Original Article

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How attendance of a health guidance program relates to health checkup results and medical service data among specific medical checkup examinees after three years

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Abstract

This study was performed to examine whether specific medical examinees' attendance at a health guidance program influenced the results of health checkups conducted 3 years later and other medical service data. The study population consisted of 250 individuals residing in Town B, Prefecture A, who were enrolled in the national health insurance plan; had received a specific medical checkup in 2012 and subsequently became eligible for health guidance; had received another specific medical checkup in 2015; and for whom relevant medical service data were available. The main variables were age, gender, results of both checkups, annual medical fees, and whether they had received consultations on lifestyle-related diseases at a medical institution. Participants were grouped according to whether they had attended health guidance during the 3-year study period (attendance vs. non-attendance), and ensured that all participant data were anonymized. After 3 years, significant decreases in diastolic blood pressure (DBP) ($p < 0.001$) and low-density lipoprotein cholesterol (LDL-C) ($p = 0.005$) were observed among males in the attendance group, while the females in the same group showed significant decreases in body weight ($p = 0.043$), DBP ($p = 0.011$), and LDL-C ($p = 0.002$). To examine how the changes in health checkup results differed between groups, we calculated difference scores by subtracting the 2012 data from the 2015 data. The males in the attendance group showed a significantly greater decrease in DBP (-4.12 ± 7.20, $p = 0.014$) than the males in the non-attendance group. The females in the non-attendance group showed a significantly greater increase in high-density lipoprotein cholesterol (HDL-C) than the females in the attendance group (2.95 ± 8.33, $p = 0.042$). The number of patients who consulted medical institutions for hypertension ($p = 0.039$) and hyperlipidemia ($p = 0.010$) were also significantly increased in the females in the non-attendance group. The significant decrease in DBP among males in the attendance group may have been because these individuals reviewed their lifestyle habits after receiving health guidance. The increase in HDL-C among the females in the non-attendance group could be attributed to their participation in exercise therapy during consultations with other medical institutions. The results of this study clearly indicated the importance of organizing health guidance with collaboration between municipality and medical institutions.

KEY WORDS

specific medical checkup, health guidance program, disease aggravation prevention, attendance state

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Introduction

The enactment of the Act on Assurance of Medical Care for Elderly People in 2008 established widespread practice of specific health checkups and guidance throughout Japan to prevent the development of metabolic syndrome. Many active recipients of such specific health checkups and guidance (hereafter, "active support recipients") reported greater improvements in abdominal circumference, body weight, blood glucose level, blood pressure, and lipid levels in the following year when compared to non-recipients[1]. Furthermore, a comparison of outpatient expenses for metabolic-syndrome-related illnesses (e.g., diabetes, hypertension, hyperlipidemia) in 2011 between active support recipients and non-recipients revealed that these expenses were 6,340 JPY and 6,390 JPY cheaper for male and female recipients, respectively, compared to non-recipients. In other words, actively participating in support initiatives has helped reduce the medical fees for metabolic-syndrome-related illnesses[1].

However, 31.5% of men and 64.4% of women meeting all the criteria for metabolic syndrome (i.e., abnormal blood pressure, lipid, and blood glucose levels) are not classified as obese[2]. According to the Ministry of Health, Labor and Welfare, many individuals who carry the risk factors for metabolic syndrome (high blood pressure level, dyslipidemia, and high blood glucose level) but whose abdominal circumference is within the normal range do not become targets for specific health guidance ("non-targets"). As addressing these non-targets is exceedingly important, the Ministry has been constantly reviewing this matter in recent years[3].

The above reports also highlight the importance of initiatives aimed at preventing the aggravation of diabetes and other illnesses among non-targets of specific health guidance. In other words, it is necessary to develop methods that do not rely on specific health guidance to reduce the number of people with or who are at risk of developing metabolic syndrome. In addition to providing specific health guidance, each municipality in Japan provides general health guidance to those who require it[4]. So far, however, past studies have only validated the effect of specific health guidance[5-6]; there has been no evaluation of the preventative effects of such general health guidance on long-term disease aggravation based on the results of follow-up health checkups, particularly among non-obese people. For this reason, we believe that it is necessary to evaluate other forms of health guidance provided by municipalities in conjunction with specific health guidance. The results of such an evaluation could provide basic reference material to municipalities for the effective implementation of future lifestyle-related illness countermeasures.

