ORIGINAL ARTICLE

# Diabetes Quality of Life Among Elderly Diabetic Patients and Its Associations

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## ABSTRACT

**Introduction:** The number of elderly diabetes patients is rising all over the world. Therefore, the quality of life of older people as well as the factors that influence it are aimed to be evaluated in this study. **Method:** A cross-sectional study was carried out on 269 senior diabetes patients from government health clinic in Kuantan, Pahang. Their sociodemographic information was gathered, and the Diabetes Quality of Life Instrument (DQoL) was used to assess their quality of life. The connection between DQoL domains and covariates was determined by Mann-Whitney U test and the Kruskal-Wallis test. Linear regression analysis was used to find the predictors. **Results:** : The majority of patients in the B40 groups had at least a primary level of education (52.2%) and a source of income (97.3%).The majority of the clinics (61.3 %) were located in rural areas and did not have a family medicine specialist on staff (77.7 %). The majority of the patients had uncontrolled diabetes (71.7%), uncontrolled blood pressure (63.2%), uncontrolled cholesterol levels (74.0%), and abnormal abdominal circumferences (84.8%). Clinic location, diabetes control status, and old age were statistically significant in predicting the quality of life. **Conclusion:** Despite the perception of a significant risk of problems, this study found that decreasing the HbA1c goal further improved the quality of life of older patients. Those clinic headed by family medicine specialist gave the highest degree of patient quality of life. As a result, additional primary care physicians should be trained, as well as local treatment measures.
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## INTRODUCTION

The ageing population is growing all across the world (1–5). Due to the sheer linear association between age and the prevalence of noncommunicable diseases, this involves senior citizens (1–5). This growth might be attributed to most nations' improved healthcare services (6,7). The life expectancy is getting longer and improved up to the age of 72 years old worldwide (8). Meanwhile, life expectancy for Malaysia is expected to be 74.5 years old (9). Malaysia is evolving towards an elderly age predominant country in the future resulting in a lot of health aspects surrounding elderly needs more attention. As the population of the elderly grows, so does the number of their morbidities, resulting in increased complications and hospitalisation rates among this group (1,3,4,10,11). This includes elderly diabetic patients predominantly in view of diabetes among the top list of non-communicable diseases in Malaysia (1,3,12-15). Diabetes is not only confined towards hypoglycaemia and hyperglycaemia events, but it also covers systemic diseases that lead to multiple target organ damage if not monitored (1,16). Considering the factor of fragility in ageing patients, the intensity of the treatment should depend on the risk and the benefits, which at most times may lead to suboptimal management of the elderly patients (17).

The patient-centred method highlights the approaches

for the medical professionals to lower down the HbA1c level of an elderly patient without any features of hypoglycaemia to an individualized target (1,12,14,16). This target, however, should be less strict compared to the adult population. However, few medical practitioners are aware of the elderly's degree of quality of life in terms of sugar management (11,14, 18-20). The dilemma among clinicians is the possibility of further deterioration of quality of life with stricter treatment and intense medications towards sugar control (21,22). This hesitancy might lead to under sugar control in the elderly, which later leads to further complications and target organ damage.

Since the 1970s, quality of life has been introduced as a key component in medical literature as patient satisfaction parameters should be considered in disease management outcomes (23). Patient satisfaction is increasingly important and becoming one of the parameters to be measured to identify the success of the services provided by the clinic (24). This encompasses a patient's total quality of life, which is the foundation of a holistic approach to patient management. Quality of life is described as an individual's perception of their situation in life in relation to their goals, expectations, standards, and worries, as well as the culture and value systems in which they live (18,19). It is a broad notion that is impacted in a complicated way by a person's physical health, psychological condition, personal beliefs, social standing, and relationship to key environmental factors. Good quality of life will produce a better outcome of disease control and overall health status. It indirectly will improve patient satisfaction towards themselves and the treatment given (18-21). It indirectly will improve patient satisfaction towards themselves and the treatment given. Therefore, patient compliance towards medications and follow up can always be maintained for a long-term period.

Previous study has shown the association of several variables with patients' quality of life. These include family support, clinic services, medications provided, financial status and disease control (18-21,25). However, very minimal knowledge is known about the real situations affecting the elderly. Nonetheless, psychological characteristics and support networks are important predictors of high quality of life in the aged population (26, 27). However, the true predictors among older diabetes patients are unknown, and the link to diabetic management should be investigated. It is concerning that diabetes quality of life in the elderly is rarely assessed. Similar previous studies mainly focused on elderly patients with dementia and general diabetic (18,20,28-30). Therefore, this study aims to measure the level of quality of life among elderly diabetes patients and identify its contributing factors for further holistic management of the patient in the future.

