Anti-diabetic medication burden amongst older persons with diabetes and associated quality of life

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ABSTRACT

Background: Older persons with diabetes are the major demographic of diabetic patients followed up in primary health clinics. Despite their increasing age and morbidities, they are still being managed strictly towards good sugar control in order to achieve the ideal HbA1c level without taking their quality of life into consideration. This study aimed to determine the prevalence in the use of antidiabetic drugs among older persons with diabetes and its association with their quality of life.

Methodology: A cross-sectional study was conducted among 269 older persons with diabetes in all government health clinics in Kuantan using Diabetes Quality of Life questionnaire. SPSS version 23 was used for the statistical analysis.

Results: Majority of the respondents were females (61%), Malays (84.8%), pensioners (54.3%) with education up to primary school (52%) and are staying with family members (93.7%). Most of the patients were on two antidiabetic agents (48%) followed by a single antidiabetic agent (32%). Despite the risk of hypoglycaemia, 0.4% of them are on glibenclamide. The use of insulin is still common among 21% of them that are on intermediate-acting insulin, 15.6% on premixed insulin and 7.8% on short-acting insulin. Those taking a higher number of antidiabetic agents were found to be associated with poorer quality of life (p=0.001) compared to those taking one or two antidiabetic medications. Those on insulin also have significantly poorer quality of life score (p=0.012).

Conclusion: Despite aiming for controlled diabetes, older persons suffer poor quality of life with further intensification of their antidiabetic medications according to the guidelines. This includes the complexity of insulin usage and polypharmacy, which contribute to the low quality of life score.

KEYWORDS:
Older persons, Diabetic, Antidiabetic agents, Quality of Life

INTRODUCTION

Older persons are defined as those ≥60 years old.[1] Diabetes Mellitus (DM) is common in the older age group worldwide. This condition is seen in Malaysia in which most follow-up patients in the government clinics consists of older persons.[2-4] This is in concordance with the improvement in the health services in Malaysia, which increased the average life expectancy to 75 years.[5,6] Therefore, the prevalence of DM among older persons is higher with the increasing number of older age group.[1-3] More research is needed to focus on this specific age group.

In addition, older persons with DM have a higher number of macrovascular and microvascular complications. The rate of hospital admissions among this group is also increasing and this contributes to increase burden of health expenses, if DM is not managed properly at the primary care level.[7,8] Older people are also prone to other comorbidities that may reduce their quality of life, such as cognitive impairment, depression, isolation, urinary incontinence, risk of fall and polypharmacy.[2-4] There are also individual psychosocial factors that need to be considered in managing their DM that may further contribute to worsening the problems.[9]

Polypharmacy is defined as using multiple medications by a patient for disease treatment and is a global risk factor among older patients.[10,11] This issue is not only limited among those with multiple diseases but also with those having DM, as older patients need to be treated multiple medications for their sugar level to be controlled. Besides that, older people also have a lack of physical activity, poor dietary input and difficulty in lifestyle modification.[10,11] Achieving appropriate prescription can be a challenge in treating older persons with diabetes. A previous study has shown a good correlation between the quality of life and disease control, which may drive the clinicians to treat older persons with similar goals.[12] Several medication can be prescribed safely even in older persons, including insulin and sulphonylureas, provided precautions and close monitoring for complications are observed.[4,13] However, polypharmacy can lead to negative consequences, such as drug to drug interactions, instability and mortality among the older persons, which should either be avoided or managed.[14,15]

Older persons may lack in fitness and may be frail, which needs to be taken into consideration. One in every four older persons with DM had problems with frailty contributed by the person's frequent fatigue sensation, underweight, weight loss, reduction in muscle strength, sarcopenia and reduced mobility together with a tendency to fall.[16] Thus, for frail and functionally dependent older persons, HbA1c level of 8.5%

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may be considered an appropriate target for therapy, however, those who are fit and functionally independent, HbA1c level of 7.0% can be considered.16 Medications that can cause gastrointestinal disturbances, such as acarbose, metformin and GLP-1 receptor agonist may need to be avoided or used with caution. Although insulin is not a popular choice among older persons with DM, it may provide anabolic effects that are useful for them.

