 6.05), p = 0.032] yang lebih tinggi berbanding dengan peserta bukan Melayu. Selain itu, IA dikaitkan secara negatif dengan MCS [β = -0.37, (95% CI -0.46, -0.28), p <0.001], yang bermaksud peserta dengan skor IA yang lebih tinggi satu unit mempunyai skor MCS rendah sebanyak 0.37 berbanding peserta dengan skor IA satu unit lebih rendah. Penemuan kajian ini menunjukkan penurunan dalam domain HRQOL berbanding sebelum pandemik. Etnik Melayu mencatatkan tahap kesejahteraan fizikal dan mental yang lebih tinggi, manakala individu yang IA mempunyai tahap kesejahteraan mental yang lebih rendah.

Kata kunci: *Fizikal; ketagihan internet; kualiti hidup berkaitan dengan kesihatan; mental; pandemik COVID-19*

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ABSTRACT

The COVID-19 pandemic changed how people communicate, whereby there is an increase in internet usage, raising concerns about internet addiction (IA). This study aimed to evaluate the health-related quality of life (HRQOL) among Malaysian adults and its association with IA and sociodemographic characteristics. A cross-sectional study was conducted between June and September 2022. Participants were given a set of online questionnaire including the Short-Form (SF-12) scale. The SF-12 measured two domains of HRQOL: physical component summary (PCS) and mental component summary (MCS). A total of 250 adult patients participated with the mean age of 34.69 years (SD 11.39). Most participants were females (n = 149, 59.6%) and Malays (n = 203, 81.2%). The mean scores for HRQOL components, specifically PCS and MCS were 46.94 (SD 7.46) (min = 23.36, max = 67.11) and 46.18 (SD 10.12) (min = 9.32, max = 72.70), respectively. The prevalence of IA was 30.3%, with a mean score of 39.09 (SD 12.28) (min = 20, max = 87). Multivariable analysis revealed that Malay ethnicity was associated with higher PCS [β = 2.93, (95% CI 0.51, 5.35), $p = 0.018$] and MCS [β = 3.16, (95% CI 0.28, 6.05), $p = 0.032$] compared to non-Malay. IA was negatively associated with MCS [β = -0.37, (95% CI -0.46, -0.28), $p < 0.001$], meaning that the participants with one-unit higher IA scores had lower MCS scores by 0.37 compared to participants with one-unit IA scores. Our finding demonstrates a decrement in HRQOL domains compared to before the pandemic. Malay ethnicity had a higher physical and mental well-being, while individuals with IA had lower mental well-being.

Keywords: COVID-19 pandemic; health-related quality of life; internet addiction; mental; physical

INTRODUCTION

Over the world, COVID-19 pandemic has caused significant disruptions in people's lives. The pandemic triggered a substantial crisis in the people's social and economic function, causing unemployment, family problems and stress from the death of loved ones (Bahar Moni et al. 2021). The pandemic has also impacted on people's health and quality of life, particularly their physical and mental well-being (Park et al. 2021). Hays and Reeve (2008) define the health-related quality of life (HRQOL) as how well a person functions in life and their perceived well-being regarding physical, mental and social health. This broad-ranging concept comprises the complex interconnection between biopsychosocial, environmental and spiritual values (WHO 2012). Among the tools used to assess HRQOL are SF-36 and its shorter version, the SF-12 scale, which has become more widely accepted because of its easy administration (Jenkinson & Layte 1997). The SF-12 scale consists of eight health domains related to two measures; physical component summary (PCS) and mental component summary (MCS) (Ware et al. 1995).

During the pandemic, limitations of face-to-face interactions were imposed, forcing people to change their social and working lives to curb the spread of infection (Ammar et al. 2020). Working from home has become a norm, with meetings, shopping or learning which are mainly conducted online (Ammar et al. 2020). It was a struggle for most people to change their lives abruptly, disturbing their well-being. This issue triggered a worldwide concern, causing researchers to investigate and their findings demonstrated a deterioration in the HRQOL, with the young and female groups being more affected (Long et al. 2022; Wen et al. 2022). The results suggest that when people are confined at home, feeling disconnected and worrying about the future could ensue and induce psychological symptoms and poor physical health (Bono et al. 2023; Fu et al. 2022; Zamberi et al. 2022).

