

Factors that Predict Potential Disability in Diabetes Cases

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ABSTRACT

Diabetes is a long-term chronic disease with high incidence, prevalence rate, and cost. It is the fifth leading cause of death in Taiwan. This study aimed to identify the important factors for predicting potential disability in diabetes. A cross-sectional survey design was conducted for patients >20 years of age with type 2 diabetes. Data were collected using a structured questionnaire. A total of 157 samples were obtained.

The average age of the patients was 65.2 ± 12.1 ; 55.4% were women, 37.6% had good HbA1C control, and 63.1% were overweight or obese. Results showed that age, level of education, working status, number of diagnosed diseases, disease duration, number of complications, HbA1C, and ADL and IADL scores were all associated with potential disability. Patients who had been sick for less than one year had an odds ratio 17.9 times that of patients who had been sick for more than one year. Moreover, the odds ratio of disability for two or more complications was 6.5 times that of patients without complications. Diabetes patients further exhibited poor response to therapy and easy disease recurrence, severely affecting their quality of life. All these results indicated that personal traits, health conditions, and disease-control situations were important factors for predicting potential disability. Accordingly, we recommend that medical staff establish a good case-management system and provide urgent relevant care that can alleviate disease symptoms.

Keywords

Potential Disability, Type 2 Diabetes, Chronic Disease.

Clinical Trial Registry

Ethics committee of Kuang Tien General Hospital, Taiwan (Approval Number: 10642).

Introduction

Diabetes is a chronic disease with high incidence, prevalence, and cost and easily results in complications [1-5]. According to the World Health Organization [6], the prevalence of diabetes is 8.5% and is severe in the elderly. The prevalence of diabetes worldwide has reached 15% on average and more than 20% in developed countries [7]. Approximately 422 million people suffer

from diabetes worldwide, which is expected to reach 552 million by 2030, and 2.2 million people die of diabetes [8]. Diabetes has a 10% prevalence rate and is the fifth leading cause of death in Taiwan [9]. In recent years, with the advancement of medical technology, diabetes care has focused on the changes in mortality or morbidity [10,11] and also considered the quality of life as an important outcome of health care [11,12].

Diabetes is a chronic metabolic abnormality primarily because of excessive weight and physical inactivity; approximately 90% of cases are type 2 diabetes [7]. Regarding physiological threats, diabetes causes multiple organ lesions, including cardiovascular disease, kidney failure, retinopathy, neuropathy, and gastrointestinal lesions [6]. People with diabetes have a 2.4–4.3 times higher risk

of depression than those without diabetes [13-15]. Ismail et al. [16] also found that patients with a long course of disease (>2 years), poor HbA1C control, and average BMI of $33.34 \pm 7.29 \text{ kg/m}^2$, have a high chance of depression. These factors all contribute to the risk of disability and have a major effect on quality of life.

"Disability" is more predictive of death risk in diabetic patients than in "multiple comorbidities" [17]. Disability is a broad-based concept. Early medical perspectives consider disability as a simple structural or functional anomaly. They observe individuals who deviate from health but ignore the socially unfriendly discrimination of the disabled [18]; Verbrugge and Jetic [19] proposed the concept of disability integration and prevention strategies, explaining the theoretical framework of disability process, which refers to pathological or physiological defects that may further restrict the body from performing certain actions and affecting the independent life of an individual. Social roles and participation cause various disability. WHO [20] defines disability as a "holistic concept that covers impaired physical activity and participation restrictions". Given the changes in physical function or structure, individuals can only perform limited tasks or actions. Therefore, disability is a complex phenomenon that reflects the interaction between the physical and social functions of individual. Disability shortens the lifespan and also causes illness to the individual and considerably burdens the family, society, and the country economic. The competitiveness is reduced. If we can predict the potential disability of diabetes patients early and systematically apply known preventive measures to grasp the beginning and progress of the disease, most of the lesions caused by diabetes can be avoided, and the occurrence of disability and premature death can be remarkably reduced. In summary, this study aims: (1) to understand the sociodemographic characteristics, disease characteristics, and potential disability of patients with diabetes; (2) to explore the relationship between sociodemographic characteristics, disease characteristics and potential disability of patients with diabetes; and (3) to predict the important factor in potential disability of diabetes.

Methods

This study used descriptive correlational design that is based on a purposive sampling method. Questionnaire survey was conducted in the medical ward of a regional hospital in central Taiwan. A total of 180 questionnaires were distributed, and 157 valid questionnaires were collected. The recovery rate was 87.22%. The inclusion criteria were as follows: (1) patients must be over 20 years old and diagnosed with type 2 diabetes; (2) patients can use mandarin or Taiwanese communicators; (3) patients are willing to be interviewed, either by themselves or assisted by the researcher; and (4) those who agree to participate in the study must sign the consent form. Exclusion criteria are those who are severely demented, have acute respiratory syndrome, vision, hearing, or communication impairment. The data collection time was from August 1, 2018 to July 31, 2019. This study used a structured questionnaire to collect data. The research tool consisted of three parts as follows.