## MATERIALS AND METHODS

A cross-sectional study was done on 269 senior diabetes patients from all 11 government health clinics in Kuantan's district that provide follow-up for non-communicable diseases. The research was carried out from March to June 2019. The sample size was 260, based on a 41.2 % of people with good diabetes control in semi-urban regions, a 5% error margin, and a 90 % confidence level (31). The number of patients necessary was distributed proportionately according to the ratio of elderly diabetic patients per clinic. Those patients aged 60 and above, been diagnosed with diabetes and follow up actively at the clinic, will be recruited for this research. Research instrument used were sociodemographic data form consisting of characteristics of the patients (age, gender, religion, ethnicity, education, profession, household income, family support, smoking status, clinic background, diabetes control, blood pressure control, lipid control, renal status, body mass index status and drug profiles) and a revised version of Diabetes Quality of Life Instrument (DQoL) (28). The demographic data were obtained from patient as well as from the patient's diabetic book. The bilingual Malay and English questionnaire developed and validated by Mohammad Adam et al in 2018 was used in this study. It consists of 13 items that maintain the conceptualization of "satisfaction," "impact," and "worry". The questionnaire has good composite reliability for "satisfaction" domain (0.922; 95% CI: 0.909–0.936), "impact" domain (0.781; 95% CI: 0.745–0.818), and "worry" domain (0.794; 95% CI: 0.755–0.832) (28,32). The questionnaire is a self-administered questionnaire in which it may take up to 15 minutes for the patient to answer all the questions completely. A research assistant will explain the meaning of each statement to the patients prior to the test if clarification is required. It contains statements that need a Likert scale answer of 1 to 5 for each domain. The satisfaction domain has a maximum score of 30, the impact domain has a maximum score of 20, and the worry domain has a maximum score of 15. The maximum DQoL score will be 65 in total. The higher the score for each domain and the overall DQoL score, the lower the DQoL score in terms of satisfaction, worry and impact on their quality of life.

Data was collected by researchers and diabetic educators. The diabetic educators were recruited from each involved clinic, and they underwent training with technical input from the researchers. The training highlighted the appropriate ways to communicate with the respondents, measures to obtain informed consent and strategies to conduct questionnaires. SPSS version 23 was used for data entry and analysis. For descriptive analysis, categorical variables were recorded as frequencies and percentages and numerical variables were recorded as means and standard deviation (SD)

unless otherwise stated. Participants with any missing data are excluded from analysis. Normality tests were carried out for Diabetes Quality of Life Instrument Status score, Satisfaction domain score, Impact domain score and Worry domain score. Parametric tests, such as the independent t-test and one-way ANOVA, were used to analyse normally distributed data. Non-parametric tests, such as the Mann Whitney U test and the Kruskal Wallis test, were used to analyse data that were not normally distributed. These tests were used to see if there were any significant variations in the patient's mean DQoL score based on socio-demographic factors and antidiabetic medicines. Further statistical analysis was carried out using multiple linear regression to discover the determinants of respondents' quality of life. A p-value of $< 0.05$ was considered statistically significant.

**Ethical Approval**

The National Medical Research Registry was notified about this study (NMRR18-2894-44033). The International Islamic University of Malaysia Research and Ethics Committee (IREC) and the Ministry of Health Malaysia's Medical Research Ethics Committee (MREC) both gave their approval. The Kuantan Health District Office also granted authorization for the study endeavour. The authors granted permission for this study to utilise the updated bilingual version of the Diabetes Quality of Life Instrument. In addition, each responder signed a written informed consent form.