Due to the limitation of physical interactions, there was a rapid surge in internet use during the pandemic (Feldman et al. 2021). This pattern is expected to sustain as people now prefer online platforms to do work or maintain social connectedness (Feldman et al. 2021).

Nevertheless, a growing concern is that people may overuse the internet and become addicted to it (Zewde et al. 2022). Internet addiction (IA) is becoming a new healthcare focus due to its addictive potential and impact on well-being (Sela et al. 2021). Scholars have defined IA as an impulse-control disorder that is uncontrolled and excessive and does not involve intoxicants (Young 1998). It can be characterised as excessive or poorly controlled preoccupations, urges or behaviours regarding computer use and internet access (Shaw & Black 2008), leading to personal and social consequences (Black et al. 1999). Comparison prior to the pandemic, there has been an increase in the prevalence of IA, particularly among younger generations (Ansari et al. 2022; Ismail et al. 2021; Siste et al. 2020). Although using the internet confers many learning opportunities, communication and entertainment, some misuse it to vent their emotions or escape from real-world problems, i.e. negative coping (Melodia et al. 2022).

Previous studies have documented the negative impact of IA on a person's physical, psychological well-being and overall quality of life (Karimy et al. 2020; Tran et al. 2017). IA can lead to musculoskeletal pain (Güzel et al. 2018) and a sedentary lifestyle (Alaca 2020) because of prolonged sitting in front of the screen. People addicted to the internet are likely to spend time sitting in front of computers or electronic devices, and it can even be as long as 4 to 8 hours per day (Siste et al. 2020). IA is also linked with mental health, possibly associated with low self-esteem, depression, anxiety (Kim et al. 2017) and suicidality (Guo et al. 2020). Furthermore, those addicted to the internet are exposed to cyberbullying (Arpaci et al. 2020), disturbing their personal relationships and mental health. Besides, the prolonged use of the screen can induce computer vision syndrome, which is now becoming a concern among healthcare providers (Alamri et al. 2022).

Currently, there is limited information on the quality of life of Malaysians after several years of the COVID-19 pandemic. Studies in other countries demonstrated that the impact of COVID-19 on people's HRQOL remains even after years of the pandemic (Algamdi 2021; García-Garro et al. 2022). Malaysians may have a similar experience, but we do not know whether our population is affected. Therefore, there is a need to investigate HRQOL post-COVID-19 pandemic and its association with IA sociodemographic characteristics in a local setting. Our objective was also to determine the prevalence of adults suffering from IA. This study aimed to provide us a picture of our population's HRQOL in post-pandemic era.

MATERIALS AND METHODS

Study Design, Setting and Population

A cross-sectional study was conducted at the Selayang Baru Health Clinic, an urban primary care clinic in Malaysia, from June to September 2022. The inclusion criteria were adult patients between 18 and 65 years old, able to read and write in Malay and have internet access. Adults diagnosed with dementia, stroke, psychiatric illness or emergency conditions were excluded. The sample size was calculated based on the study objectives. The association between factors and the outcome was calculated using Power and Sample Size software (Vanderbilt University, Nashville, Tennessee, USA), which gave various sample sizes (Dupont & Plummer 1990). For example, the association between gender and quality of life (QoL) requires a sample size of at least 2544 based on Sabri et al. (2022). Due to limited time and resources, the Kish formula was used to estimate IA's prevalence (Kish 1965). Based on a previous study, the prevalence of IA was 14.4% (Siste et al. 2020); thus, the present study required a minimum sample size of 185. Considering a 20% non-response rate, the final number needed was 222.

Data Collection

The current study employed a systematic random sampling method whereby every adult patient registered at the clinic who fulfilled the criteria

was invited to participate. The participants were given information about the study, and once they agreed, they needed to scan a QR code, which directed them to the online consent form. After the participants gave consent by clicking "Yes", they would be asked to answer a self-administered questionnaire without requiring them to sign in to an account.

This self-administered questionnaire was conducted online, allowing the participants to complete it at their convenience during the clinic visit. It is not compulsory for participants to fill out all the sections of the questionnaire. Nevertheless, the authors encouraged them to complete all sections by emphasising and reminding them to finish during their current visit, so that completeness can be monitored immediately. The questionnaire took around 20 minutes to complete, and no token of appreciation was given to the participants.

