

The Analysis of Diabetes-Related Factors Based on National Life Data Investigation

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Abstract:

Diabetes has become one of the serious disease which influences our daily life deeply. Many researches have tried to identify the reasons of diabetes and ways to decrease the influence caused by diabetes. Few researches checked the connection of social life information and diabetes. In our research, we identified possible risk factors of diabetes via logistic analysis. The results indicate that some factors that are also listed in the standard of Ministry of Economy, Trade and Industry, have connection with diabetes. The results also certificate that 9 factors have tight connection with diabetes. The 9 factors are age, gender, profession category, health awareness, stress, obesity, hyperlipidemia and hypertension

Key words: Diabetes, life data, logistic analysis, factors

1 Background

Diabetes has become one of the disaster disease. WHO reports that 422 million adults have diabetes all over the world, which makes one of every eleven people to be diabetes patient. (1). Diabetes is not only deeply connected but also influences our daily lives. It will also cause various complication: Ketoacidosis& ketones, hypertension, kidney disease and foot complications etc. [2]. In Japan, more people have type 2 diabetes and the medical fee costed by diabetes also increased [3]. To prevent the effects caused by diabetes, Japanese government makes various efforts to prevent the lifestyle disease including diabetes. The Ministry of Economy, Trade and Industry (METI) of Japan started the diabetes severity prevention project [4], planning to change the serious situation of diabetes patients. From 2018, the Japan Agency for Medical Research and Development (AMED) [5] continue the project. The project collects diabetes patients' information from 7 institutes: the personal information, the activity information, the hypertension information and the checked HbA1c information. They also issued the health information exchange standard on 2017 [6] which explaining the details of each items

of information. However, the social meaning of the listed information items in the standard is unclear. Various efforts have been done to release the bad effects caused by diabetes. Some studies focus on identifying the efficient methods to prevent diabetes and decrease the amount of diabetes patients. Some researchers make efforts to find out the medical reasons of diabetes. Few researches try to find the connection between social factors and diabetes. In this study, we identified some risk factors of diabetes which certificate that the listed information items in the standard of METI are definitely necessary. The risk factors also remind us that we should improve our healthcare awareness and try our best to decrease our stress in our daily life, when we generally only focus on avoid obesity and hypertension.

2 Data source

In Japan, the Ministry of Healthcare, Labor and Welfare (MHLW) [7] makes Basic census of people's lives since 1995 which includes: the family information, the living information, hospital information, stress information and etc. Only five years' anonymous data are available till now: 1998, 2001, 2004, 2007, 2010. Meanwhile, the information items in each year are also different. Considering the

year of the data, we used the data of 2010 and 2007, which nearly have same information items. Because, some of the data are noise, we chosen the data that have information about diabetes form the origin 192,519 peoples' anonymous data. At last, the data used in our analysis are based on the survey results from 26,163 investigated people. The data are shown in table 1 as following. The age stage of the anonymous data is from 15 years old.

Table 1. The used data in this analysis

Age	Num. of People	Percentage	Diabetes	
			yes	no
15~19	145	0.55%	0	145
20	1723	6.59%	23	1700
30	3266	12.48%	80	3186
40	4580	17.51%	268	4312
50	7318	27.97%	856	6462
60	6187	23.65%	938	5249
70	2426	9.27%	373	2053
80	496	1.90%	56	440
90	22	0.08%	3	19
Total	26163	100.00%	2597	23566

3 Methodology

Using logistic analysis, we can identify the connected factors and calculate the possibility of each one. The model with smallest AIC were chosen as the best results. The results of logistic analysis certificate that the factors: age, gender, healthcare awareness, insurance type, profession type, obesity, hypertension and hyperlipidemia, have connection with diabetes. Profession type have many categories, thus we used logistic analysis again to check the different situation of each category of profession. The result are shown in table 3. The statistics of stress causes is also shown by us, helping people understand the factors that may make them have high risk of having diabetes. All the results are introduced in part 4.

4 Results

The original 16 factors used in the analysis are: family number, family type, outcome of one year, room space, medical fee of one year, gender, age, insurance type, worktime of one week, profession category, obesity, hyperlipidemia, high blood pressure, healthcare awareness, stress and the habit of smoking. We identified 9 possible factors of diabetes using logistic analysis. The 9 factors are: gender, age, profession category, health awareness, stress, insurance type, obesity, hyperlipidemia, high blood pressure. After finding the possible factors, we calculated the possibility of suffering from diabetes for different factors. All the results are shown as table 2. The results indicate the factor that even though the factors: gender, stress, hyperlipidemia, high blood pressure, have connection with diabetes, the difference of two situations of each factor is not extremely large. Perhaps, these are because that the data capacity of with diabetes and without diabetes is greatly different. Only a few of data belong to the group that with diabetes. However, considering the factor: obesity, we can find that people with obesity have nearly 10% higher possibility to have diabetes than the without obesity. We also know that obesity is tightly connected with BMI. Therefore, the information about BMI is necessary in the standard of METI. The health awareness factors indicates that the measures which can improve the awareness of health is important. This certificates meaning of alarming the diabetes patients in the project of METI.

