Biomedical Research 2017; 28 (6): 2462-2465 *ISSN 0970-938X*
www.biomedres.info

The study on relationship between obesity and living quality or incidence of T2DM complication: 3 year Chinese cohort study.

Fan Linlin*, Liu Yaping, Yu Jixiang, Lu Ying, Zhao Jie, Sun Fengjuan, Mi Na, Wu Junli

[1]Department of Endocrinology, Jining City First People's Hospital, PR China

Abstract

Objective: To evaluate the impact of obesity on the living quality and the complications risk in T2DM patients.

Methods: A total of 1000 patients with T2DM were observed for a median follow-up period of more than 3 years (less than 4 years). In the cohort, there were 500 patients who were obese (30 kg/m^2<BMI<34.9 kg/m^2) as obesity group, and other 500 normal weight (18.5 kg/m^2<BMI<24.9 kg/m^2) patients who were paired with the obesity group (non-obesity group). The living quality and incidence of complication in the follow-up period between two groups was compared. Relative risk of T2DM complications between two groups was calculated.

Results: The patients in Non-obesity group had better score than those in the obesity group (P<0.05). We follow up the primary complications of all the patients. The result showed that the incidence in the obesity group was significantly higher in the comparison of cerebrovascular (19.80% *vs.* 10.40%, t=17.23, P<0.05), peripheral artery (17.40% *vs.* 8.60%, t=17.12, P<0.05), cardiovascular (14.00% *vs.* 7.60%, t=10.63, P<0.05) and renal (9.20% *vs.* 5.60%, t=4.73, P<0.05) complications. Moreover, patients in the obesity group have higher risk in the cerebrovascular (RR=5.58, 95% CI ((3.58~9.25)), peripheral artery (RR=5.49, 95% CI (3.40~8.59)), cardiovascular (RR=2.25, 95% CI (1.29~5.43)) and renal complications (RR=2.10, 95% CI (1.18~5.06)) than that in the non-obesity group.

Conclusions: T2DM patients with obesity will have great possibilities poor outcome in living quality; T2DM patients with obesity will have higher risk in diabetes complication.

Keywords: Type 2 diabetes mellitus, Complication, Obesity, Follow-up.

Accepted on November 1, 2016

Introduction

Type 2 diabetes mellitus (T2DM) is a metabolic disorder caused by many factors. It is clinical incurable in the stage. The core strategy is to control blood sugar and delay complications [1-3]. The ultimate goal is to develop the patients' quality of life. Due to the long course of T2DM, patients' psychological, physical and social functions are closely correlated with the living quality of T2DM patients [4,5]. After these potential confounding factors are adjusted, obesity is still an independent risk factor for reducing the living quality of T2DM patients [6,7]. Obesity as an epidemic of this and last century is a major public health problem worldwide which its prevalence is dramatically increasing in this century [8,9]. Obesity is physiologically defined as fat accumulation in an abnormal or excessive pattern in adipose tissue may cause some serious health concerns, including the poor outcome in some disease [10]. Obesity is a serious health problem with side effects can vary from a complaint of disability to premature death. So decreasing in living quality is unavoidable. Some studies have proclaimed that maybe increasing rate of obesity prevalence is associated with the notable changes in the life style [11,12]. This is not a systematic research on the relationship between obesity and complication in specially people group such as T2DM patients. Meanwhile, there is no doubt that the high risk of complications can also lead to a decline in the living quality of T2DM patients [13]. However, there is no study showing the relationship between the obesity, complications and living quality in a long term follow-up. China has been experiencing the biggest shift in the world in diabetes and obesity epidemic over the past three decades [14]. Chinese Diabetes Society developed and published four editions of stand of care for type 2 diabetes management as clinical guidance for practice in China in the last twelve years. We have explored an obesity patient's cohort with the patients in our region. So we made a survey with these data to investigate their interactive influence on T2DM patients. The aim of the survey was to evaluate the impact of obesity on the living quality and the complications risk in different body system.