- Social demographic characteristics of type 2 diabetes,

including age, gender, height, weight, BMI, marital status, housing status, religious beliefs, education level, work status, economic status, and so on.

- Health status, including the number of diagnosis, the number of complications, blood glucose status (HbA1C value), ADLs, IADLs, and so on.
- Potential disability scale

This study cites the large-scale assessment for prevention in Japan (Longevity Foundation charity Division Promotion Foundation, 2011). This scale contains 24 questions with five categories, namely, sports, nutrition, cognition, socialization, and depression. The answer is yes or no. If each category was greater than or equal to 1-point, potential disability is present. The score ranged from 0 points to 24 points. The higher the score, the more severe the potential disability described in the category. The expert validity of this scale has a CVI of 0.87, the internal consistency of Cronbach's alpha was 0.77, and the five categories of Cronbach's alpha values were exercise, nutrient, cognition, social, and depression at 0.70, 0.75, 0.72, 0.73, and 0.78, respectively [21].

Results

Table 1 summarizes the social characteristics and health status of subjects. The mean patient age was 65.2 ± 12.1 , 58.6% were above 65 years old, 55.4% were women, more than half of education level were below the elementary school, 19.8% were single, and 73.9% of patients were not currently working. Regarding health status, 45.9% of patients had diabetes for more than 5 years, 56.1% with more than three types of disease diagnosis, 59.9 with more than one comorbidity, 63.1% were overweight or obese, and only 37.6% with good control of HbA1C. In terms of functional status, ADLs were completely independent of 64.3%, and IADLs were also 54.1%.

	Item	No.	%
Age	<65	65	41.4
	65-79	77	49.0
	≥80	15	9.6
Gender	Male	70	44.6
	Female	87	55.4
Level of Education	Illiterate	29	18.5
	Elementary School	63	40.1
	Junior High School	22	14.0
	Senior High School	31	19.7
College or above		12	7.6
Marriage	Single	31	19.8
	Spouse	126	80.3
Dwelling Condition	Living Alone	13	8.3
	Non-Living Alone	144	91.7
Religion	No	30	19.1
	Yes	127	80.9
Working Status	No	116	73.9
	Yes	41	26.1

ADL Score	100	101	64.3
	91–99	14	8.9
	61–90	22	14.0
	21–60	14	8.9
	0–20	6	3.8
IADL Score	≥22	85	54.1
	19–21	25	15.9
	16–18	10	6.4
	≤15	37	23.6
BMI	Underweight	1	0.6
	Normal	57	36.3
	Overweight	40	25.5
	Obesity	59	37.6
HbA1C	>9%	27	17.2
	7%–9%	71	45.2
	<7%	59	37.6
Disease Duration	<1 year	9	5.7
	1–5 years	76	48.4
	6–10 years	32	20.4
	>10 years	40	25.5
Number of Complication	No	63	40.1
	1	61	38.9
	≥2	33	21.0
Number of Diagnosis	1	22	14.0
	2	47	29.9
	3	44	28.0
	4	26	16.6
	≥5	18	11.5

Table 1: Social characteristics and health status of subjects.

Table 2 shows the potential of disability among type 2 diabetes. Score greater than or equal to 1 represents a potential disability situation. The higher the score, the more severe the potential disability. The mean of potential disability scale was 8.02 ± 6.13 . In the five categories, the top three disability items were movement, depression, and cognition, each score by mean accounting for 2.03, 1.68, and 1.55, respectively.

Item	No.	%	Mean ± SD
Total (24)	150	95.5	8.02 ± 6.13
Movement (5)	113	72.0	2.03 ± 1.75
Nutrition (4)	114	72.6	1.38 ± 1.16
Cognition (5)	115	73.2	1.55 ± 1.37
Social (5)	74	47.1	1.38 ± 1.85
Depression (5)	99	63.1	1.68 ± 1.75

Table 2: Potential of disability among type 2 diabetes (N = 157).

Note: Diabetes loss for exercise, nutrition, cognitive, social, depression and any one total score greater than or equal to 1-point potential disability status.