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## RESULT

Majority of the respondents' age was less than 70 years old (69.5%) with a mean age of 67.9 years old (95% CI = 67.29, 68.54, SD=5.4). The response rate was 96% of the total of 280 elderly approached, whereby eleven participants refused to join the study due to time constraints imposed by the care givers. Demographically, majority of the 269 elderlies were female (61%), Malay (84.8%), Muslim (85.1%), had at least primary level of education (52%), pensioner (54.3%), financial income falls within B40 groups (97.4%), stayed with family members (93.7%), accompanied by family member during follow up (60.6%) with independent activity of daily living (89.2%). In terms of clinic and follow up background, majority of the clinic was in the rural area (61.3%), without the presence of a Family Medicine Specialist (77.7%), mostly seen by medical officers and diabetic educators only (55.8%) without any tertiary care (72.5%). Regarding the health status background of the elderly patients, majority had uncontrolled diabetes (71.7%), uncontrolled blood pressure readings (63.2%), uncontrolled lipid level (74.2%), abnormal abdominal circumference (84.8%), mostly overweight (37.2%), had normal renal function (48.9%), non-smoker (72.5%) and mostly rely on two antidiabetic medications (48%) and two antihypertensive medications (35.3%). The details can be referred further from Table I below.

**Table I Demographic Data of the Respondents, Clinic Backgrounds and Disease control.**

| Variables | Categories | Numbers of patients (n) | Percentage (%) |
|---|---|---|---|
| Gender | Female | 164 | 61.0 |
| | Male | 105 | 39.0 |
| Age | 60-70 | 187 | 69.5 |
| | 71-80 | 82 | 30.5 |
| Ethnicity | Malay | 228 | 84.8 |
| | Chinese | 33 | 12.3 |
| | Indian | 7 | 2.6 |
| | Others | 1 | 0.4 |
| Religion | Muslim | 229 | 85.1 |
| | Non-Muslim | 40 | 14.9 |
| Education level | Nil | 27 | 10.0 |
| | Primary | 140 | 52.0 |
| | Secondary | 84 | 31.2 |
| | Tertiary | 18 | 6.8 |
| Job status | Still working | 45 | 16.7 |
| | Pensioner | 146 | 54.3 |
| | Unemployed | 78 | 29.0 |
| Income | B40 | 262 | 97.4 |
| | T20 | 7 | 2.6 |
| Family support | Stay with family | 252 | 93.7 |
| | Stay alone | 17 | 6.3 |
| Accompanied by family on TCA | Yes | 163 | 60.6 |
| | No | 106 | 39.4 |
| Activity of Daily Living | Independent | 240 | 89.2 |
| | Semi-dependent | 28 | 10.4 |
| | Totally dependent | 1 | 0.4 |
| Clinic location | Rural | 165 | 61.3 |
| | Urban / Suburban | 104 | 38.7 |
| Presence FMS | Yes | 60 | 22.3 |
| | No | 209 | 77.7 |
| Level of care | MO & DE only | 150 | 55.8 |
| | MO & DE & Dietitian only | 68 | 25.3 |
| | At least under FMS | 19 | 7.1 |
| | Other combinations | 32 | 11.8 |
| Tertiary shared care | Yes | 74 | 27.5 |
| | No | 195 | 72.5 |
| Diabetic control (HbA1C $\leq$ 6.5) | Yes | 76 | 28.3 |
| | No | 193 | 71.7 |
| Blood pressure control (< 140/80) | Yes | 99 | 36.8 |
| | No | 170 | 63.2 |
| Lipid control | Yes | 70 | 26.0 |
| | No | 199 | 74.0 |

CONTINUE

**Table I Demographic Data of the Respondents, Clinic Backgrounds and Disease control. (cont.)**

| Variables | Categories | Numbers of patients (n) | Percentage (%) |
|---|---|---|---|
| BMI status | Underweight | 5 | 1.9 |
| | Normal | 48 | 17.8 |
| | Overweight | 100 | 37.2 |
| | Obese 1 | 92 | 34.2 |
| | Obese 2 | 20 | 7.4 |
| | Obese 3 | 4 | 1.5 |
| Smoking status | Non-smoker | 195 | 72.5 |
| | Ex-smoker | 50 | 18.6 |
| | Smoker | 24 | 8.9 |
| Renal status | Normal | 131 | 48.9 |
| | CKD 3A | 73 | 26.9 |
| | CKD 3B | 47 | 17.5 |
| | CKD 4 | 16 | 6.0 |
| | CKD 5 | 2 | 0.7 |
| Number of antidiabetics | Nil | 10 | 3.7 |
| | One | 86 | 32.0 |
| | Two | 129 | 48.0 |
| | Three | 44 | 16.4 |
| Number of antihypertensive | Nil | 19 | 7.1 |
| | One | 69 | 25.7 |
| | Two | 95 | 35.3 |
| | Three | 58 | 21.6 |
| | Four | 25 | 9.3 |
| | Five | 3 | 1.1 |