For this reason, this study examined health guidance attendance among individuals who do not meet all the criteria for specific health guidance, including those eligible for other forms of health guidance outside of the specific health guidance, and how this attendance correlated with the results of specific health checkups three years later. We also examined how attendance related to medical fees and whether individuals had received other medical consultations for lifestyle-related diseases. The three-year period was analyzed in order to evaluate the status of medical consultations for severe diseases such as cerebrovascular disease and ischemic heart disease.

Methods

1. Participants

The participants of this study were adults (aged 40 or above) who were enrolled in the national health insurance program of Town B, Prefecture A in 2012 and 2015; who had become health guidance targets after receiving a specific health checkup in 2012; and had received a specific health checkup again in 2015 (Figure 1). Town B has a population of approximately 37,700, and the national health insurance enrollment rate was roughly 19% in 2017. Furthermore, approximately 42% of the population received specific medical checkups in 2017. In that data, regardless of the presence or absence of diabetes treatment, the ratio of people with HbA1c levels higher than 7.0% was higher in Prefecture A[7].

In 2012, the eligible targets of health guidance in Town B were all individuals at high risk of disease aggravation, including those with HbA1c levels higher than 6.5% but who do not take diabetes medicine or receive insulin shots; who have been diagnosed with Grade II hypertension (systolic arterial pressure [SAP] of over 160mmHg or diastolic blood pressure [DBP] of over 80mmHg) but do not take antihypertensive agents;

or those with a low-density lipoprotein-cholesterol (LDL-C) level of 180mg/dl or higher but who do not consume any hyperlipidemia agents. In addition, the eligible targets of health guidance in Town B were motivational support and active support as part of the specific health guidance. The eligible targets of health guidance in Town B defined these criteria for aggravation risk; we further referenced a diabetes treatment guide, hypertension treatment guidelines, and arteriosclerotic disease prevention guidelines. All targets were mailed invitations to health guidance. Those who accepted the invitation were provided health guidance via individual conferences with a public health nurse, a national registered dietitian, and a hospital nurse. Those who received guidance were also evaluated via phone or another individual conference six months later.

For the analysis, we classified individuals who became targets of health guidance in 2012 and actually received such guidance as the attendance group, whereas those who became targets of health guidance but did not receive it were classified as the non-attendance group.

2. Research period

This study was conducted from July to October 2016.

3. Procedure

The research objectives, methods, and all ethical considerations were explained both in writing and verbally to the relevant medical health examination manager in Town B, Prefecture A, and their consent was obtained. We obtained medical checkup data and medical service data integrated for each individual from the municipality of Town B, devoid of any information that could personally identify any individual. These data were used in the analysis. This study was conducted after receiving approval from the Kanazawa University Medical Ethics Review Committee (approval number: 683).

4. Research items

1) Basic attributes

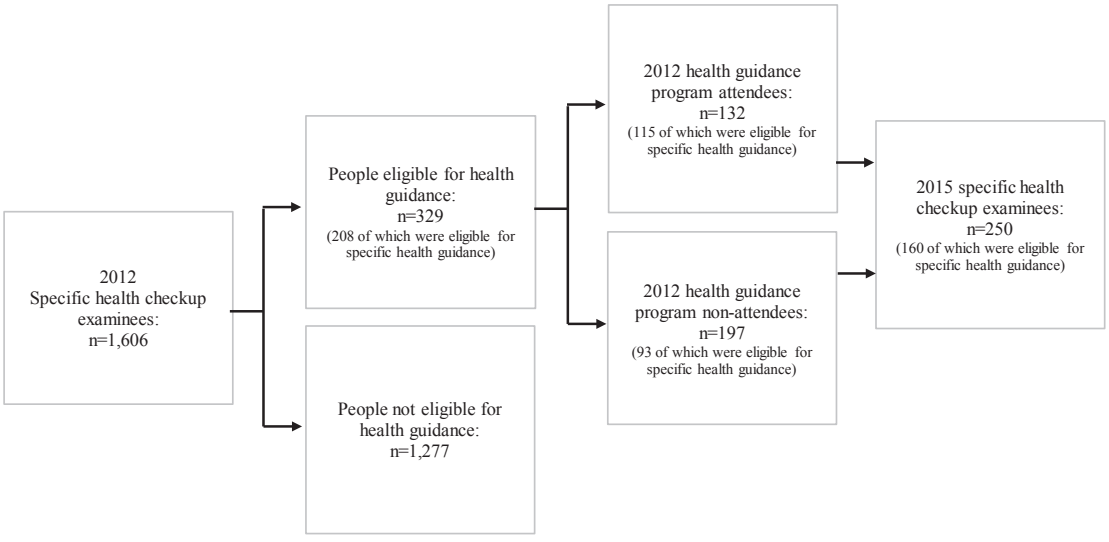
The basic attributes of age and gender were collected for each participant.