Age, level of education, working status, ADL and IADL scores, HbA1C, number of diagnosed diseases, number of complications,

and disease duration were all associated with potential disability (Table 3). The association of personal characteristics on the potential of disability by using multiple logistic regression are shown in Table 4. With non-workers as reference, odds ratio was 0.04 (95% CI = 0.00–0.67). Disease duration is a risk factor for potential disability, whereby disease duration 1–5 years was used as a reference, odds ratio was 17.9 (95% CI = 1.39–230.13). Nonetheless, the results on the number of diagnosis were not significant. The sample that had more than 2 complications also had significant results with the odds ratio being (OR = 6.54; 95% CI = 1.69–25.37) for those who non-complication.

Item	Total	Movement	Nutrition	Cognition	Social	Depression
Age	4.13 ***	-5.24***	-2.62**	-2.98 **	-4.41 ***	-2.62**
Gender	0.65	0.42	0.004	0.35	2.11	0.00
Level of Education	20.79 **	15.43**	9.14*	17.93 **	21.57 ***	5.12
Marriage	2.11	0.03	0.00	1.97	0.37	1.58
Dwelling Condition	0.45	0.00	1.19	0.89	0.03	6.18*
Religion	0.00	0.59	0.04	0.00	0.11	0.00
Working Status	15.10 **	6.59*	2.43	6.61*	14.51 **	5.87*
ADL Score	6.21 ***	6.33***	3.61**	4.68 ***	6.37 ***	4.99***
IADL Score	9.08 ***	7.73***	3.47**	5.29 ***	9.31 ***	5.46***
BMI	1.08	0.88	2.86**	0.77	2.01 **	1.62
HbA1C	3.23*	4.08*	0.18	4.51*	2.32	1.20
Disease Duration	42.88 ***	16.57**	12.67*	16.92 **	42.13 ***	27.48***
Number of Complication	19.02 ***	10.91**	0.92	2.85	22.28 ***	7.62*
Number of Diagnosis	-5.24 ***	-3.99**	-1.6	-3.16 **	-5.52 ***	-3.26**

Table 3: Difference between personal characteristics and potential of disability (t/F).

Item		OR	95% CI
Age (ref: <65)		1.03	0.97–1.09
Level of Education (ref: Illiterate)	Elementary School	0.30	0.08–1.09
	Junior High School	0.21	0.03–1.44
	Above Senior High School	0.30	0.05–1.79
Working Status (ref: no)		0.04*	0.00–0.67
Dwelling Condition (ref: Living Alone)		0.06	0.01–0.029
Disease Duration (ref: 1–5years)	<1 year	17.9*	1.39–230.13
	6–10 years	1.27	0.36–4.52
	>10 years	1.13	0.37–3.50
Number of Complication (ref: no)	1	1.07	0.31–3.70
	≥2	6.54**	1.69–25.37
Number of Diagnosis (ref: 1)	2	--	--
	≥3	1.85	0.56–6.09

Table 4: Association of personal characteristics on potential of disability using multiple logistic regression.

Conclusion

The results of this study are consistent with the literature. Diabetes is strongly associated with the risk of physical disability. Approximately 49% of people with diabetes have a high degree of functional limitations. Inconvenient mobility increases the dependence of patients on daily living, the risk of disability is 2.41 times higher than that of non-diabetic. Moreover, approximately 11% of people with diabetes have more psychological problems than non-diabetics [22,23]. Patients with diabetes with increased risk of disability also reduces patient compliance, poor metabolic control, and increased complication rates, which considerably affect the quality of life in the physical, psychological, social, and environmental aspects of diabetes [24,25]. Therefore, early assessment of the risk of diabetes disability is essential [26].

Moreover, the average age of the subjects was 65.24 years old. Elderly patients with diabetes were debilitated and had multiple chronic diseases and comorbidities, which greatly burden the mind and may also increase the risk of depression. Therefore, the risk of disability must be emphasized. Relevant sports, nutrition, education, and other strategies must be provided to prevent and manage the risk of potential disability, satisfy the different needs of patients with diabetes, and promote community support networks to maintain the function of diabetes and delaying disability and improving the quality of life [5,27].

Patients with diabetes with increased risk of disability tend to have reduced patient compliance, poor metabolic control, and increased complication rates, which remarkably affect the quality of life in the physical, psychological, social, and environmental aspects of diabetes. Through streamlining assessment tools and analysis, the possibility of disease severity and future disability can be effectively estimated. Early detection by the medical team, joint efforts, and control of their condition can reduce the risk of disability in the future.