Regarding the diabetic's quality of life, the lower the DQoL score, the higher the quality-of-life level. This study proved a significant association between higher quality of life score with good HbA1c control lower than 6.5% compared to those not achieving good HbA1c control ($p < 0.001$). This was supported further by continuous data analysis in which there was significant Spearman correlation between higher quality of life score with lower postprandial sugar level (2 tailed = 0.020) and lower latest HbA1c score (2 tailed < 0.001). Those who are working, or pensioners are also significantly experienced a higher quality of life compared to those unemployed ($p = 0.002$). Each clinic also significantly had a different quality of life score, in which those located in the central urban area (KK Bandar Kuantan) had a higher quality of life score compared to those in suburban and rural areas ($p < 0.001$). Better quality of life was also significantly observed among younger age elderly compared to older elderly (2 tailed = 0.006). Further details are tabulated in Table II.

In terms of dissatisfaction score, higher dissatisfaction score was associated with clinics that do not have a Family Medicine Specialist compared to the clinic with a specialist ($p = 0.014$). This is supported by a significant higher dissatisfaction among elderly in a clinic located

**Table II Significant association between DQOL score and studied variables**

| | DM control (HbA1c ≤ 6.5%) | | | | | Profession | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Yes | | No | | P | Still working | | Pensioner | | Unemployed | | |
| | Mean | SD | Mean | SD | | Mean | SD | Mean | SD | Mean | SD | P |
| DQOL | 20.05 | 3.74 | 22.65 | 5.12 | 0.000 | 22.44 | 4.50 | 20.97 | 4.66 | 23.37 | 5.21 | 0.002 |
| | Clinic Location | | | | | | | | | | | |
| | Gambang | | Paya Besar | | KK Bandar Kuantan | | Jaya Gading | | Balok | | Permatang Badak | p |
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| DQOL | 25.19 | 3.19 | 27.33 | 5.77 | 18.93 | 4.14 | 19.80 | 5.92 | 19.87 | 3.52 | 23.47 | 5.41 | 0.000 |
| | HbA1c value | | | | Postprandial sugar | | | | Age | | | |
| | Correlation coefficient | | Sig. (2-tailed) | | Correlation coefficient | | Sig. (2-tailed) | | Correlation coefficient | | Sig. (2-tailed) | |
| DQOL | 0.216 | | 0.000 | | 0.141 | | 0.020 | | -0.168 | | 0.006 | |

Significant P value < 0.05

in the rural area (p = 0.002) and those far away from the city centre (example KK Gambang) (p < 0.001). A higher dissatisfaction level was also significantly present among those with uncontrolled diabetes, abnormal abdominal circumference, those that need to attend for work, those among the B40 income group, those that depend among others for daily activity and those of smokers/ex-smoker (p < 0.05). Further details are shown in Table III.

**Table III Significant association between Dissatisfaction Score and Variables**

| Variables | | Mean score | Standard Deviation | P value |
|---|---|---|---|---|
| Presence of FMS | Yes | 10.10 | 2.74 | 0.014 |
| | No | 11.23 | 3.06 | |
| DM control | Yes | 9.87 | 2.43 | 0.000* |
| | No | 11.41 | 3.13 | |
| Abdominal circumference | Normal | 12.39 | 3.74 | 0.011* |
| | Abnormal | 10.72 | 2.81 | |
| ADL status | Independent | 11.10 | 3.06 | 0.037* |
| | Semi dependent | 9.79 | 2.42 | |
| | Total Dependent | 15.00 | | |
| Job status | Still working | 12.47 | 3.61 | 0.000* |
| | Pensioner | 10.18 | 2.57 | |
| | Not working | 11.62 | 3.01 | |
| Income group | B40 | 11.04 | 3.02 | 0.050* |
| | M40 | 8.88 | 2.47 | |
| Smoking status | Smoker | 10.80 | 2.95 | 0.024* |
| | Ex-smoker | 11.96 | 2.86 | |
| | Non-smoker | 10.75 | 3.03 | |
| Clinic location | Gambang | 15.36 | 2.09 | 0.000* |
| | Paya Besar | 11.87 | 2.07 | |
| | Bandar Kuantan | 9.43 | 2.77 | |
| Urban/rural | Urban/suburban | 10.19 | 2.77 | 0.002* |
| | Rural | 11.47 | 3.08 | |
| HbA1c value | Correlation coefficient 0.137 | | Sig. (2-tailed) 0.025* | |
| Income value | Correlation coefficient 0.153 | | Sig. (2-tailed) 0.042* | |

* Significant P value ≤ 0.05

In terms of bad impact towards the quality of life, those elderly who are not working (p = 0.027) had poor HbA1c value (sig 2 tailed = 0.003), larger abdominal circumference (sig 2 tailed = 0.017), follow up session in rural area and further away from the city (p < 0.001) were significantly associated with higher bad impact score. Further details as shown in Table IV.