Nevertheless, one important solution that needs to be considered while prescribing drugs to older persons with DM is to achieve a good quality of life. It is a standard level that is developed based on the expectations of an individual or society for a good quality of life for daily activities. These expectations are guided by their values, goals and socio-cultural context.[17,18] Whilst focusing on the blood sugar readings, holistic management approach that focuses on the quality of life among older persons with DM should be initiated. This study focuses on identifying the medication burdens of older persons with DM and to identify the level of quality of life in associations with antidiabetic medications.

MATERIALS AND METHODS

A cross-sectional study was conducted among 269 older persons with DM from 11 Klinik Kesihatan (KK) (government health clinics) in Kuantan district, Pahang, Malaysia. The KKs provide outpatient services. The participants age range between 60 and 80 years old. Patients with underlying mental incapability or memory impairment were excluded. The study was conducted from March until May 2019. The sample size was calculated based on the proportion of good diabetic control in the semi-urban areas of 41.2% with an error margin of 5% and a 90% confidence level of 260. The number of patients required per clinic was divided proportionately according to the number of older persons with DM in each clinic. The research instrument used were sociodemographic form consisting of characteristics of patients (age, gender, religion, ethnicity, education and household income), the antidiabetic medications of the patients and a revised version of Diabetes Quality of Life Instrument (DQoL).[19] The details of the antidiabetic medications were recorded, including the type and number of medications, types of oral medications, types of insulin and route of administration. Different types of insulin also contributed to the total number of medications per day.

The questionnaire (DQoL) was developed and validated by Mohammad Adam et al., in 2018 with bilingual language of Malay and English. It consists of 13 items that maintained the conceptualization of "satisfaction," "impact," and "worry". The questionnaire has good composite reliability for "satisfaction" domain (0.922; 95% Confidence Interval, 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).[19,20] The questionnaire is a self-administered questionnaire, which take up to 15 minutes for the patients to complete. One research assistant explained the meaning of each statement to the patients prior to the test if clarification is required. Each domain consisted of statements that required a Likert scale response from 1 to 5. The maximum score for satisfaction domain is 30, for impact domain is 20 and for worry domain is 15. Total maximum DQoL score is 65. For each domain and total DQoL score, the higher the score, the poorer the quality of life score in terms of satisfaction, worry and impact to their quality of life.

The clinical data was collected by researchers and diabetic educators. The diabetic educators were recruited from each clinic that was involved in the study and 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 the questionnaires. SPSS version 23 was used for data entry and analysis. Normality tests were carried out for DQoL score, Satisfaction domain score, impact domain score and worry domain score. Normally distributed data were analysed using parametric tests, i.e., independent t-test and one-way ANOVA. Data which were not normally distributed were analysed with non-parametric tests, namely Mann Whitney U test and Kruskal Wallis test. These tests were performed to determine if differences in the mean score of DQoL across socio-demographic and antidiabetic medications of the patient were significant.

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RESULTS

The mean age of the patients was 67.9 years (Standard Deviation, SD 5.4). Demographic of the participant are shown in Table I, the majority of the 269 patients were females (61%), Malays (84.8%), pensioners (54.3%), financial income within B40 groups (97.4%), and stayed with family members (93.7%). In terms of the use of antidiabetic agents (Table II), most patients depended on two antidiabetic agents (48%) followed by a single antidiabetic agent (32%). Majority of them were prescribed with metformin (83.6%) and gliclazide (48.0%). Nevertheless, despite the risk of hypoglycaemia, 0.4% of the patients still relied on glibenclamide. The use of conventional insulin was still common with 106 of them (37.9%) were using insulin. These include 21% on basal insulin, 15.6% on premixed insulin and 7.8% on short-acting insulin. The prescription of insulin analogue was very minimal (0.4%). The use of new antidiabetic medications, such as dipeptidyl peptidase-4 inhibitor and sodium-glucose transport protein 2 inhibitor were also very rare (0.4%).

