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Quality Of Life And Health Literacy Among Patients Living With Diabetes Mellitus In Penang State Hospital, Malaysia

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ABSTRACT

Introduction: *Diabetes mellitus is a major non-communicable disease (NCD) which affects approximately 10.5% of adults worldwide.*

Methods: *This study is a cross-sectional study conducted in the Hospital Pulau Pinang. A total of 129 participants have been sampled, where the sampling method has been simple random sampling, with 122 minimum samples.*

Results: *The mean overall QOL scores is 60.85, with SD 18.180. The overall mean health literacy score is 73.76 (SD12.636) which is reported as sufficient health literacy among the respondents. Through multiple linear regression, QOL between patient's age 18-40 years old and age 61-80 are significantly different. Mean QOL among patients with primary education and secondary education are significantly different from each other. Finally, patient's QOL for excellent health literacy are significantly different from QOL for patients with problematic health literacy.*

Discussion: *The limited health literacy or inadequate health literacy among participants in this study is 4.7%, which showed a higher rate of health literacy among Malaysians in this study. Health literacy is shown to significantly affect diabetic patients' QOL.*

Conclusion: *QOL is one of the many outcomes of treatment of diseases and therefore is important as a measure of outcome of treament.*

Key words: *Health literacy, quality of life, diabetes mellitus*

INTRODUCTION

Diabetes mellitus is a major non-communicable disease (NCD) which affects approximately 10.5% of adults worldwide (Sun et al., 2022). It is a major public health concern and is known to significantly impact on patients' quality of life (Alshaikhi et al., 2025; Sun et al., 2022). There are a few types of diabetes mellitus according to the ICD-11 classification and this includes Type 1, Type 2, and gestational diabetes mellitus (Kumar et al., 2020). In Malaysia itself, as of 2019, it is noted that approximately 3.9 million adults are living with diabetes, with the majority of them being Type 2 diabetes mellitus. According to the National Health and Morbidity Survey 2019 (NHMS), the prevalence of overall raised blood glucose among Malaysians is 18.9% while NHMS noted an increase in the prevalence of diabetes mellitus from 11.2% in 2011 to 13.4% in 2015 (Mokhtar, Zaki, & Ibrahim, 2025). The burden of the complications of the disease poses a threat to the nation, and increases both the direct and indirect costs attributable to the disease, more so when the healthcare system is heavily subsidised by taxpayer's money (Chandran, Selva Kumar, Hairi, Low, & Mustapha, 2021). Atherosclerotic disease and heart failure remain the major causes of premature death and disability, but the Global Burden of Cardiovascular Diseases Study show there is lack of improvements in the five key risk factors in the past 30 years. These are high Body Mass Index (BMI), high systolic blood pressure (BP), high Low-density Lipoprotein Cholesterol (LDL-C), high fasting plasma glucose, and renal dysfunction, the top five modifiable risk factors of atherosclerotic disease and heart failure, from 1990-2019 (Roth et al., 2020).

Quality of life (QOL) is a pertinent domain in human life, and is noted to be related to the values systems and culture in an individual as well as their expectations and goals. (Group, 1994). Diabetes mellitus is known as one of the major NCDs which contribute to the poorer QOL among those suffering from the disease (Tamornpark et al., 2022). It is noted that generally those suffering from diabetes mellitus exhibit poorer QOL compared to the general population. Exhibiting a poorer QOL leads to several impacts on patients' physical and mental health (Degu, Wondimagegnehu, Yifru, & Belachew, 2019). Studies have further shown that Malaysian patients suffering from diabetes mellitus tend to be associated with lower QOL with increasing complications. Patients with foot ulcer, severe heart failure, and amputation recorded worse scores across domains in all EQ-5D-5L dimensions (Mokhtar et al., 2025).

Health literacy is an important aspect of educating the patients especially those who suffer from NCDs, who would frequent the health facilities compared to the general population. As this study refers to the study of health literacy in the public health context, hence "Public health literacy is the degree to which

individuals and groups can obtain, process, understand, evaluate, and act upon information needed to make public health decisions that benefit the community" (Freedman et al., 2009). Individuals with adequate health literacy are known to more likely engage with necessary self-care activities, with higher health literacy correlating with higher QOL (Avsar, Kilincarslan, Yilmaz, & Sari). Patients with adequate health literacy are more likely to adhere to treatment regimens, monitor their blood glucose, and adopt healthy lifestyle behaviours, which in turn is associated with improved quality of life.