2) Specific-medical checkup-related items

We collected their health guidance correspondence status in 2012 and their class attendance status. We also collected data on body weight, abdominal circumference, SAP, DBP, LDL-C and high-density lipoprotein cholesterol (HDL-C) levels, HbA1c (NGSP), and estimated glomerular filtration rate (eGFR) from the 2012 and 2015 specific health checkups. Furthermore, we obtained information on whether participants were taking medication for lowering blood pressure or cholesterol or blood glucose at the 2012 checkup.

3) Medical service data

We collected data on participants' annual medical fees and whether they had consulted other medical



※Those whose consultation state of medical institutions cannot be ascertained using national insurance database were excluded

(e.g., those enrolled to national insurance plan other than the national plan)

Figure 1: Participant selection

institutions to obtain a prescription for the treatment of a lifestyle-related disease (medical consultation status) in 2012 and 2015.

5. Data analysis

All statistical analyses were conducted using SPSS Statistics 22. The significance level was set at 5%. We first examined changes in health checkup results and annual medical fees between 2012 and 2015 for each attendance status. First, we tested the normality of the data, and then used the paired t-test or Wilcoxon signed rank test to compare the results between 2012 and 2015 for each attendance status. Next, we examined group differences in the changes in these health checkup results and annual medical fees. To do this, we calculated difference scores by subtracting the 2012 data from the 2015 data and then compared them between the attendance and non-attendance groups via Student's t-test or the Wilcoxon rank-sum test, after confirming the normality of the data. We then compared medication consumption in 2012 between the attendance and non-attendance groups using Pearson's chi-squared test and Fisher's exact test. Finally, to analyze the change in medical consultation status, we checked for the existence of any medical prescriptions and then applied McNemar's test.

Results

1. Changes in specific medical checkup results and annual medical fees between 2012 and 2015

1) Within-group analyses (Tables 1 and 2)

Among males, those in the attendance group showed significant decreases in DBP and LDL-C (DBP: from 84.7±11.0 mmHg to 80.5±9.9 mmHg, $p<0.001$; LDL-C: from 141.0±29.8 mg/dl to 132.7±30.4 mg/dl, $p=0.005$). In contrast, the non-attendance group showed significant decreases in body weight and SAP (body weight: from 70.6±10.4 kg to 69.6±10.1 kg, $p=0.030$; SAP: from 134.6±16.2 mmHg to 130.9±17.3 mmHg, $p<0.001$). The non-attendance group also showed a significant increase in annual medical fees (from 171,295±385,547 JPY to 230,196±474,997 JPY, $p=0.001$).

Among females, those in the attendance group showed significant decreases in body weight (from 60.7±8.6 kg to 59.6±6.8 kg, $p=0.043$), DBP (from 82.8±9.8 mmHg to 78.8±9.4 mmHg, $p=0.011$), and LDL-C (from 162.9±54.0 mg/dl to 135.1±34.9 mg/dl, $p=0.002$), respectively. Their annual medical fees also significantly increased (from 131,995±223,187 JPY to 204,025±207,475 JPY, $p=0.010$). The non-attendance group showed significant decreases in DBP (from 77.8±10.1 mmHg to 74.8±10.9 mmHg, $p=0.012$) and LDL-C (145.0±38.7 mg/dl to 131.7±34.6 mg/dl, $p=0.027$), but a significant increase in annual medical fees (from 116,503±136,639 JPY to 371,549±695,829 JPY, $p<0.001$).