In terms of worry domain, a higher worry score was significantly observed among younger elderly age group (p = 0.027), Malay ethnicity (p=0.048), higher education status (p = 0.009), follow up session in urban/suburban area (p = 0.037), had larger abdominal circumference (p < 0.001), higher body mass index values (p = 0.034) and worsening eGFR (p = 0.039). Further details are shown in Table V.

**Table IV Significant Bad Impact Score with Categorical Variables**

| Variables | | Mean score | Standard Deviation | P value |
|---|---|---|---|---|
| Job status | Still working | 5.11 | 1.61 | 0.027* |
| | Pensioner | 5.73 | 1.93 | |
| | Not working | 6.13 | 2.40 | |
| Clinic location | Paya Besar | 8.47 | 2.00 | 0.000* |
| | Permatang badak | 6.67 | 2.47 | |
| | Bandar Kuantan | 4.86 | 1.29 | |
| Urban/rural | Urban/suburban | 6.54 | 2.51 | 0.000* |
| | Rural | 5.24 | 1.51 | |
| HbA1c value | Correlation coefficient 0.183 | | Sig. (2-tailed) 0.003* | |
| Abdominal circumference | Correlation coefficient 0.145 | | Sig. (2-tailed) 0.017* | |

* Significant P value ≤ 0.05

**Table V Significant Worry Score with Categorical Variables**

| Variables | | Mean score | Standard Deviation | P value |
|---|---|---|---|---|
| Age category | ≤ 70 | 5.41 | 2.09 | 0.027 |
| | > 70 | 4.70 | 1.95 | |
| Religion | Muslim | 5.36 | 2.07 | 0.038 |
| | Non-muslim | 5.73 | 1.93 | |
| Ethnicity | Malay | 5.34 | 2.07 | 0.048 |
| | Chinese | 4.45 | 1.52 | |
| | Indian | 5.86 | 3.24 | |
| | Orang Asli | 10.00 | | |
| Education status | Nil | 4.78 | 2.01 | 0.009 |
| | Primary | 5.02 | 2.05 | |
| | Secondary | 5.67 | 2.08 | |
| | Tertiary | 6.00 | 2.06 | |
| Urban/rural | Urban/suburban | 5.64 | 2.30 | 0.037 |
| | Rural | 5.02 | 1.90 | |
| Age | Correlation coefficient -0.191 | | Sig. (2-tailed) 0.002 | |
| Abd circumference | Correlation coefficient 0.251 | | Sig. (2-tailed) 0.000 | |
| BMI values | Correlation coefficient 0.130 | | Sig. (2-tailed) 0.034 | |
| eGFR values | Correlation coefficient 0.127 | | Sig. (2-tailed) 0.039 | |

* Significant P value ≤ 0.05

According to the findings of the linear regression analysis (Table VI), only clinic location, diabetes control status, and old age were statistically significant for predicting patients' diabetes quality of life. In terms of total quality of life score, other factors did not exhibit any meaningful predictions. The final equation for diabetes quality of life among diabetic elderly based on multiple linear regression was:

*DQoL = 29.262 + 1.701 (DM control) - 0.433 (Clinic) – 0.151 (Age)*

**Table VI Predictors of Diabetes Quality of Life with Multiple Linear Regression Model**

| Model | B[1] | SE | Beta[2] | t | P |
|---|---|---|---|---|---|
| (Constant) | **29.262** | **3.994** | | **7.327** | **0.000*** |
| Job Status | 0.775 | 0.419 | 0.105 | 1.851 | 0.065 |
| **Clinic** | **-0.433** | **0.093** | **-0.273** | **-4.674** | **0.000*** |
| **DM control status** | **1.701** | **0.657** | **0.157** | **2.589** | **0.010*** |
| Latest HbA1c readings | 0.019 | 0.055 | 0.021 | 0.355 | 0.723 |
| Postprandial sugar or RBS | 0.056 | 0.036 | 0.089 | 1.548 | 0.123 |
| **Age** | **-0.151** | **0.052** | **-0.165** | **-2.892** | **0.004*** |