It can be noted that higher health literacy will lead to better self-care, which in turn will improve patients' QOL and it is therefore pertinent to state that health literacy and QOL go hand in hand in the education and treatment of patients living with diabetes mellitus.

Objectives

The objectives of this study are as follows:

General objective

"To assess the level of QOL of patients with diabetes mellitus in Penang State Hospital and identify its association with health literacy and social demographic factors."

Specific objectives

a. "To describe the sociodemographic factors of patients with diabetes mellitus in Penang State Hospital"
b. "To assess the level of QOL of patients with diabetes mellitus in Penang State Hospital"
c. "To measure the level of health literacy of patients with diabetes mellitus in Penang State Hospital"
d. "To identify the association between between QOL and health literacy among patients with diabetes mellitus in Penang State Hospital?"

Research Questions

What is the QOL of patients with Diabetes Mellitus in Penang State Hospital?
What is the health literacy level of patients with Diabetes Mellitus in Penang State Hospital?
What are the sociodemographic factors associated with QOL of patients with Diabetes Mellitus in Penang State Hospital?
What is the association between QOL and health literacy among patients with Diabetes Mellitus in Penang State Hospital?

METHODS

This study is a cross-sectional study conducted in the Hospital Pulau Pinang, which is a Ministry of Health tertiary hospital and a referral hub of the northern region. This particular hospital is chosen as the study site as it is the only hospital in Penang state which has a Diabetologist as a resident doctor in the hospital, and the clinic is a hub of all types of diabetic patients referred to the hospital as a referral centre. There are more myriad patient conditions in Penang State Hospital as the centre is a referral centre in the region, hence the patients are more random in terms of logistics. The inclusion criteria include:

1. "All diabetic patients followed up in Diabetes and Endocrinology Clinic above 18 years old in Penang State Hospital";

Exclusion criteria include:

1. "Diabetic patients who lack the capacity to provide informed consent due to psychiatric illness, dementia, or temporary impairment such as severe pain, under sedation etc."

A total of 129 participants have been sampled, where the sampling method has been simple random sampling, with 122 minimum samples. The sample size calculation is calculated using the SSCPS version 1.0.03 software where sample size calculator for estimating mean is applied for the dependent variable of quality of life among diabetic patients.. For the independent variables, the Power and Sample Size Program is utilised, where sample size is calculated based on difference of means in significant studies. Participants were chosen from a sample of patient list, with every third patient in the list being selected to participate. The study was conducted from February 2025 to June 2025. The study instrument used to measure the QOL of patients with diabetes mellitus is the The World Health Organization's WHOQOL-BREF quality of life assessment, which is a 26-item questionnaire assessment, which is a version of the WHOQOL-100 questionnaire (Group, 1998; Trompenaars, Masthoff, Van Heck, Hodiamont, & De Vries, 2005). The study instrument used to measure the health literacy among the diabetic patients is the European health literacy questionnaire (HLS-EU-Q12), which is a short version HLS-EU-Q47 questionnaire (Duong et al., 2019; Maydeu-Olivares, 2013). Both instruments have documented internal and external validity and have been validated to be used in Malaysian population (Duong et al., 2019; Group, 1998).

The variables which are explored in this study is as below.

Dependent variable

Variable	Conceptual definition	Operational definition
Quality of Life	"how well a person functions in their life and his or her perceived wellbeing in physical, mental, and social domains of health" (Köves et al., 2017)	Physical; Psychological; Social; Environmental (see below)
1) Physical QOL	"The physical dimension refers to perceived and observed bodily functions or disruption." (Felce & Perry, 1995)	0-100 marks
2) Psychological QOL	"ranging from a positive sense of wellbeing to nonpathological forms of psychological distress to diagnosable psychiatric disorder"(Post, 2014)	0-100 marks
3) Social QOL	"including assessment of both quantitative and qualitative aspects of social contacts and interactions"(Post, 2014)	0-100 marks
4) Environmental QOL	"The measurement of qualitative and effective evaluation of environmental quality"(Pereira et al., 2006)	0-100 marks