Considering the factor profession categories, we checked the difference of each profession category. The results (table 3) certificate the fact that different profession have different factors of diabetes, which remind us that we perhaps should treat the diabetes patients of various profession individually. As to stress, we counted numerical data

Table 2. The results of logistic regression

Items	Data volume	P-value	Possibility of diabetes	
Gender	男性	14466	2.00E-16	53.44%
	女性	11697	16	51.29%
Age	15~	26163	2.00E-16	-
Profession	12 種類	26163	0.018734	-
	ある	15004	6.91E-05	53.19%
Stress	なし	9158	05	54.07%
	不詳	2001		-
Insurance type	5 種類		0.013366	-
Obesity	ある	405	2.00E-16	60.70%
	なし	25758	16	52.35%
Hyperlipidemia	ある	3047	2.10E-06	52.29%
	なし	23316	06	53.95%
High blood pressure	ある	6683	9.20E-08	52.31%
	なし	19480	08	52.97%

P-Value indicates the connected factors. The smaller P-value the better connection among dependent and independent

through different reasons. The statistical data are shown in table 4. We can find that the reason: income, disease and work, have comparatively more data. This indicates that more work should be done to help people decrease the pressure that caused by work. The data of table 5 indicate that the possibility of having diabetes increase with age. However, the old people generally have high possibility of having various disease. It is difficult to say that the age really will influence the possibility of getting diabetes. More study should be done to clarify the real connection between age and diabetes.

Table 3. The logistic analysis results of various professions

	Age	Obesity	Hyperlipidemia	Hypertension	Smoking	Stress
1	+	+	-	-	-	-
2	+	+	+	+	-	-
3	+	+	-	+	-	-
4	+	+	+	+	-	-
5	+	+	+	-	-	-
6	+	+	-	-	-	-
7	-	+	-	+	-	-
8	+	+	-	+	-	-
9	+	+	-	-	-	-
10	+	+	-	-	-	-
11	+	+	+	-	-	-
12	+	+	-	-	-	-

1 管理的職業従事者, 2 専門的・技術的職業従事者, 3 事務従事者, 4 販売従事者, 5 サービス職業従事者, 6 保安職業従事者, 7 農林漁業従事者, 8 生産工程従事者, 9 輸送・機械運転従事者, 10 建設・採掘従事者, 11 運搬・清掃・包装等従事者, 12 分類不能の職業; +: connected factor, -: un-connected factor

Table 4. The statistical data of the reasons of stress

01 家族との人間関係	2550	12 妊娠・出産	168
02 家族以外との人間関係	2340	13 育児	452
03 恋愛・性に関すること	377	14 家事	906
04 結婚	288	15 自分の学業・受験・進学	565
05 離婚	112	16 子どもの教育	1052
06 いじめ・セクシュアル・ハラスメント	118	17 自分の仕事	4790
07 生きがいに関すること	1798	18 家族の仕事	1169
08 自由にできる時間がない	1254	19 住まいや生活環境 (公害、安全及び交通事故を含む)	1418
09 収入・家計・借金等	4533	20 その他	1352
10 自分の病気や介護	5725	21 わからない	373
11 家族の病気や介護	2571	22 悩みやストレスの原因不詳	1156

Table 5: The percentage of having diabetes (age)

Number	Age	Possibility	number	Age	Possibility
4	15~19	49.50%	12	55~59	52.82%
5	20~24	49.91%	13	60~64	53.23%
6	25~29	50.33%	14	65~69	53.65%
7	30~34	50.74%	15	70~74	54.06%
8	35~39	51.16%	16	75~79	54.47%
9	40~44	51.57%	17	80~84	54.88%
10	45~49	51.99%	18	85~89	55.29%
11	50~54	52.40%	19	90~	55.70%

5 Discussion & conclusion

In our research, we used logistic analysis to identify the possible factors of diabetes and predicted the possibilities of suffering from diabetes considering various factors. Our results certificate that the insurance type and profession category will influence the possibility of diabetes, as well as healthcare awareness. The higher awareness of health the lower possibility of suffering from diabetes. Meanwhile, our logistic analysis results show that the stress will enhance the possibility of diabetes. This alarms us that we really should pay attention to our daily life to make our life has less stress.

As our results shown, some factors issued by the of MITE really have influence on diabetes. This indicates that the standard can be helpful to diabetes patients. Meanwhile, some identified factors: insurance type and stress are not contained within the project. Perhaps the project should consider collecting the information of insurance type, profession category to improve the situation of diabetes.

Issues are also existed in our research. Firstly, statistic data we used in this research are not the medical data of diabetes. There are some necessary factors of diabetes are not considered in

our analysis which causes our analysis only focus on the life factors of diabetes. Future work should use special medical information of diabetes patients. At the same time, extra information should be contained into the investigation in Japan to help public lowering the diabetes risk. Secondly, the used data are obtained from 2010 and 2007, which are not the latest data. Future analysis should use recent data and we might have different results. Thirdly, the data in this research does not classify the categories of diabetes. For different types of diabetes, the risk factors of diabetes will be different. Our future work will use the data that clarify the differences of various diabetes types. Finally, the social factors of diabetes are complex, other analysis methods like decision-tree or DNN will may discover better results. Our future analysis will try to use some deep leaning methods and better results are expected.

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