2) Between-group analyses (Table 3)

Among males, the decrease in DBP for the attendance group was –4.12±7.20 mmHg, whereas it was –1.64±11.86mmHg in the non-attendance group. The change in the attendance group was significantly larger than that in the non-attendance group ($p=0.014$). Among females, the change in HDL-C was –1.07±10.06 mg/dl in the attendance group, whereas it was 2.95±8.33 mg/dl in the non-attendance group. The change in the non-attendance group was significantly larger ($p=0.042$).

2. Group differences in medication consumption in 2012

Among males, none of the attendance group participants took medicine to lower their blood pressure in 2012 (0.0%) while 16 people did so among the non-attendance group (19.0%); the number was significantly higher in the non-attendance group ($p<0.001$).

Similarly, among females, none of the attendance group persons took medicine to lower their blood pressure (0.0%) and only 16 of the non-attendance group did so (23.5%); the number was again significantly higher in the non-attendance group ($p=0.002$. Similarly, none of the attendance group took medication to lower their cholesterol (0.0%), while 17 people in the non-attendance group (25.0%) did so. This difference was significant ($p=0.001$).

3. Changes in medical consultation status (Tables 4 and 5)

We observed no significant difference in consultation status between 2012 and 2015 in the attendance group, for either males or females. In contrast, in the non-attendance group, the number of females who had consultations for hypertension increased from 21 (30.9%) to 30 (44.1%) ($p=0.039$). The number of females who had consultations for hyperlipidemia also increased significantly, from 29 (42.6%) to 40 (58.8%) ($p=0.010$).

Table1．Changes in specific medical checkup results and annual medical fees between 2012 and 2015(male)

		Attendees(n=68)			Non-attendees(N=84)		
		2012	2015	p-value	2012	2015	p-value
Body weight	(kg)	73.2± 8.8	72.6± 9.4	0.119 a)	70.6±10.4	69.6±10.1	*0.030* a)
BMI	(kg/㎡)	25.9± 2.6	25.7± 2.7	0.223 a)	25.2± 3.1	24.9± 2.9	0.135 a)
Abdominal circumference	(cm)	90.3± 6.2	89.9± 6.6	0.316 a)	89.4± 8.4	88.6± 8.0	0.087 a)
SAP	(mmHg)	135.0±17.4	133.6±15.8	0.468 b)	134.6±16.2	130.9±17.3	*<0.001* b)
DBP	(mmHg)	84.7±11.0	80.5± 9.9	*<0.001* a)	78.6±10.7	77.0±11.4	0.534 b)
HbA1c	(%)	6.0± 1.0	5.9± 0.5	0.558 b)	6.0± 0.9	6.1± 1.2	0.078 b)
LDL-C	(mg/dl)	141.0±29.8	132.7±30.4	*0.005* a)	129.2±34.2	123.7±31.9	0.079 b)
HDL-C	(mg/dl)	52.1±10.8	51.8±10.5	0.747 a)	51.7±13.7	52.8±14.6	0.177 b)
eGFR	(ml/min/1.73㎡)	72.0±11.9	68.5±13.5	*<0.001* b)	76.1±13.6	73.2±14.0	*0.003* a)
Annual medical fees	(yen)	154,471±364,334	235,941±712,946	0.497 b)	171,295±385,547	230,196±474,997	*0.001* b)

Mean±SD
a)the paired t-test
b)Wilcoxon signed rank test

Table2．Changes in specific medical checkup results and annual medical fees between 2012 and 2015(female)

		Attendees(n=30)			Non-attendees(N=68)		
		2012	2015	p-value	2012	2015	p-value
Body weight	(kg)	60.7± 8.6	59.6± 6.8	*0.043* a)	56.7± 9.1	56.2± 8.9	0.091 b)
BMI	(kg/㎡)	26.3± 3.1	26.1± 2.7	0.445 b)	24.5± 3.6	24.4± 3.4	0.362 b)
Abdominal circumference	(cm)	90.6± 8.2	90.8± 6.3	0.823 b)	85.2± 9.9	85.3± 9.1	0.788 b)
SAP	(mmHg)	135.4±21.6	130.7±15.4	0.897 a)	135.2±19.8	133.0±16.9	0.464 a)
DBP	(mmHg)	82.8± 9.8	78.8± 9.4	*0.011* b)	77.8±10.1	74.8±10.9	*0.012* b)
HbA1c	(%)	6.3± 1.5	6.0± 0.6	0.705 a)	6.1± 0.8	6.1± 0.8	0.085 a)
LDL-C	(mg/dl)	162.9±54.0	135.1±34.9	*0.002* a)	145.0±38.7	131.7±34.6	*0.027* a)
HDL-C	(mg/dl)	62.5±14.7	61.4±15.9	0.566 b)	61.2±15.3	64.1±16.4	*0.005* b)
eGFR	(ml/min/1.73㎡)	72.7±11.1	67.4±17.7	*0.009* a)	79.4±17.2	76.7±17.7	*0.026* a)
Annual medical fees	(yen)	131,995±223,187	204,025±207,475	*0.010* a)	116,503±136,639	371,549±695,829	*<0.001* a)