Table III shows the mean score for each domain of satisfaction, worry, impact and total diabetes quality of life. If the mean score is converted into a percentage score, the most affected domain that contributes to the diabetes quality of life is the dissatisfaction score, which was 36.6%. This is followed by the 'worry' domain with a percentage score of 35.1% and impact domain with 28.7% score. Overall total quality of life of older persons with diabetes is still satisfactory with the mean percentage score of 33.8%, which is considered moderate.

Table IV shows the mean dissatisfaction, bad impact, worry and total poor quality of life scores with the use of insulin. A

Table I: Demographic data of the respondents

Variables	Categories	Numbers of patients (n)	Percentage (%)
Gender	Female	164	61.0
	Male	105	39.0
Age	60-70	190	70.6
	71-80	79	29.4
Ethnicity	Malay	228	84.7
	Chinese	33	12.3
	Indian	7	2.6
	Others	1	0.4
Religion	Muslim	229	85.1
	Non-Muslim	40	14.9
Income	B40	262	97.4
	M40	7	2.6
Smoking status	Non-smoker	195	72.5
	Ex-smoker	50	18.6
	Smoker	24	8.9

*B40 = Household income ≤RM4000, M40 = Household income between RM4,001 and RM9,620

Table II: Usage of antidiabetic medications

Antidiabetic	Numbers of patients (n)	Percentage (%)
Nil (non-pharmacotherapy only)	10	3.7
Single (one antidiabetic medication)	86	32.0
Two antidiabetic medications	129	48.0
Three antidiabetic medications	44	16.4
Metformin	225	83.6
Gliclazide	129	48.0
Glibenclamide	1	0.4
Acarbose	1	0.4
Any Insulin	102	37.9
Intermediate & long acting insulin (Basal)	59	21.9
Short acting insulin (Actrapid)	21	7.8
Intermediate + Short acting insulin (Premixed)	42	15.6
SGLT2 inhibitors	1	0.4%
DPP4 inhibitor	1	0.4

Table III: Quality of life score for respondents based on the Diabetes Quality of Life Instrument (DQoL)

Items	Mean score	SD	Median	Percentage score
Satisfaction	10.98	3.02	11.00	36.6 %
Impact	5.74	2.05	5.00	28.7 %
Worry	5.26	2.08	5.00	35.1 %
Total DQoL	21.91	4.90	22.00	33.8 %

significant quality of life score was observed among older persons who are not using insulin (mean 21.31, SD4.54) compared to those using insulin (mean 22.90, SD4.54). Those taking insulin were significantly more dissatisfied (mean 11.45, SD 2.82) with higher bad impact score to their life (mean 6.21, SD2.39).

In terms of combining medications, poor quality of life was recorded among those taking a higher number of medications (mean score 23.66, SD5.31) compared to the fewer number of medications as shown in Table IV. The quality of life score is also lower among those receiving injection route of medications (mean score 23.62, SD 6.56) compared to the oral route of medications (p=0.006) as shown in Table IV.

The results of the linear regression analyses showed that the number of antidiabetic medications, type of antidiabetic medication administration, antidiabetic medication group and insulin use were not statistically significant in predicting diabetes patients' quality of life (p-value>0.05) (Table V).

DISCUSSION

Nearly one half of Malaysians are living with a chronic condition and the prevalence is in a increasing trend. The chronic conditions includes overweight and obesity (50.1%), hypertension (30.0%) and diabetes (18.3%).[21,22] Patients with chronic conditions suffer morbidities in which their quality of life and performance in social activity is affected.[23] Majority of them are in the older age group. The quality of life is important in every patient regardless of their disease and social status. Quality of life has been well-recognised as a useful criterion in evaluating medical management outcomes together with physiological measures of health status.[22,23] This is especially important in diabetic patients in

Table VI: Quality of life score with type of anti-diabetic medication administration