Study Instrument

The study instrument was a self-administered questionnaire in Malay that was comprised of three sections. The first section was about sociodemographic characteristics and the second is the Malay version of IA (MVIAT) (Guan et al. 2015). Young (2015) originally developed this IA scale, but it had been translated into Malay (Guan et al. 2015). It consisted of 20 items measuring IA symptoms and had good internal consistency with a Cronbach alpha value of 0.91 (Guan et al. 2015). Participants must select from a five-point Likert-type response scale between 1 to 5 (1 = never to 5 = always) that best reflected the frequency of their symptoms. Those who scored 43 and above on the MVIAT had IA (Guan et al. 2015).

The third section was the SF-12 scale to evaluate HRQOL, specifically the PCS and MCS (Jenkinson & Layte 1997; Ware et al. 1995). It has been translated into Malay and demonstrated good reliability indices with Cronbach alpha of 0.749 and 0.701 for PCS and MCS, respectively (Noor & Aziz 2014). The SF-12 consisted of 12 items, measuring eight health domains, contributing to both PCS and MCS (Lacson et al. 2010; Ware et al. 1995). The PCS consisted of six questions from four domains, namely *General Health Perception (GH), Physical Functioning (PF), Role Limitation due to Physical Health Problems (RP)* and *Bodily Pain (BP)*. The remaining six questions assessed four other domains under MCS, which were *Role Limitation due to Emotional Problems (RE), Vitality (VT), Mental Health (MH)* and *Social Functioning (SF)*. The responses for these items differed; some were 3-point Likert scales while some had 5-points. Its scoring method involved a complex algorithm using the software provided by QualityMetric Health Outcome™ Scoring System (QualityMetric Incorporated, Lincoln, Rode Island, USA). This scale reflected a continuum where the minimum score of 0 indicated the worst health, while the maximum score of 100 indicated the best health. Apart from these questionnaires, we also asked the participants about their perception of internet use and difficulties during the COVID-19 pandemic.

Statistical Analysis

Data was analysed using the Statistical Package for the Social Sciences version 27 (IBM Corp, Armonk, NY). Descriptive analysis was conducted first. Simple linear regression (SLR) was performed, and then the multiple linear regression (MLR) analysis was performed to identify the final factors associated with PCS and MCS scores. The backward stepwise regression was used, and statistical significance was set at $p < 0.05$.

Ethical Approval

Approval to conduct the study was obtained from the Medical Research and Ethics Committee (MREC) of the Ministry of Health Malaysia (NMRR ID-21-02405-VVQ (IIR) and the Research Ethics Committee of Universiti Kebangsaan Malaysia (JEP-2021-900). Permission was also obtained from the Selangor Director of Health and Health District Office of Gombak.

RESULTS

The Study Participants' Characteristics

Among 255 participants who were eligible for the study, only 250 completed the questionnaire. Two participants refused to participate, and three questionnaires were incomplete, yielding a response rate of 98.0%. Table 1 depicted their sociodemographic characteristics. The mean age was 34.69 (SD 11.39) years. Over half were between 18 to 35 years old (n = 136,54.4%) and females (n = 149, 59.6%), while the majority were Malays (n = 203, 81.2%). Approximately half were married (n = 133, 53.2%) and attained a higher level of education (n = 132, 52.8%). Most were employed (78.0%). Table 2 showed the mean score of IA was 39.09 (SD 12.28) and 75 participants (n = 76,30.3%) suffered from IA. Majority perceived that they were using more internet (n = 171,68%) and reported difficulties during the pandemic (Table 2).

Mean Scores of PCS and MCS of HRQOL (SF-12)

Table 3 described the mean score of each SF-12 domain. The mean score for PCS and MCS was 46.94 (SD 7.46) and 46.18 (SD 10.12), respectively. Among the PCS domains, the highest score was PF at 71.20 (SD 29.05), while the lowest was GH at 54.88 (SD 23.61). Among the MCS domains, the highest score was RE at 66.20 (SD 27.69), while the lowest was VT at 61.40 (SD 22.18).