References

1. Roglic G. WHO Global report on diabetes A summary. *International Journal of Noncommunicable Diseases*. 2016; 1: 3-8.
2. Shamshirgaran SM, Jorm L, Lujic S, et al. Health related outcomes among people with type 2 diabetes by country of birth Result from the 45 and up study. *Primary care diabetes*. 2019; 13: 71-81.
3. Zheng Y, Ley SH, Hu FB. Global aetiology and epidemiology of type 2 diabetes mellitus and its complications. *Nature Reviews Endocrinology*. 2018; 14: 88.
4. John R, Pise S, Chaudhari L, et al. Evaluation of quality of life in type 2 diabetes mellitus patients using quality of life instrument for Indian diabetic patients Across-sectional study. *Journal of Mid-life Health*. 2019; 10: 81.
5. Werfalli M, Kassanjee R, Kalula S, et al. Diabetes in South African older adults Prevalence and impact on quality of life

and functional disability—as assessed using SAGE Wave 1 data. *Global health action*. 2018; 11: 1449924.

6. <http://www.who.int/mediacentre/factsheets/fs312/en/>
7. <https://www.idf.org/news/52:managing-type-2-diabetes-in-primary-care.html>
8. <https://www.idf.org/our-network/regions-members/western-pacific/members/114-taiwan.html>
9. <https://www.mohw.gov.tw/cp-16-48057-1.html>
10. Herman WH, Ye W, Griffin SJ, et al. Early detection and treatment of type 2 diabetes reduce cardiovascular morbidity and mortality A simulation of the results of the Anglo-Danish-Dutch study of intensive treatment in people with screen-detected diabetes in primary care ADDITION-Europe. *Diabetes Care*. 2015; 38: 1449-1455.
11. Väättäinen S, Cederberg H, Roine R, et al. Does future diabetes risk impair current quality of life? A cross-sectional study of health-related quality of life in relation to the Finnish Diabetes Risk Score FINDRISC. *PLOS one*. 2016; 11: e0147898.
12. Hajian-Tilaki K, Heidari B, Hajian-Tilaki A. Solitary and combined negative influences of diabetes, obesity and hypertension on health-related quality of life of elderly individuals A population-based cross-sectional study. *Diabetes & Metabolic Syndrome Clinical Research & Reviews*. 2016; 10: S37-S42.
13. Maric A, Molnar D, Premosa T, et al. Depression and Quality of Life in Patients with Type 2 Diabetes Mellitus. 2017.
14. Pozzo MJ, Mociulsky J, Martinez ET, et al. Diabetes and quality of life Initial approach to depression, physical activity, and sexual dysfunction. *American journal of therapeutics*. 2016; 23: e159-e171.
15. Verma SK, Luo N, Subramaniam M, et al. Impact of depression on health related quality of life in patients with diabetes. *Ann Acad Med Singapore*. 2010; 39: 913-917.
16. Ismail K, Moulton CD, Winkley K, et al. The association of depressive symptoms and diabetes distress with glycemic control and diabetes complications over 2 years in newly diagnosed type 2 diabetes A prospective cohort study. *Diabetologia*. 2017; 1-11.
17. Landi F, Liperoti R, Russo A, et al. Disability, more than multimorbidity, was predictive of mortality among older persons aged 80 years and older. *Journal of Clinical Epidemiology*. 2010; 63: 752-759.
18. Dong HR. The conceptual structure and social implications of physical and mental disabilities. *Physical and Mental Disorders Research*. 2003; 1: 32-42.
19. Verbrugge LM, Jette AM. The disablement process. *Social Science & Medicine*. 1994; 38: 1-14.
20. <https://www.who.int/topics/disabilities/en/>
21. Chen HM, Chen CM. Factors associated with quality of life among older adults with chronic disease in Taiwan. *International Journal of Gerontology*. 2017; 11: 12-15.
22. Koye DN, Shaw JE, Magliano DJ. Diabetes and disability in older Australians The Australian diabetes, obesity and lifestyle AusDiab study. *Diabetes Research and Clinical Practice*. 2017; 126: 60-67.
23. Tabesh M, Shaw JE, Zimmet PZ, et al. Association between

-
- type 2 diabetes mellitus and disability What is the contribution of diabetes risk factors and diabetes complications *Journal of Diabetes*. 2018; 10: 744-752.
24. Reus GZ, dos Santos MAB, Strassi AP, et al. Pathophysiological mechanisms involved in the relationship between diabetes and major depressive disorder. *Life Sciences*. 2017; 183: 78-82.
25. Nguyen HV, Tran TT, Nguyen CT, et al. Impact of comorbid chronic conditions to quality of life among elderly patients with diabetes mellitus in Vietnam. *International Journal of Environmental Research and Public Health*. 2019; 16: 531.
26. de Lima Filho BF, da Nóbrega Dias V, Carlos AG, et al. Factors related to depressive symptoms in older adult patients with type 2 Diabetes Mellitus. *Experimental Gerontology*. 2019; 117: 72-75.
27. Assar ME, Laosa O, Rodríguez Mañas L. Diabetes and frailty. *Current Opinion in Clinical Nutrition & Metabolic Care*. 2019; 22: 52-57.