Independent variables

Variable	Conceptual definition	Operational definition
Sociodemographic Factors		
Age	"The concept of age describes how old a person is at a particular point in time. It is defined as the measure of the time elapsed from date of live birth to a specific point in time, usually the date of collection of the data"(Statistics, 2017)	18-40; 41-60; 61-80 years old
Job	"A regular renumerative position" (Webster, 2024)	
Gender	"Characteristics of women, men, girls and boys that are socially constructed" (Organisation, 2024)	Male; Female
Race	"Group individuals with a shared country or region of birth or residence" (Braun, Wolfgang, & Dickersin, 2013)	Malay; Chinese; Indian; Others
Education	"Beliefs about what is worth learning and how people should acquire that learning" (Biesta, 2015)	Primary; Secondary; Tertiary
Income	"Money that a person or a business receives in return for working, providing a product or	≤RM1000; RM1001-M3000;

	service, or investing capital" (Williams & Griffin, 1967)	RM3001-RM5000; RM5001-RM7000; RM7001-RM9000; (Goh & Tey 2018)
Marital status	"The civil status of each individual in relation to the marriage laws or customs of the country" (Schoenborn, 2004)	Single; Married
Health Literacy	"Public health literacy is the degree to which individuals and groups can obtain, process, understand, evaluate, and act upon information needed to make public health decisions that benefit the community"(Freedman et al., 2009)	Excellent (>84%-100%) Sufficient (>66% - 84%) Problematic (>50%-66%) Inadequate (0%-50%)

To avoid biases in the study, simple random sampling method has been utilised in this study and representative sampling has been conducted. Unbiased data collection has been assured by using validated questionnaire, where The World Health Organization's WHOQOL-BREF quality of life assessment, which is a 26-item questionnaire assessment, and the European health literacy questionnaire (HLS-EU-Q12), have been utilised. The tools utilised have been validated to be used in the Malaysian setting.

The study size of minimum sample size of 122 was obtained using SSCPS version 1.0.03 software to obtain the sample size for dependent variable and the Power and Sample Size Program to calculate for independent variables. Data was analysed using SPSS 26. The data obtained was represented descriptively in tables. Cross-tabulations are also presented descriptively. The means of the QOL score were calculated and tabulated. The mean scores of the QOL were compared using ANOVA (patient's age, patient's education, patient's race, patient's income, years since diagnosis, and health literacy), and t-test (gender, patient's marital status, patient employment status). Simple linear regression and multivariate regression analysis was used to assess the significant variables, which are associated with QOL. Multiple linear regression test is used to represent the means. A p-value of <0.05 is considered as significant. A p-value of 0.20 was used as a cut-off point to decide which variables from univariate to include in the multiple regression model. The mean marks are assumed to be normal, and parametric test was utilised, which confirms the assumption has been fulfilled.

This study has followed the ethical principles laid out in Belmont's principles. These are respect for persons, beneficence, and justice. This study has abided by respect for persons by delineating to the participants they are free to withdraw from the study at any time, without giving any reason. This study is beneficial to the participants as it will improve the understanding of health literacy, its association with QOL of patients with diabetes mellitus. Other than that, the findings of the study will do justice if steps are taken to rectify the issue deemed to have been identified. This study also practises informed consent, where the objectives and purpose of the study are delineated to the participants prior to consent. It also ensures anonymity by protecting its participants' identity. This study has also obtained ethics approval from Medical Research Ethics Committee (MREC).