Patients and Methods

We randomly selected 500 patients (the age from 45 to 65 years old; the average age is 53.25 ± 6.35; 298 male and 202 female) who were obese (30 kg/m^2<BMI<34.9 kg/m^2 based on

WHO Guidelines approved by the Guidelines Review Committee) as obesity group, and take other 500 normal weight (18.5 kg/m^2<BMI<24.9 kg/m^2) patients (the age from 45 to 65 years old; the average age is 53.52 ± 6.40; 284 male and 216 female) who were paired with the obesity group (non-obesity group). There are some exclusion criteria in our cohort: 1. all the patients were first time diagnosed with diabetes in our hospital and they would be long time treatment in our hospital. 2. All patients were ability to self-care oneself without any other serious illnesses. They did not have a long-term medication history. 3. All patients were without any diabetes complication when they were diagnosed with diabetes. 4. All patients have medical insurance coving the cost. All the patients were from our diabetes patient's database. Patients' information was obtained when they got into our database. We would save their baseline and update their treatment history every time in our database.

In our present study, all the patients had their T2DM records in our database more than 3 years and less than 4 years for good comparability between groups. We would mark the complication state to count the incidence. "Diabetes specific quality of life" scale was used for the living quality test.

It was composed by 3 dimensions and 24 entries. Linear coring from 1-5 is made in sequence according to the options. The sum of the point of each entry is defined as total point. The higher the points are, the more serious the patient is affected, and the poorer in his living quality. Part one was physiological function, to understand the physical discomfort caused by diabetes. Part two was psychological function, to understand the impact of diabetes on patients' mental. Part three was social relations, to understand the effects of diabetes on the patient's interpersonal relationship and family status.

Statistical analysis

Epidata 2.1 was used to build a database. Two people typed the data in the computer individually. SPSS 13.0 statistical software was used for the analysis. The value obtained from logistic regression model was taken as the estimated value of Relative Risk (RR). P<0.05 was taken as an inspection level.

Results

First of all, the result showed there is not significantly different between the two groups expect body mass index. It proved that there was a good comparable between groups.

Secondly, the patients in non-obesity group had higher level of living quality. The T2DM patients from the different groups had similar living quality scores when they were rolled into our study cohort (Table 1). However, there was significant difference between the two groups after three or four year follow-up. The patients in Non-obesity group had better score than those in the obesity group (Table 2). In the comparison of physiology, the scores were 24.36 ± 3.28 and 22.18 ± 4.58 respectively in the obesity group and non-obesity group (t=8.65, p<0.05). In the comparison of psychology, the scores were 17.58 ± 2.89 and 15.56 ± 3.07 respectively (t=10.71, p<0.05). In the comparison of Social relation, the scores were 5.22 ± 1.28 and 4.26 ± 1.02 respectively (t=13.11, p<0.05).

The patients in the obesity had higher risk in the complications. We used the epidemiological prospective study methods to work on the risk of obesity and the complications (Table 3). The results showed the patients in the obesity group have higher risk in the cerebrovascular (19.80% *vs.* 10.40%, t=17.23, P<0.05), peripheral artery (17.40% *vs.* 8.60%, t=17.12, P<0.05), cardiovascular (14.00% *vs.* 7.60%, t=10.63, P<0.05) and renal (9.20% *vs.* 5.60%, t=4.73, P<0.05) complications than that in the non-obesity group (Table 4).

Table 1. *The baseline data of patient characteristics.*

	Obesity	Non-obesity	t/x^2 value	P value
Sex (Male/Female)	298/202	284/216	0.81	>0.05
Age (year)	53.25 ± 6.35	53.52 ± 6.40	0.67	>0.05
Systolic blood pressure (mmHg)	112.25 ± 6.25	112.47 ± 5.24	0.6	>0.05
Diastolic bold pressure (mmHg)	79.85 ± 10.5	78.99 ± 9.56	1.35	>0.05
Body mass index (kg/m^2)	32.58 ± 2.25	22.45 ± 2.01	75.08	<0.05
Triglycerides (mmol/L)	1.89 ± 0.52	1.92 ± 0.39	1.03	>0.05
Total cholesterol (mmol/L)	5.10 ± 0.54	5.08 ± 0.68	0.52	>0.05
LDL-C (mmol/L)	2.33 ± 0.84	2.38 ± 0.72	1.01	>0.05
HDL-C (mmol/L)	1.52 ± 0.25	1.50 ± 0.19	1.42	>0.05
Fasting bold glucose (mmol/L)	9.10 ± 1.20	9.08 ± 1.17	0.27	>0.05
Uric acid (μmol/L)	270.68 ± 29.58	269.41 ± 28.14	0.7	>0.05
Creatinine (μmol/L)	87.92 ± 12.25	86.25 ± 15.74	1.87	>0.05
physiology	23.69 ± 2.23	23.41 ± 2.47	1.88	>0.05
psychology	13.47 ± 1.45	13.28 ± 1.79	1.84	>0.05
Social relation	3.01 ± 0.58	2.99 ± 0.46	0.6	>0.05