	Satisfaction			Impact			Worry			DQoL		
	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
Current Usage of Insulin												
Yes	11.45	2.82	0.033*	6.21	2.39	0.007*	5.45	2.04	0.254	22.90	4.54	0.012*
No	10.69	3.11		5.46	1.77		5.15	2.04		21.31	4.54	
Number of Anti-diabetic Medications												
Nil	9.10	2.51	0.030*	4.90	1.29	0.288	3.70	0.82	0.031*	17.70	2.63	0.001*
One	11.07	3.15		5.45	1.55		5.14	1.92		21.66	4.41	
Two	10.79	2.91		5.85	2.22		5.31	2.16		21.81	4.99	
Three	11.77	3.03		6.16	2.42		5.73	2.22		23.66	5.31	
Type of Anti-diabetic Medication Administration												
Non-pharmacological only	9.27	2.45	0.058	4.91	1.22	0.012*	3.91	1.04	0.050	18.09	2.81	0.006*
Oral only	10.85	3.13		5.49	1.78		5.24	2.05		21.59	4.53	
Injection only	10.69	3.04		6.62	1.80		6.31	2.56		23.62	6.56	
Oral & Injection	11.48	2.81		6.19	2.50		5.33	2.10		22.75	5.23	

* Significant p-value <0.05; SD-Standard Deviation

Table V: Predictors of Diabetes Quality of Life Instrument (DQoL) with multiple linear regression model

Model	B1	SE	Beta2	t	p-value
(Constant)	25.130	5.090		4.937	0.000
Number of Antidiabetic Medications	0.931	0.520	-0.145	1.791	0.074
Type of Antidiabetic Medications Administration	-0.372	0.930	-0.074	-0.400	0.689
Common Antidiabetic medications group	-0.097	0.072	-0.099	-1.346	0.179
Insulin usage	-2.067	1.788	-0.205	-1.156	0.249

view of the multiple assessments, visits, complications and treatment burden packaged together with the disease. Antidiabetic medications are numerous, and overprescribing tends to occur, which may lead to polypharmacy among the patients. Moreover, older persons are more prone to develop mood and anxiety disorders that are underdiagnosed as their presentations are atypical and most often not recognised by the caretakers or even doctors if the patient did not come with a specific complaint. Furthermore, mass screening for mood and anxiety disorders may not be necessary but should be done individually. Nevertheless, if the quality of life is not assessed, it may affect the overall control in diabetes patients and lead to further complications and morbidities.

Based on the demographic data for this study, most respondents were Malays and Muslims, given the location of the study, which is in the east coast region of Malaysia. However, the proportions of ethnicity are representable to the demographic data of the Pahang population, which is predominantly Malay, followed by Chinese. The majority were females (61%) considering the prevalence of DM in Malaysia is higher in females compared to males.[21] In terms of the age group, 70.6% of the respondents were between the age of 60 and 70 years old. Since this study was confined to older persons with DM, majority of the respondents falls in the bottom 40% financial income, which is the median household income of ≤RM3000. This financial constraint is mainly among Malay ethnicity (84.3%). A total of 8.9% of the patients are active smokers and this is almost similar to our national health morbidity survey on the smoking status among older persons.[21] Generally, the motivation to quit smoking is low in this age group.[21]

In this study, the antidiabetic agents, metformin, is among the most frequently prescribed drug as it is the first-line antidiabetic medication in treating DM.[24] The next common antidiabetic medication used was gliclazide, despite its risk of inducing hypoglycaemia in older persons. It is possibly due to its availability in the primary care setting, cheaper price, good sugar-lowering efficacy and acceptable safety profile if prescribed with caution among older persons.[3,24,25] The use of the new generation oral antidiabetic agents, such as SGLT2 inhibitor and DPP4 inhibitor was minimal in this study (0.4%). The underlying reason could be due to the lack of availability of these medications in the government primary health care clinics as well as the lack of interest for both doctors and patients to get an option for a further referral or access from other centres given the time constraint in a daily busy clinic.[26,27] There was still the prescriptions of acarbose and the older generation of sulphonylurea in this study showing that these medications are still useful in older persons according to the individualised indications and preferences, provided the benefit outweighs the risk.[28]