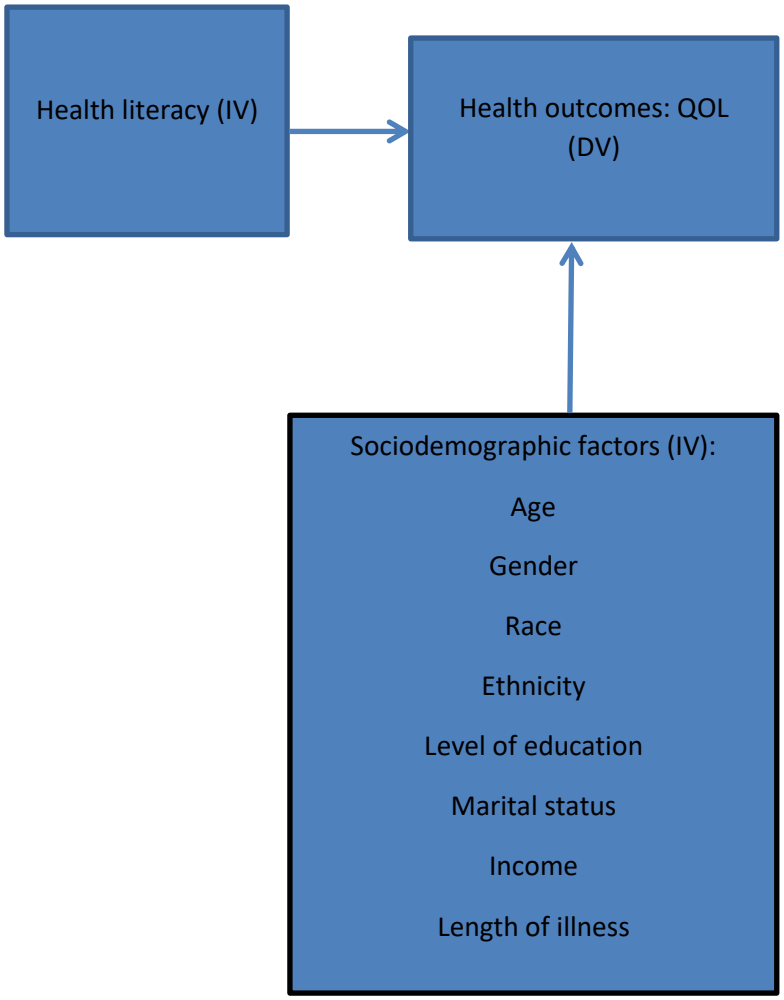

Figure 1: Conceptual Framework

RESULTS

The results of the study are depicted as in the tables below. Table 1 shows the descriptive variables of respondents' baseline characteristics.

Variables	Frequency	Percentage (%)
Patient's age		
18 to 40 years old	52	40.3
41 to 60 years old	59	45.7
61 to 80 years old	18	14.0
Patient's gender		
Men	61	47.3
Women	68	52.7
Patient's Marital status		
Married	85	65.9
Single	44	34.1
Patient's Education		
Primary school	5	3.9
Secondary school	53	41.1
Tertiary education	71	55.0
Patient's Race		
Malay	62	48.1
Chinese	42	32.6
Indian	23	17.8
Others	2	1.6
Patient's Employment		
Employed	93	72.1

Unemployed	36	37.9
Patient's income		
Less than RM1000	42	32.6
RM1001-RM3000	29	22.5
RM3001-RM5000	15	11.6
RM5001-RM7000	5	3.9
RM7001-RM9000	7	5.4
Years since diagnosed		
Less than 10 years	49	38.0
10-20 years	38	29.5
20-30 years	32	24.8
More than 30 years	10	7.8
Health literacy		
Excellent (>84%-100%)	24	18.6
Sufficient (>66% - 84%)	75	58.1
Problematic (>50%-66%)	24	18.6
Inadequate (0%-50%)	6	4.7

Table 1: Descriptive variables of respondent's baseline characteristics

It is reported that the highest patient age category is from 41-60, with 59 (45.7%). There are 68 (52.7%) women, and 61 (47.3%) men. There are 85 (65.9%) married, and 44 (34.1%) single participants. It is further noted that 71 (55.0%) are tertiary educated. There are 62 (48.1%) Malays, followed by 42 (32.6%) Chinese, and 23 (17.8%) Indians. There are 93 (72.1%) employed and 36 (39.9%) unemployed. Those earning less than RM1000 is deemed 42 (32.6%). 49 (38.0%) of patients were diagnosed for less than 10 years, while between 10-20 years, there are 38 (29.5%), 20-30 years 32 (24.8%), followed by more than 30 years, 10 or 4.8%). There are 24 (18.6%) patients with excellent health literacy, 75 (58.1%) with sufficient health literacy, 24 (18.6%) with problematic health literacy, and 6 (4.7%) with inadequate health literacy.

Table 2 shows the QOL scores of the respondents. The mean overall QOL scores is 60.85, with SD 18.180. The mean scores for the subdomains were physical 61.66 (SD 15.647), psychological 65.37 (SD15.475), social 64.53 (SD 16.676), and environmental 66.33 (SD13.397). The highest mean scores were for environmental QOL, followed by psychological, social, and physical QOL.