Table 2. *Rating scale of living quality of T2DM patients.*

	Obesity	Non-obesity	T value	P value
Physiology	24.36 ± 3.28	22.18 ± 4.58	8.65	<0.05
Psychology	17.58 ± 2.89	15.56 ± 3.07	10.71	<0.05
Social relation	5.22 ± 1.28	4.26 ± 1.02	13.11	<0.05

Table 3. *The comparison of complications incidence between two groups of T2DM patients.*

	Obesity	Non-obesity	x^2 value	P value
Cerebrovascular complications	99/401	52/448	17.23	<0.05

Peripheral artery disease	87/413	43/457	17.12	<0.05
Cardiovascular complications	70/430	38/462	10.63	<0.05
Ocular complications	48/452	37/463	1.53	>0.05
Renal complications	46/454	28/472	4.73	<0.05
Peripheral neuropathy	31/469	22/478	1.61	>0.05

Table 4. *The estimates of obesity leading to complications incidence in terms of relative risk.*

	Cerebrovascular complications		Peripheral artery disease		Cardiovascular complications		Renal complications	
	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Obesity	5.58	3.58~9.25*	5.49	3.40~8.59*	2.25	1.29~5.43*	2.1	1.18~5.06*
Non-obesity	1.58	0.86~3.21	1.43	0.78~3.04	1.14	0.72~1.99	1.08	0.69~1.88

*P<0.05

Discussion

The prevalence of obesity and T2DM are all increasing globally. The relationships between obesity and T2DM are complex, and thus difficult to elucidate [15,16]. Nevertheless, evidence supports the hypothesis that obesity increases the risks of T2DM. However, there was not a systematic research on the relationship between obesity and the T2DM complication in long follow-up time and large sample cohort. We aim to make some work in the area with our abundant medical resources.

The patients in our cohort demonstrated significant differences living quality scores between two groups. At baseline, there is no significant difference between them although the patients in the obesity group have really higher BMI than the ones in the non-obesity group. The results showed that for the patients with obesity, they would have faster decline speed in the living quality. The obesity is independently associated with lower living quality. The clinical treatment aim to the T2DM is to control the blood sugar level so that to prevent and delay the occurrence of complications, and there were a lot of evidences show that the most important factor is complication for the patients with T2DM, such as diabetic foot, ketoacidosis, diabetic nephropathy and so on [17,18]. The results showed that the incidence in the obesity group was higher than that in the non-obesity group in the comparison of cerebrovascular, peripheral artery, cardiovascular and renal complications. It is similar to a lot of studies [19,20] and it is more reliable conclusions with large sample and long-time follow-up. However, whether there was a close relationship between the obesity and complications was not known before. In our present study, it showed the patients in the obesity group have higher risk in the cerebrovascular (19.80% *vs.* 10.40%, t=17.23, P<0.05), peripheral artery (17.40% *vs.* 8.60%, t=17.12, P<0.05), cardiovascular (14.00% *vs.* 7.60%, t=10.63, P<0.05) and renal (9.20% *vs.* 5.60%, t=4.73, P<0.05) complications than that in the non-obesity group. So we can get the conclusions that (1) T2DM patients with obesity will have great possibilities poor outcome in living quality; (2) T2DM patients with obesity will have higher risk in diabetes complication.

In our research, we describe the impact of obesity on the living quality and the complications risk in different body system with long follow-up time and large sample cohort. However, there are several limitations. Firstly, the patients in our study from a single hospital registry study may limit external validity, as they reflect the experience of only our hospital. The patients have various backgrounds and treated by many different surgeons. Secondly, the distribution of patients may be skewed based on BMI. Using BMI as a measure of obesity is popular, but it has been criticized as inaccurate in certain patients, particularly those who are heavily muscled. Thirdly, there was something in contrast with other reported papers. Our study showed there is no significantly different between the two groups in the risk of Peripheral neuropathy and Ocular complications. The reason maybe has some relationship with the distance of fellow-up. As some reported pagers, the Peripheral neuropathy and Ocular complications will focus on more than three years later [21,22]. We will continue our work on those problems in the future research with more time fellow-up.