The overall use of insulin is high among older persons in this study with 37.9% showing good management by medical

doctors and high acceptance by the community towards insulin compared to the national data of 25.1% prevalence.[21] As expected, basal insulin is the most common type of insulin prescribed, given its once a day injection with the ultimate aim to control fasting blood sugar level among those with uncontrolled sugar level with prior to one or two antidiabetic medications.[2,24] Majority of the patients are on two antidiabetic medications, mostly being metformin and gliclazide. This is comparable with other studies where these two drugs are the most widely available in most clinics and among the first two initial antidiabetic agents to be recommended in the guideline with uncontrolled sugar.[24,29] It is also expected that most older persons required a combination of lifestyle modification and pharmacotherapy with only 3.7% of them not requiring any drugs. Clearly, in older persons with DM, therapeutic lifestyle strategy of one size fits all is not applicable due to the enormous functional heterogeneity of these individuals and the difficulty in changing the habit that had been practised from the young age.[2,4,11,13,28,29]

This study is able to assess the quality of life among older persons with diabetes and the associations with the drugs prescribed to them. Using a revised version of DQoL, the score is able to be divided further into dissatisfaction, bad impact on life, and worry domains. It was observed in this study that dissatisfaction component contributes more to poor quality of life score (mean percentage 36.6%). This was followed by worry component (mean percentage 35.1%) and bad impact (mean percentage 28.7%) to the functionality of the patients. The dissatisfaction of patients towards medical services is a major indicator for the assessment of healthcare quality in which further improvement should be made.[30,31] Therefore, it is expected that dissatisfaction domain gives a higher contribution to the score. Elements of worry are also influenced by the sociodemographic data, including age in which older persons are associated with psychological symptoms, such as anxiety and worry.[32] With the increasing number of the elderly population, anxiety will become a widespread problem later in life, especially among those with multiple comorbidities. It will be one of the major causes of health care access contributing to high society and individual costs. Thus, worry domain also plays an important element in the quality of life as demonstrated in this study. The mean score of total diabetes quality of life in our study was 21.91 (SD4.90), which gives DQoL a score of 33.8%. The lower the score, the better the quality of life of the older persons with DM, which can be classified to fall in the moderate level. This is comparable with another study as type 2 diabetes mellitus can impair the quality of life of these patients and this study has provided additional evidence to support the observation in older persons.[33,34]

In terms of total DQoL, poor quality of life is significantly associated with the use of insulin. More importantly, the significant association is true for general use of insulin but is not associated with any specific type of insulin. This study shows that each type of insulin is neither superior nor inferior in relation to the association with DQoL, despite few types are associated with dissatisfaction and bad impact score as previously mentioned.[2,4,28] Interestingly, this study also managed to show a significant association of DQoL with the number of antidiabetic medications the elderly consumed, the type of drug combinations and administration. It is known from this study that the higher the number of antidiabetic medications the older persons consumed, the higher the dissatisfaction and worry score experienced by the older persons in which these can worsen the quality of life score. This study also confirms that multiple and complex antidiabetic regime combinations contribute to the poor quality of life score. Therefore, medical professionals need to make a proper individualised justification and assessment before venturing into multiple regimes of medications to control the sugar level without considering the difficulty of the patients in adapting with various drugs combinations.[2,4,11,13,15]

In terms of limitations, our study was confined in a homogeneous population with a majority of them being Malays and within a subgroup of B40. Therefore, the results do not apply to other epidemiological settings. The population also does not include those with the age of over 80, hence, this study only describes the quality of life of those who are below 80 years old. This study also did not include other confounders, such as number of episodes of hypoglycaemia in the previous 12 months, number of hospital admissions due to DM in the past year and number of unrecorded insulin injections per day. The types of medications prescribed to the patients in this study were low and are not generalisable to other health-care systems where more drugs are available on the formulary.

CONCLUSION

In conclusion, even though no specific predictors for DQoL was shown, quality of life is significantly worsened among those taking a higher number of antidiabetic medications, multiple regimes and complex combination of antidiabetic groups with different administration routes. Therefore, a patient-centred approach in choosing the appropriate medications for older persons with diabetes is the most important solution in achieving a good quality of life than solely focusing on the disease control strategy.

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