	Mean	Standard deviation	Min	Max
Overall QOL	60.85	18.180	0.00	100.00
Physical	61.66	15.647	25.00	100.00
Psychological	65.37	15.475	20.83	95.83
Social	64.53	16.676	0.00	100.00
Environmental	66.33	13.397	25.00	100.00

Table 2: Quality of Life scores

Table 3 shows the overall mean health literacy score is 73.76 (SD12.636) which is reported as sufficient health literacy among the respondents.

	Mean	Standard deviation	Min	Max
Overall HL	73.76	12.636	37.50	100.00

Table 3: Health literacy scores

Table 4 shows the association of mean QOL and patients' baseline profile. It is worth noting that according to the ANOVA/t-test conducted for all the groups of patients, mean marks of health literacy is shown to be significantly different in the different quadrant with highest QOL in the excellent group, followed by sufficient, inadequate, and finally problematic group.

Variables	**Overall Quality of Life score (Mean score)**	**95% CI**
Patient's age		

18 to 40 years old (1)	61.06	55.56-66.56
41 to 60 years old (2)	58.05	53.34-62.77
61 to 80 years old (3)	69.44	64.57-74.32
Patient's gender		
Men	60.25	52.73- 65.46
Women	61.40	53.92- 66.59
Patient's Marital status		
Married	61.91	51.91- 65.71
Single	58.81	49.02- 62.39
Patient's Education		
Primary school	65.00	47.00-82.0
Secondary school	60.85	56.12-65.58
Tertiary education	60.56	57.69-64.02
Patient's Race		
Malay	60.89	55.93-65.85
Chinese	60.12	54.53-65.71
Indian	62.50	55.98-69.02
Others	60.85	
Patient's Employment		
Employed	60.35	55.69- 68.61
Unemployed	62.15	56.87- 71.04
Patient's income		
Less than RM1000	59.23	53.08-65.37
RM1001-RM3000	59.05	51.65-66.45
RM3001-RM5000	65.83	59.72-71.95
RM5001-RM7000	60.00	21.35-98.65
RM7001-RM9000	67.86	50.38-85.33
Years since diagnosed		
Less than 10 years	59.44	54.18-64.70
10-20 years	62.17	56.56-67.78
20-30 years	59.38	52.60-66.15
More than 30 years	67.50	52.78-82.22
Health literacy		
Excellent (>84%-100%)	73.44	64.87- 82.01
Sufficient (>66% - 84%)	60.33	56.75- 63.91
Problematic (>50%-66%)	51.04	43.43 - 58.65
Inadequate (0%-50%)	56.25	40.18-72.32

Table 4: The comparison of mean QOL across patient's baseline profile

Table 5 shows the T-test/Anova and post hoc analysis for the variables across patient's baseline profile.

Variables	**T-test/ ANOVA F/p-value**	**Post-hoc**
Patient's age		
18 to 40 years old (1)	2.790/ 0.065	
41 to 60 years old (2)		
61 to 80 years old (3)		
Patient's gender		
Men	0.404/ 0.526	
Women		
Patient's Marital status		
Married	0.101/ 0.751	
Single		
Patient's Education		

Primary school	0.137/ 0.872	
Secondary school		
Tertiary education		
Patient's Race		
Malay	0.126/ 0.945	
Chinese		
Indian		
Others		
Patient's Employment		
Employed	1.742/ 0.189	
Unemployed		
Patient's income		
Less than RM1000	0.550/ 0.738	
RM1001-RM3000		
RM3001-RM5000		
RM5001-RM7000		
RM7001-RM9000		
Years since diagnosed		
Less than 10 years	0.676/ 0.568	
10-20 years		
20-30 years		
More than 30 years		
Health literacy		
Excellent (>84%-100%)	7.234/ <0.01*	Inadequate - p = 0.28 Problematic - p = <0.01 Sufficient - p = 0.01
Sufficient (>66% - 84%)		
Problematic (>50%-66%)		
Inadequate (0%-50%)		

Table 5: T-test/ANOVA of variables across patient's baseline profile
*Significant p-value <0.05

Table 6 shows multiple linear regression for patient factors associated with QOL. It is noted that the QOL between patient's age 18-40 years old and age 61-80 are significantly different. Mean QOL among patients with primary education and secondary education are significantly different from each other. Mean QOL of patients with income bracket RM5001-RM7000 is deemed significant. Finally, patient's QOL for excellent health literacy are significantly different from QOL for patients with problematic health literacy.