References

1. Ostawal A, Mocevic E, Kragh N, Xu W. Clinical effectiveness of liraglutide in type 2 diabetes treatment in the real-world setting: a systematic literature review. Diabetes Ther 2016; 7: 411-438.
2. Amblee A. Mode of administration of dulaglutide: implications for treatment adherence. Patient Prefer Adherence 2016; 10: 975-982.
3. Smith JD, Mills E, Carlisle SE. Treatment of paediatric type 2 diabetes. Ann Pharmacother 2016; 50: 768-777.
4. Chapman A, Liu S, Merkouris S. Psychological interventions for the management of glycemic and psychological outcomes of type 2 diabetes mellitus in China: A systematic review and meta-analyses of randomized controlled trials. Front Public Health 2015; 3: 252.
5. Gois C, Akiskal H, Akiskal K. Depressive temperament, distress, psychological adjustment and depressive

symptoms in type 2 diabetes. J Affect Disord 2012; 143: 1-4.

6. Genser L, Casella Mariolo JR, Castagneto-Gissey L. Obesity, type 2 diabetes, and the metabolic syndrome: pathophysiologic relationships and guidelines for surgical intervention. Surg Clin North Am 2016; 96: 681-701.
7. Barrcs R, Zierath JR. The role of diet and exercise in the transgenerational epigenetic landscape of T2DM. Nat Rev Endocrinol 2016; 12: 441-451.
8. Dan AG. Obesity-the epidemic crisis of our time. Surg Clin North Am 2016; 96: 15-16.
9. Seidell JC, Halberstadt J. Obesity: The obesity epidemic in the USA - no end in sight. Nat Rev Endocrinol 2016; 12: 499-500.
10. Wolyniec Z, Debska-Slizien A, Wolyniec W. Impact of obesity on renal graft function-analysis of kidney grafts from the same donor. Transplant Proc 2016; 48: 1482-1488.
11. Limnili G, Ozcakar N, Kartal M. Health promotion lifestyle profile scores are not associatedwith obesity in high school students. Turk J Med Sci 2016; 46: 1018-1024.
12. Melchart D, Eustachi A, Wellenhofer-Li Y, Doerfler W, Bohnes E. Individual health management-a comprehensive lifestyle counselling programme for health promotion, disease prevention and patient education. Forsch Komplementmed 2016; 23: 30-35.
13. Jonkman NH, Schuurmans MJ, Groenwold RH. Identifying components of self-management interventions that improve health-related quality of life in chronically ill patients: Systematic review and meta-regression analysis. Patient Educ Couns 2016; 99: 1087-1098.
14. Liu X, Li Y, Li L, Zhang L, Ren Y. Prevalence, awareness, treatment, control of type 2 diabetes mellitus and risk factors in Chinese rural population: the rural diabetes study. Sci Rep 2016; 6: 31426.
15. Aziz Z, Absetz P, Oldroyd J, Pronk NP. A systematic review of real-world diabetes prevention programs: learning from the last 15 years. Implement Sci 2015; 10: 172.
16. Fredrick T, Kaur P, Murhekar MV. Diabetic retinopathy and its risk factors in patients with type 2 diabetes attending rural primary healthcare facilities in Tamil Nadu. Natl Med J India 2016; 29: 9-13.
17. Al-Amer R, Ramjan L, Glew P. Self-efficacy, depression, and self-care activities in adult jordanians with type 2 diabetes: the role of illness perception. Issues Ment Health Nurs 2016; 1-11.
18. Yamazaki H, Tsuboya T, Katanuma A. Lack of independent association between fatty pancreas and incidence of type 2 diabetes mellitus: 5 year Japanese cohort study. Diabetes Care 2016; 15.
19. Malenica M, Prnjavorac B, Causevic A, Dujic T, Bego T. Use of databases for early recognition of risk of diabetic complication by analysis of liver enzymes in type 2 diabetes mellitus. Acta Inform Med 2016; 24: 90-93.
20. Al-Saeed AH, Constantino MI, Molyneaux L, DSouza M, Limacher-Gisler F. An inverse relationship between age of type 2 diabetes onset and complication risk and mortality: the impact of youth-onset type 2 diabetes. Diabetes Care 2016; 39: 823-829.
21. Rota E, Morelli N. Entrapment neuropathies in diabetes mellitus. World J Diabetes 2016; 7: 342-353.
22. Misra SL, Braatvedt GD, Patel DV. Impact of diabetes mellitus on the ocular surface: a review. Clin Exp Ophthalmol 2016; 44: 278-288.

*Correspondence to

Fan Linlin

Department of Endocrinology

Jining City First People's Hospital

PR China