Mean±SD
a)Wilcoxon signed rank test
b)the paired t-test

Table3．Between-group analyses ※

		Male			Female		
		Attendees(n=68)	Non-attendees(N=84)	p-value	Attendees(N=30)	Non-attendees(N=68)	p-value
Body weight	(kg)	-0.56± 2.94	-0.96± 4.00	0.574 a)	-1.16± 3.47	-0.51± 2.43	0.185 a)
BMI	(kg/㎡)	-0.14± 0.96	-0.23± 1.41	0.643 b)	-0.22± 1.53	-0.12± 1.03	0.594 a)
Abdominal circumference	(cm)	-0.44± 3.60	-0.77± 4.06	0.605 b)	0.22± 5.26	0.17± 5.16	0.737 a)
SAP	(mmHg)	-1.34±17.07	-3.69±17.80	0.411 b)	-4.63±22.37	-2.23±17.94	0.749 a)
DBP	(mmHg)	-4.12± 7.20	-1.64±11.86	*0.014* a)	-4.03± 8.14	-3.00± 9.51	0.389 a)
HbA1c	(%)	-0.10± 0.76	0.13± 1.06	0.256 a)	-0.24± 1.16	-0.05± 0.46	0.271 a)
LDL-C	(mg/dl)	-8.29±23.71	-5.46±24.78	0.321 a)	-27.80±47.18	-13.38±44.19	0.139 a)
HDL-C	(mg/dl)	-0.28± 7.10	1.08± 9.10	0.729 a)	-1.07±10.06	2.95± 8.33	*0.042* b)
eGFR	(ml/min/1.73㎡)	-3.46± 7.73	-2.96± 8.81	0.629 a)	-5.30± 9.89	-2.68±10.57	0.252 b)
Annual medical fees	(yen)	81,470±751,647	58,900±461,635	0.068 a)	72,030±198,838	255,046±698,290	0.945 a)

Mean±SD
※we calculated difference scores by subtracting the 2012 data from the 2017 data
a)Wilcoxon rank-sum test
b)Student's t-test

Table4. Changes in medical consultation status (attendance group)

		Male(n=68)					Female(n=30)				
		2012		2015		p-value	2012		2015		p-value
		N	(%)	N	(%)		N	(%)	N	(%)	
Diabetes	Yes	12	17.6	13	19.1	1.000	5	22.6	6	20.0	1.000
	No	56	82.4	55	80.9		25	77.4	24	80.0	
Hypertension	Yes	7	10.3	10	14.7	0.505	6	27.4	9	30.0	0.505
	No	61	89.7	58	85.3		24	80.0	21	70.0	
Hyperlipidemia	Yes	9	13.2	11	16.2	0.077	5	16.7	11	36.7	0.077
	No	59	86.8	57	83.8		25	83.3	19	63.3	
Fatty liver	Yes	3	4.4	2	2.9	1.000	2	6.7	1	3.3	1.000
	No	65	95.6	66	97.1		28	93.3	29	96.7	
Arteriosclerosis	Yes	1	1.5	3	4.4	0.480	0	0.0	2	6.7	0.480
	No	67	98.5	65	95.6		30	100.0	28	93.3	
Cerebral infarction	Yes	4	5.9	4	5.9	1.000	1	3.3	0	0.0	1.000
	No	64	94.1	64	94.1		29	96.7	30	100.0	
Cerebral hemorrhage	Yes	0	0.0	0	0.0	—	0	0.0	0	0.0	—
	No	68	100.0	68	100.0		30	100.0	30	100.0	
Angina pectoris	Yes	2	2.9	3	4.4	1.000	0	0.0	1	3.3	1.000
	No	66	97.1	65	95.6		30	100.0	29	96.7	
Cardiac infarction	Yes	0	0.0	0	0.0	—	0	0.0	0	0.0	—
	No	68	100.0	68	100.0		30	100.0	30	100.0	
Hyperuricemia	Yes	3	4.4	2	2.9	1.000	0	0.0	1	3.3	1.000
	No	65	95.6	66	97.1		30	100.0	29	96.7	

McNemar's test

Discussion

In the following section, we describe the characteristics of participants in both groups, consider the effects of health guidance, and propose future tasks for providing health guidance, based on the results of our analyses.