* Significant P value < 0.05

Regarding the dissatisfaction domains of diabetes quality of life, the results of the linear regression analyses showed that only clinic location, household income values and group, abdominal circumference and status of activity of daily living were statistically significant for predicting patients' dissatisfaction. Other variables showed no significant predictions in terms of dissatisfaction score. The final equation for dissatisfaction score among diabetic elderly based on multiple linear regression was: *Dissatisfaction = 17.080 + 0.001(Income Value) - 0.525 (Clinic) – 4.322 (Income group) – 1.196 (Abdominal circumference) – 1.305 (ADL status)*

Regarding the bad impact domains of diabetes quality of life, the results of the linear regression analyses showed that only job status, location of clinic (urban/rural) and latest HbA1c values were statistically significant for predicting patients' bad impact score. Other variables showed no significant predictions in terms of bad impact. The final equation for bad impact score among diabetic elderly based on multiple linear regression was: *Bad impact = 5.293 + 0.442(Job status) + 0.051 (HbA1c value) – 1.507 (urban/rural)*

Regarding the worry domains of diabetes quality of life, the results of the linear regression analyses showed that only the patients' ethnicity, religion, education status and abdominal circumference were statistically significant for predicting patients' worry score. Other variables showed no significant predictions in terms of bad impact. The final equation for bad impact score among diabetic elderly based on multiple linear regression was: *Bad impact = 1.386(Ethnic) + 0.457 (Education status) + 0.057 (Abdominal circumference) - 2.056 (Religion)*

## DISCUSSION

The study of diabetes in the elderly is not popular among researchers compared to non-communicable disease in the younger population considering shorter life span and multiple comorbidities of the elderly population (3,5,8,15,18). The outcome in the elderly population is usually poor and the treatment plan is usually individualized, limiting the intensification of the treatment regime (33). Furthermore, there is a lack of evidence-based in terms of cardiovascular disease risk scoring in this elderly age group (34-36). However, elderly care has become more important considering predictors of quality of life play a major role in the treatment outcome in the elderly patient (31,37). This study is among the pilot studies in this region focusing on the disease burden, control among the elderly and identifying the predictors.

Looking at the demographic data of this study, there were higher female elderly patients compared to male elderly patients. This proved that the prevalence of having at least one non-communicable disease was found to be higher amongst the females compared to male, considering the trend of a higher number of female populations with increasing age and longer life span compared to male (36,38). It may also reflect more awareness and attitude for better health attention among females compared to male (34,39-41). Male have a different health-seeking approach and this limits the openness for screening due to major responsibility and dignity as the family leader, typically in Asian countries such as Malaysia. In terms of ethnicity, the Malay population dominated the area due to the higher proportions of this ethnicity in the East Coast of Malaysia. Furthermore, since most of the clinics located in this study area are within rural regions (61.3%), Malay ethnicity is expected to be more prevalent.

In terms of socioeconomic background, the studied population was born around Malaysia's independence period whereby education opportunities were not easily accessible compared to the current situation. Therefore, the majority of the respondents only had primary care education level (52%) with 10% of them having no formal education. The government nowadays is shifting their focus towards the bottom 40 group (household income less than 40% of the Malaysian) (4,15). This study proved that the majority of the B40 group are indeed coming from the elderly population as shown in Table I (97.4% falls under B40) with most of them are unemployed or a pensioner. Thus, this study is among the important studies focusing on this target group for Malaysia National Strategic Plan 2020 and beyond. The advantage of this study is that it proved that our elderly

are still being well taken care of by their family members with the evidence of the high number of clinics visited by the family members (60.6%) or staying together with their family (93.7%).

Their daily functions were also maintained considering 89.2% of them are totally independent, but due to our culture and social hierarchy, the majority of them were accompanied by their children which is vital for the patient's support system. Regarding the follow up session, only 7.1% of the respondents were under family medicine specialist follow up despite being a high-risk group. This figure is probably because the majority of medical doctors in primary care require input from the specialist through advice and clinical guidance without the need for the specialist to see the patient directly at that point of consultation. However, the flow can be improved in the future with an increasing number of family medicine specialists in the future. Furthermore, only 22.3% of the clinics have a family medicine specialist in which they are also required to look after other major disease burdens in the clinic. This study is evidence to support the importance of more family medicine specialists to be produced in Malaysia due to its high demand (10,11,15).