Variables	**Overall Quality of Life score (Mean score)**	**Coefficient**	**p-value**
Patient's age			
18 to 40 years old	61.06	0.178	0.093*
41 to 60 years old	58.05	-	-
61 to 80 years old	69.44	0.284	0.010*
Patient's gender			
Men	60.25	1.00	0.025*
Women	61.40	0.02	0.986
Patient's Marital status			
Married	61.91	0.093	0.382
Single	58.81	-	-
Patient's Education			
Primary school	65.00	0.122	0.195*
Secondary school	60.85	0.177	0.075*
Tertiary education	60.56	-	-

Patient's Race			
Malay	60.89	0.099	0.959
Chinese	60.12	0.077	0.822
Indian	62.50	0.077	0.785
Others	60.85	-	-
Patient's Employment			
Employed	60.35	0.173	0.405
Unemployed	62.15	-	-
Patient's income			
Less than RM1000	59.23	0.161	0.390
RM1001-RM3000	59.05	-	-
RM3001-RM5000	65.83	0.024	0.816
RM5001-RM7000	60.00	0.154	0.126*
RM7001-RM9000	67.86	0.101	0.316
Years since diagnosed			
Less than 10 years	59.44	-	-
10-20 years	62.17	0.086	0.383
20-30 years	59.38	-0.008	0.937
More than 30 years	67.50	0.105	0.282
Health literacy			
Excellent (>84%-100%)	73.44	0.314	0.001*
Sufficient (>66% - 84%)	60.33	-	-
Problematic (>50%-66%)	51.04	-0.239	0.015*
Inadequate (0%-50%)	56.25	-.085	0.366

Table 6: Multiple linear regression for patient factors associated with QOL
*significant p-value <0.20

DISCUSSIONS

The mean QOL of participants in this study is 60.85. A study done in 2024 by Oluwatuyi et al. showed almost similar QOL scores among patients with diabetes mellitus in Lagos, where the mean QOL score was 63.37, which is still higher than the mean QOL score among participants in this study (Oluwatuyi et al., 2024). However, QOL assessments in the four domains in another study by Kiçaj et al. (2025) showed poorer mean marks among the patients in Albania compared to the participants in this country, with mean marks of physical health of 35.36, psychological health 34.26, social health 40.77, and environmental health of 30.93 (Kiçaj et al., 2025). Another study done in Indonesia showed mean marks of physical domain of patients with diabetes mellitus in Indonesia to be 59.3, psychological health, 62.7, social health 68.2, and environmental health 70.5 (Yusuf, 2025) which is reasonably close to the findings from this study. Hence from these studies done throughout the world, it can be concluded that the mean QOL score of the participants in this study showed average QOL scores in regular diabetic patients.

The mean health literacy score of the participants in this study is 73.76 with an SD12.636. It is noted that the global data on health literacy among patients with diabetes mellitus is limited and about 79% of patients with diabetes mellitus live in low middle income countries (LMICs). In the USA, it is noted that percentage of patients with limited health literacy is 30%, while proportion of adults in Canada with limited health literacy is 12.6% (Abdullah, Liew, Salim, Ng, & Chinna, 2019). The limited health literacy or inadequate health literacy among participants in this study is 4.7%, which showed a higher rate of health literacy among Malaysians in this study. This is an exemplary result shown which goes to show that

our health education and health promotion in the public health sector achieves success and meet its target.