TABLE 1: Sociodemographic characteristics (n=250)

Characteristics	n (%)	Mean (SD)
Age (years)		34.69 (11.39)
Age group		
18 - 35 years old	136 (54.4)	
36 - 55 years old	100 (40.0)	
> 55 years old	14 (5.6)	
Gender		
Male	101 (40.4)	
Female	149 (59.6)	
Ethnic[1]		
Malay	203 (81.2)	
Chinese	7 (2.8)	
Indian	36 (14.4)	
Others	4 (1.6)	
Marital status		
Unmarried	94 (37.6)	
Married	133 (53.2)	
Divorced/widowed	23 (9.2)	
Educational level		
No formal education	5 (2.0)	
Primary school	2 (0.8)	
Secondary school	111 (44.4)	
Diploma	75 (30.0)	
Degree/Masters/PhD	57 (22.8)	
Occupation[2]		
Unemployed	55 (22.0)	
Employed	195 (78.0)	

Note: [1]Ethnic: Others included smaller communities such as Sikhs and Non-Malay indigenous from different parts of Malaysia; [2]Occupation: Student, unemployed and retiree were categorised as unemployed

TABLE 2: Internet use characteristics among participants (n=250)

Characteristics	Mean	SD
Internet Addiction Score MVIAT (min = 20, max = 87)	39.12	12.26
	Frequency (n)	**Percentage (%)**
The proportion of adults with internet addiction		
Addicted (total score ≥ 43)	76	30.3
Not addicted (total score < 43)	175	69.7
Perceived internet use during the COVID-19 pandemic		
Amount of time increased (n = 248)	171	68.1
Less than 1 hour a day	18	7.3
1-2 hours a day	51	20.6
3-4 hours a day	78	31.5
More than 4 hours a day	101	40.7
Difficulties faced during the COVID-19 pandemic		
Infected with COVID-19	116	46.2
Family or friends infected with COVID-19	183	72.9
Loss of job or source of income	70	27.9
Death of a family member or close friend	30	12.0
Family relationship difficulty	22	8.8
Other	11	4.4
No difficulty	132	52.6

MVIAT: Malay version of internet addiction

TABLE 3: Mean scores of HRQOL (SF-12) domains (n = 250)

HRQOL (SF-12) domain	Mean (SD)
PCS (min = 23.36, max = 67.11)	46.94 (7.46)
Physical Functioning (PF)	71.20 (29.05)
Role Limitation Due to Physical Health Problems (RP)	63.30 (26.38)
Bodily Pain (BP)	63.70 (27.07)
General Health Perception (GH)	54.88 (23.61)
MCS (min = 9.32, max = 72.70)	46.18 (10.12)
Vitality (VT)	61.40 (22.18)
Social Functioning (SF)	65.20 (28.68)
Role Limitation Due to Emotional Problems (RE)	66.20 (27.69)
Mental Health (MH)	62.45 (21.33)

Regression Analysis on Factors Associated with the PCS Domain of HRQOL

Table 4 depicted the association between sociodemographic characteristics and IA with PCS score. Both SLR and MLR analyses indicated that only Malay ethnicity was significantly associated. Adjusted analysis showed that Malay participants had a higher mean PCS score of 3.08 [(95% CI 0.73, 5.43), $p = 0.011$) than non-Malay. The model explained 2.0% of the variance of the PCS score ($R^2 = 0.02$).

Regression Analysis on Factors Associated with the MCS Domain of HRQOL

Table 5 showed the association between sociodemographic characteristics and IA with MCS score. SLR analysis showed age, marital status, and IA score were significantly associated with MCS score. Adjusted analysis showed Malay participants had a higher MCS score of 3.16 [95% CI 0.28, 6.05), $p = 0.032$] than non-Malay. Those with higher IA scores had a lower MCS score of 0.37 [(95% CI -0.46, -0.28), $p < 0.001$]. The

model explained 20% of the variance of the MCS score (R^2 = 0.20).

DISCUSSION

The purpose of the current study was to evaluate the HRQOL in a sample of Malaysian adults and its association with IA and sociodemographic characteristics. The results of this study provide an important insight into the physical and mental well-being of Malaysians after going through a challenging time, the COVID-19 pandemic. Our findings revealed that the overall mean PCS and MCS scores were lower than before the pandemic (Ashri et al. 2021; Su et al. 2019), suggesting that our population's well-being may be affected.