Reviewing the patient's overall disease status and control as shown in Table I, majority of the elderly had uncontrolled diabetes (71.7%), uncontrolled hypertension (63.2%), uncontrolled dyslipidaemia (74%), abdominal obesity (84.8%) and overweight/obese (80.3%). This might be contributed by the lack of intensification for the treatment target due to over reliance on the suboptimal targets on the elderly by the medical doctors to avoid drugs induced complications, multiple comorbidities which restrict the effort to achieve treatment targets, patient demotivation due to fragility with aging and reliance on supplements or alternative medications rather than evidence-based medications (1,12,13,16,17). These scenarios if not corrected will lead to further deteriorations on the elderly health status, morbidities and higher economic consumption in view of the increased rate of hospitalizations and mortality. Moreover, one of the findings in this study could be used to explain the misconception of a higher number of drugs used to treat a disease in the elderly. The results showed that the majority of the patients only consumed two types of antidiabetics (48%) and antihypertensive (35.3%). This reflects the hesitance of both doctors and patients to intensify the medications despite the majority of the patients having a normal renal function (48.9%).

Surprisingly, this research can prove a significantly higher-level quality of life achieved by those who are able to maintain lower HbA1c target less than 6.5% compared to those with uncontrolled diabetes status (p value < 0.01). This is further supported by a significantly better quality of life among those who achieved controlled postprandial sugar level, which indirectly reflects the HbA1c values (Sig. 2-tailed = 0.020). Thus, the treatment intensification is safe without inducing further complications that may reduce the quality of life in elderly patients. In fact, the elderly patients should be involved with the discussion and be well informed about further management plans to achieve HbA1c treatment target as low as possible as long as there are no features of hypoglycaemia (1,12,13,16,17). Furthermore, this study was also able to prove that those patients that have follow-up sessions in the urban areas also achieved a higher quality of life considering more intensification of treatment and services in this setting compared to the rural clinic (p value < 0.01). The ability of the patients to work or having working experiences also do significantly contribute towards a better quality of life compared to those that are unemployed (p value = 0.02). This is because, by getting involved in a working environment, the elderly will indulge in many social interactions and communicate well with people (1,10,26,27). These can promote better mental health status and a strong feeling of health security among the elderly in addition to having savings and income. Another positive finding in this study includes a better quality of life among the younger elderly patients (17). This is expected considering less fragility among the younger elderly group and they can perform more physical daily activity. Furthermore, subsequent multiple linear regression proves that age, diabetes control and clinic location significantly predict the level of diabetic quality of life (Table VI). Thus, this study proved that specific clinic programs uniquely practised by the clinic management team members do play an important role in improving the outcome of patients (1,12). In this study, there is a linear relationship between effective management by the clinic team, the HbA1c achievement level and the diabetics quality of life.

In terms of a specific domain, this study further divided the associated factors towards dissatisfaction score, worry score and bad impact score among the elderly patients. Life dissatisfaction, a dimension of quality of life encompassing physical, mental, social and spiritual well-being is increasingly being recognized as a meaningful determinant of health outcome and status (42). Poor life satisfaction has been linked repeatedly to undesirable disease control. In our study, dissatisfaction was associated with clinic absence of family medicine specialists, rural area and farther location of the clinic from the city centre. Thus, the presence of family medicine specialists in a clinic is important to improve the management outcome and patient's satisfaction towards the clinical care and their diabetes control (43). This is true in which most specialists are confined in the urban areas that lead to better HbA1c control of the patients and this leads to better satisfaction parameters in the urban compared to the rural area. As expected, this study showed a significant association between dissatisfaction and poor control of the health status, namely uncontrolled diabetes and abdominal obesity. Worsening morbidities will affect the patient's

satisfaction perception due to the limitation of bodily function, fitness level and the needs for more screening and frequent follow up (14,15,20). In terms of social factors, this study found strong associations between dissatisfaction and those who still need to attend for work, those among the B40 income group, totally dependent on daily activity and those who are smokers / ex-smoker ($p < 0.05$). All these factors share similar traits, which is less time for self needs, poor income and the need to depend on other people in order to function. Surprisingly, this study shows that the level of dissatisfaction remains poor with the involvement of smoking. Thus, this might support less intensification strategy of quitting smoking among the elderly compared to the younger generation (18,44).