Health literacy is shown to be associated with diabetic patients' QOL. It is shown from this study that patients with health literacy in the excellent category are noted to have a much higher QOL, i.e. with a mean of 73.44 compared to those with problematic health literacy, which showed a mean QOL of 51.04. Diabetes mellitus is a disease known to have serious negative impact on patients' emotional, social, and physical health. It is noted that from this study, the mean overall QOL found in the patients is 60.85, which indicates that there is room for improvement, as the score is an average OOL score. From this study, higher health literacy has shown to increase the mean QOL of the patients by leaps and bounds. It is noted that higher health literacy is associated with improved QOL in diabetic patients, self-care activities, and glycaemic control (ALSharit & Alhalal, 2022). Other than that another study from China has shown the same correlation seen between health literacy and QOL, with higher health literacy associated with higher QOL (Gao et al., 2023). This study by Gao et al. (2023) also showed that the Chinese diabetic patients had poorer QOL compared to the general population with poor self-management score and skills. Other than that, patients who had higher health literacy were correlated with higher QOL and exhibited less complications from diabetes mellitus compared to patients with lower health literacy. Patients with higher health literacy were noted to be without peripheral neuropathy and diabetic foot ulcers. This is because patients with higher health literacy retain more health-related information and function at a higher level in terms of mastery of health-related information and learning ability (Schulz, Pessina, Hartung, & Petrocchi, 2021). Patients with higher health literacy are more likely to be more indulging in strict self-care activities, and this leads to lower

It is noted in most studies that poorer education has been associated with poorer QOL among patients with diabetes mellitus (Sreejith). However this study shows that patients with higher education, i.e. secondary school graduates tend to have poorer QOL compared to their counterparts who had only primary education. However, level of education is not a substitute for health literacy, hence we cannot generalise patients with lower level of education have lower health literacy. In some cases, it is noted that lower education can be associated with higher QOL in situations of patients with higher social support, fulfilling work in niche fields, and a focus on personal well-being (Stansfeld, Shipley, Head, Fuhrer, & Kivimaki, 2013). These factors act as the confounding factors which affect the relationship between education level and QOL.

That said, higher income does correspond to better QOL in this study. However, it is only significant in one income bracket, which is between RM5001-RM7000. However, the significance of the mean QOL cannot be compared to other income brackets. It is worth noting that the mean QOL increases with increasing income bracket, somewhat signalling better QOL in those with higher income. According to Tamornpark et al. (2022), patients with poorer income are correlated with poorer QOL. It is noted that having high income could well support patients' diabetic mellitus QOL as those with higher income could well afford to seek medical support and care without financial barriers (Tamornpark et al., 2022). This has been supported by other studies conducted throughout the world (Alshayban & Joseph, 2020; Komaratat, Auemaneekul, & Kittipichai, 2021; Mngomezulu & Yang, 2015)

Strength and limitations

The strength in this study lies in the fact that it is a novel study conducted in Malaysia. Prior to this, there were only two studies which covered QOL and health literacy among diabetes patients in Malaysia, and the analysis was not as thorough as shown by this study (Shibraumalisi, Mat Nasir, Md Yasin, & Isa, 2020; Wan Hamdzan, Mahmud, Ismail, & Ghazali, 2024). Other than that, the strength of the study also lies in the fact that minimum sample size has been achieved to show a significant difference in the findings. The simple random sampling method utilised in this study has also made the findings more significant.

The limitation of this study lies in the fact that it is somewhat a small-scaled study conducted in Penang State Hospital only. Further research conducted in this field and subject should utilise second generation linear regression method such as Structurel Equation Modelling to ensure a more robust analysis.

This study will add value in terms of public health impact. This study shows that health literacy of the participants is sufficient, hence it proves that the health education, and health literacy among diabetic patients is in the acceptable range. Other than that, this study has reiterated the Sustainable Development Goal (SDG) 3 which is good health and wellbeing. This SDG focuses on ensuring healthy lives and promotion of wellbeing for all ages. This include a wide range of coverage of where the health literacy can reach patients. This study will be beneficial in providing evidence that necessary steps to ramp up the

health promotion among diabetic patients need to be a point of focus to help achieve higher QOL among these patients. Health policy needs to be improved upon to include health promotion in its health delivery, and targeted interventions need to be focussed on the diabetic patients to improve their QOL.

CONCLUSION

In conclusion, this study has managed to show the importance of health literacy in navigating diabetic patient's QOL. The study has managed to show the association between health literacy and diabetic patient's QOL. With the added knowledge from this study, targeted interventions can be utilised to increase patient education and improve health literacy among patients in order to produce beneficial outcomes such as better QOL among diabetic patients. As it is a novel area of research in this country, the study can be replicated in all states and can be conducted at a larger scale in Malaysia for us to truly grasp the Malaysian context of health literacy and patient's QOL.

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