It is worth noting that, the inclusion criteria could introduce a sampling bias by excluding

TABLE 4: Preliminary and final factor associated with physical component summary (PCS)

Factors	PCS score	Simple linear regression				Multiple linear regression			
	Mean (SD)	β	95% CI	t	p-value	β	95% CI	t	p-value
Age	46.94 (7.46)	-0.07	-0.15, 0.02	-1.58	0.117				
Gender									
Female (reference)	47.09 (7.49)								
Male	46.71 (7.45)	-0.38	-2.28, 1.52	-0.40	0.692				
Ethnic									
Non-Malay (reference)	44.44 (8.45)								
Malay	47.52 (7.12)	3.08	0.73, 5.43	2.58	0.011*	3.08	0.73, 5.43	2.58	0.011*
Marital status[1]									
Unmarried (reference)	46.83 (8.28)								
Married	47.04 (6.70)	0.21	-1.66, 2.08	0.22	0.83				
Educational status[1]									
Lower educational level (reference)	46.53 (7.42)								
Higher educational level	47.30 (7.51)	0.77	-1.09, 2.63	0.81	0.416				
Employment status[3]									
Unemployed (reference)	46.45 (7.84)								
Employed	47.08 (7.37)	0.63	-1.62, 2.87	0.55	0.584				
Internet Addiction Score (IAT)	46.94 (7.46)	0.01	-0.07, 0.09	0.29	0.776				

[1]Single and divorced/widowed were categorised into unmarried; [2]Diploma and degree/masters/PhD were categorised into higher educational level; [3]Student, unemployed and retiree were categorised into unemployed. *Significance at p <0.05. Simple linear regression: Normality and equal variances assumptions for all variables were met and independent random samples were drawn for the construction of data. Multiple linear regression: (Adjusted R^2 = 0.02). The model fitted reasonably well, all model assumptions were met, there was no multicollinearity problem: Variance-inflation-factor (VIF) <10.

TABLE 5: Preliminary and final factors associated with mental component summary (MCS)

Factors	MCS score	Simple linear regression				Multiple linear regression			
	Mean (SD)	β	95% CI	t	p-value	β	95% CI	t	p-value
Age	46.18 (10.12)	0.22	0.11, 0.33	4.01	<0.001*				
Gender									
Female (reference)	46.14 (10.45)								
Male	46.24 (9.67)	0.10	-2.47, 2.68	0.08	0.937				
Ethnic									
Non-Malay (reference)	44.30 (10.37) 46.62 (10.04)								
Malay		2.32	-0.90, 5.54	1.42	0.157	3.16	0.28, 6.05	2.16	0.032*
Marital status[1]									
Unmarried (reference)	44.04 (9.94)								
Married	48.07 (9.94)	4.03	1.55, 6.51	3.20	0.002*				
Educational status[1]									
Lower educational level (reference)	46.76 (9.38)								
Higher educational level	45.67 (10.76)	-1.09	-3.62, 1.43	-0.85	0.395				
Employment status[3]									
Unemployed (reference)	45.05 (10.60)								
Employed	46.51 (9.99)	1.45	-1.60, 4.49	0.94	0.349				
Internet Addiction Score	46.18 (10.12)	-0.37	-0.46, -0.27	-7.77	<0.001*	-0.37	-0.46, -0.28	-7.96	<0.001*

[1]Single and divorced/widowed were categorised into unmarried; [2]Diploma and degree/masters/PhD were categorised into higher educational level; [3]Student, unemployed and retiree were categorised into unemployed. *Significance at p <0.05. Simple linear regression: Normality and equal variances assumptions for all variables were met and independent random samples were drawn for the construction of data. Multiple linear regression: Adjusted R^2 = 0.20. The model fitted reasonably well, all model assumptions were met, there was no multicollinearity problem: VIF<10.

people who do not have have internet access. However, we postulated that most of our study population would have internet access, as this access has become increasingly abundant (Sixsmith et al. 2022). This is especially true when the country is formulating plans to provide wider internet coverage for the population, such as the Jalinan Digital Negara (JENDELA) plan (MCMC n.d.).

PCS Domain of HRQOL and its Association with Sociodemographic Characteristics

Regarding the physical component, it is noticeable that the mean score of all domains is lower compared to findings from a local, nationwide survey (Azman et al. 2003). The results indicate that the pandemic might affect the overall physical well-being. The limitation of physical interactions and recreational activities

through the enforcement of movement control order, working and learning from home (Salway et al. 2021) could have induced an inactive lifestyle, causing a deterioration of physical health (Park et al. 2021). This sedentary lifestyle and home confinement could lead to bodily pain and limitation of role due to physical health, which is probably why the scores of these two domains deteriorate in the current study (Ikeda et al. 2022).