Diabetes may have a bad impact on various life aspects including the never-ending demands of diabetes care such as eating carefully, exercising, monitoring blood glucose, and scheduling and planning. In terms of bad impact on the domain towards the quality of life, higher bad impact score in this study was significantly associated with those elderly who are not working, had poor HbA1c value, larger abdominal circumference, follow up session in the rural area and further away from the city centre. Those who are unemployed and did not receive any regular income would have lack of financial support to accommodate their social and health needs, especially in terms of the need for sudden increment for the cost of life in an emergency setting (4,15,20,27,45,46). They are also unable to express their opinion freely because of a lack of social interaction as their environment is usually confined at home. If diabetes becomes worse, they will experience a bad impact on the level of complication and morbidity. Larger abdominal circumference indicates abdominal obesity, which also contributes to worsening diabetes control. However, as stated above, treatment intensification with the availability of multiple team members such as family medicine specialist, physiotherapist and dieticians are more prevalent in the city centre compared to the rural area (3,15). The absence of these advantages in certain clinic, especially in the rural area, would definitely contribute to the negative consequences towards disease control and quality of life. Further linear regression proved that the employment status, location of the clinic (urban/rural) and latest HbA1c values were statistically significant for predicting patients' bad impact score.

Elderly with diabetes may become anxious in monitoring their glucose levels, costs and time needed with monitoring, weight and diet. They may also worry about short-term health complications, such as hypoglycemia, as well as long-term effects such as target organ damage (18,46). Therefore, worry is also part of the important domain studied in quality of life. In terms of sociodemographic background, this study observed a significantly higher worry score among younger elderly age groups ($p = 0.027$), Malay ethnicity ($p=0.048$), higher education status ($p = 0.009$) and follow-up sessions in urban/suburban areas ($p = 0.037$). Further details as shown in Table V. This is possible due to the younger group of patients having a lot of unresolved issues in terms of personal matters, family members and social security (13,46). Meanwhile, in the older elderly group, they are usually more relaxed and focus on self-time and enjoying the remaining years of their life. Malay ethnicity is among the group that had a higher proportion of poor socioeconomic status and are among the B40 income group. With inadequate financial support, this group felt more worried in terms of treatment cost and follow up session. Those with higher education background and staying in urban/suburban areas will have more information about the disease and complications, mostly from self-reading and probably not been reassured by direct education from the health care providers (15,20). They also had higher expectations in terms of clinic services and treatment outcome. All these might inculcate elements of worry compared to those with lower education groups and those staying in the rural area. From the disease perspective, elderly with large abdominal circumference (sig 2 tailed < 0.001), higher body mass index values (sig 2 tailed = 0.034) and worsening eGFR (sig 2 tailed = 0.039) had higher worry score. All these worsening comorbidities will lead to uncontrolled diabetes status. The worse the diabetes status, they become more worried in view of suspecting more complication and morbidity to happen in future. Further linear regression proved significant predictors from patients' ethnicity, religion, education status and abdominal circumference in predicting patients' worry score.

LIMITATION

This study is confined to elderly patients in the district of Kuantan at primary care level. Therefore, the quality of life and results cannot be generalised to all elderly diabetic patients in our country, especially those that have recently been admitted or treated in hospitals or tertiary centres.

## CONCLUSION

Ultimately, diabetes management status as measured by HbA1c has a crucial role in predicting diabetes quality of life in older diabetic patients, encompassing the majority of its key categories. It demonstrates that older patients are content with reducing their HbA1c target, despite the widespread belief that lowering the HbA1c aim below 6.5 % increases the risk of problems in the elderly. This study also demonstrated that social support and financial position of patients influence the degree of quality of life in the elderly, which should be considered as one of the characteristics to inquire about at each senior visit. Furthermore, this study demonstrated that each clinic has its own distinct management style, with those managed by family medicine experts and other important supporting personnel, who are often located in the city centre, providing the highest degree of patient

quality of life. As a result, additional primary care physicians should be trained, as well as local treatment measures. In the future, it is suggested that more family medicine physicians be produced and engaged with medical officers in primary care in treating elderly diabetic patients holistically with individualised targets.


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