Meanwhile, among all the PCS domains, the mean score of GH was the lowest, highlighting that our participants viewed their general health as poor (Khanna & Tsevat 2007). This is probably because the participants were sampled from patients attending the health clinic for a health condition. Hence, they might perceive their health as not being optimum, and this correlates with the understanding that HRQOL is generally affected if a person has a medical condition (Khanna & Tsevat 2007). Furthermore, most of our participants are female, and a local study has reported that females tend to view their health status as poor (Wan Puteh et al. 2019). The perception of overall health is important to portray a person's ability to execute daily tasks, work and social roles. It can be argued that this perception of general health may be interrelated with other domains of HRQOL. For example, an individual may view their health from the perspective of good mental well-being and feeling happy from having financial stability (Bialowolski et al. 2021; Weida et al. 2020). On the other hand, feeling worried and uncertain about the future, e.g. the consequence of the pandemic, can cause individuals to lose emotional control and it may influence their HRQOL, particularly the mental health domain (Khanna & Tsevat 2007).

Our study investigated the association between PCS and sociodemographic characteristics and the findings showed that the Malay ethnic group had higher physical function than non-Malay. While this result concurs with Thangiah et al. (2020), two studies reported an opposite finding (Ashri et al. 2021; Azman et al. 2003). Although previous research highlighted that Malay ethnicity has a higher level of physical activity (Cai Lian et al. 2016), it is difficult to conclude as majority of the participant was Malay and there has been a report stating no difference between ethnic groups and physical activity (Cheah & Poh 2014). Meanwhile, in view of age and gender, the current study failed to demonstrate any difference in physical function between age and gender, in contrast to a local population survey and studies in other populations (Ashri et al. 2021; Azman et al. 2003; Long et al. 2022; Su et al. 2019; Wen et al. 2022). This maybe because more than half of our sample is female and in the age group of 18-35 years old; thus, we could not detect a truly significant difference.

MCS Domain of HRQOL and its Association with Sociodemographic Characteristics

Looking into the mental component, certain aspects, including vitality, social functioning and mental health showed a deterioration compared to before the pandemic (Zamberi et al. 2022). In our study, the mean score of vitality was the lowest, followed by mental health. Vitality is defined as the sense of liveliness and vigour and it portrays a person's energy level (Guérin 2012; Khanna & Tsevat 2007). The feeling of low energy might be related to the overall mood, reduced social interactions and isolation that occurred during the pandemic (Hansel et al. 2022) and the effect may still be felt by the study participants. Moreover, disrupted sleep patterns during the lockdown period might affect the energy level leading to fatigue and reduced physical activities (García-Garro et al. 2022). The low vitality in our results suggests that some people have not recovered and restored their total capacity.

Furthermore, our study's low mental health score affirms previous studies' findings, whereby the pandemic had caused significant psychological distress (Bono et al. 2023; Hansel et al. 2022). Our study participants reported experiencing some difficulties during the pandemic, possibly disrupting their mental health and the effect may be prolonged. This issue warrants further assessment as there have been reported by other countries of high anxiety and depression triggered by the loss of loved ones,

financial difficulties and worries of uncertainties of the pandemic (Ikeda et al. 2022). It is acknowledged that people need time to recover from these unfortunate events, and currently, our findings portray that some people have not recovered.

Based on the bivariate analysis, age and marital status are significantly associated with the MCS score. It is noted that the higher the age, the better mental well-being, conforming to previous research (Thomas et al. 2016). This suggests that as people are older, they are more mature and might be better at adapting and coping with stressful changes. They are also more realistic with their aspirations in life, with better emotional reserve to counter threats and mental health issues (Thomas et al. 2016). It is worth noting that our sample was mostly below 55 years old, in the middle-aged groups where their physical function, financial and living conditions are probably stable as opposed to those in the elderly age group. We also found that marriage is associated with better mental well-being, similar with Grundström et al. (2021). The better mental well-being could be attributed to social support, better coping and financial resources (Grundström et al. 2021). However, in the multivariable analysis, only Malay was found to be a significant factor, and this finding warrants further exploration, particularly from the perspective of religion and culture. A strong belief in religion and regular religious activities practised by the Malay may play a key role in their mental well-being (Tan et al. 2022). Believing that there is a high power, God controlling every aspect of life helps them maintain calmness and hope (Tan et al. 2022), and instils a positive spirituality which is a vital factor for good quality of life (T'ng et al. 2019).

The Prevalence of IA and the Association between IA Score and HRQOL Domains

Our study revealed that 30.3% of adults are addicted to the internet, consistent with previous local studies among youth (Ansari et al. 2022) and even during the pandemic (Fu et al. 2022; Jaafar et al. 2022). This similarity could be attributed to more than half of our participants being in a young age group, but our figure is notably higher than other populations (Adorjan et al. 2021; Kim et al. 2017). This could be due to differences in study instruments and cut-off points that determine IA (Kim et al. 2017; Adorjan et al. 2021). Nonetheless, our finding implies that some people might use the internet excessively, and most participants even admitted that they use it more now than before the pandemic. Perhaps the loneliness and social isolation during the pandemic made them get used to the internet devices, and now they find them easier to use and may become addicted (Boursier et al. 2020).

As IA becomes a health concern, scholars have questioned whether IA is resulted from mental health or vice versa (Jaafar et al. 2022). Our finding revealed that people with IA have poorer mental health, which concurs with past research (Guo et al. 2020; Jaafar et al. 2022; Kim et al. 2017). A possible explanation is that some people, particularly the younger generation, like to express their emotions and inquire about themselves on social media. It can be seen as an advantage but may expose them to cyberbullying and hateful comments (Arpaci et al. 2020), triggering multiple psychological problems (Guo et al. 2020; Kim et al. 2017). People with IA are also more likely to engage excessively with screens for gaming and entertainment and have less communication with others. This can make them feel isolated and induce negative thoughts (Boursier et al. 2020). In contrast, people who are depressed or anxious due to unemployment or relationship problems might also turn to the internet to escape or form new relationships online (Ikeda et al. 2022). It can be their coping mechanism, and for this reason, they spend more time on the internet and could be labelled as having IA (Boursier et al. 2020; Melodia et al. 2022).

Consistent with other studies (Almukhtar & Alsaad 2020; Solati et al. 2018), the current study failed to detect any association between IA and PCS. This finding contradicted previous reports which found that people with IA tend to have poor physical health due to prolonged sitting (Güzel

et al. 2018) and limited physical activity (Aşut et al. 2019). Nevertheless, the evidence of the impact of IA on physical well-being is subjected to further research as it is still inconclusive.

Limitations and Recommendations

This study has several limitations. The current study is cross-sectional. Thus, a causal relationship between the variables cannot be established. Secondly, the study was conducted at a single outpatient clinic. Hence, the results cannot be generalised. We suggest conducting a nationwide survey to determine our population's standard HRQOL scores post-pandemic, including other factors, such as social support, medical conditions and psychological distress. These factors have potential impacts on HRQOL and was not included in this current study.

Further studies should be advocated to understand better how IA is linked with HRQOL, as the association is still unclear. Despite this limitation, the findings could be generalised to broader population beyond the specific clinic or hospital setting. This generalisability may be achieved as a systematic random sampling method was applied, thus reducing differences between the sample and the wider population (Rudolph et al. 2023).

As aforementioned, the association between gender, employment and QoL requires a sample size of at least 2544 based on Sabri et al. (2022). Nevertheless, due to the limited duration of the study, data collection was halted. This limitation may have contributed to several factors not showing significant association with the outcome, leading to false negative results. Thus, these findings need to be interpreted with caution. Further studies with larger sample size is important to determine the associations more thoroughly.

CONCLUSION

The current study provides a preliminary overview of our local population's well-being post-COVID pandemic. The results showed that their physical and mental well-being declined from the pre-pandemic level, with vitality and mental health domain being the lowest score. This is a great cause for concern as there is a possibility that Malaysian adults may not have fully recovered from the hardships of the pandemic. A third of the participants experienced IA and a significant link exists between it and mental well-being. Healthcare providers should attempt to screen for IA in adults with mental health and provide psychological support for people affected by the pandemic.

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