1. Characteristics of non-attendance group

In 2012, a portion of the non-attendance group (both males and females) was receiving treatment to lower their blood pressure, blood glucose level, or cholesterol. This might indicate why they did not attend health guidance—these individuals were instead consulting with medical institutions, and thus might not have believed that they required health guidance. In past research, approximately 50% of studied patients receiving treatment had metabolic syndrome, which was significantly higher than the proportion among those not receiving treatment[8]. Furthermore, among individuals receiving health checkups for people aged 20 and over conducted by the medical checkup center, approximately 60% of men and 50% of women receiving treatment for diabetes had an HbA1c level of 7.0% or higher[9]; in other words, even among patients receiving treatment for diabetes, there are individuals who meet the criteria for metabolic syndrome or poor diabetic control. Based on the diabetic nephropathy aggravation prevention program[10], we provided guidance on blood glucose and blood pressure management according to the thoughts and living conditions of the target person's diabetes. In addition, the information that was obtained, especially regarding patients that tend to interrupt their treatment, may be useful for medical institutions; thus, we believe that it is important to share this information with such institutions. The results indicate that health

Table 5. Changes in medical consultation status (non-attendance group)

		Male(n=84)					Female(n=68)				
		2012		2015		p-value	2012		2015		p-value
		N	(%)	N	(%)		N	(%)	N	(%)	
Diabetes	Yes	19	22.6	23	27.4	0.343	16	23.5	22	32.4	0.114
	No	65	77.4	61	72.6		52	76.5	46	67.6	
Hypertension	Yes	23	27.4	26	31.0	0.546	21	30.9	30	44.1	*0.039*
	No	61	72.6	58	69.0		47	69.1	38	55.9	
Hyperlipidemia	Yes	17	20.2	22	26.2	0.332	29	42.6	40	58.8	*0.010*
	No	67	79.8	62	73.8		39	57.4	28	41.2	
Fatty liver	Yes	3	3.6	3	3.6	1.000	0	0.0	3	4.4	0.248
	No	81	96.4	81	96.4		68	100.0	65	95.6	
Arteriosclerosis	Yes	4	4.8	6	7.1	0.683	6	8.8	9	13.2	0.450
	No	80	95.2	78	92.9		62	91.2	59	86.8	
Cerebral infarction	Yes	2	2.4	4	4.8	0.480	6	8.8	8	11.8	0.683
	No	82	97.6	80	95.2		62	91.2	60	88.2	
Cerebral hemorrhage	Yes	0	0.0	3	3.6	0.248	0	0.0	0	0.0	—
	No	84	100.0	81	96.4		68	100.0	68	100.0	
Angina pectoris	Yes	3	3.6	3	3.6	1.000	3	4.4	5	7.4	0.480
	No	81	96.4	81	96.4		65	95.6	63	92.6	
Cardiac infarction	Yes	1	1.2	1	1.2	1.000	0	0.0	0	0.0	—
	No	83	98.8	83	98.8		68	100.0	68	100.0	
Hyperuricemia	Yes	0	0.0	2	2.4	0.480	0	0.0	0	0.0	—
	No	84	100.0	82	97.6		68	100.0	68	100.0	

McNemar's test

guidance in municipalities should be provided in cooperation with medical institutions in the hospital. In this study, there were few people other than those receiving specific health guidance in the attendance group. In another study that evaluated the results of health guidance for non-obese people, approximately 20% of health guidance users improved their blood glucose level, blood pressure, and lipid levels[11]. For this reason, patients already being treated for chronic disease and non-obese people should be considered eligible targets for health guidance. It might be necessary to improve the methods of communicating with these target individuals to ensure that they receive health guidance.

2. Changes in medical checkup results

A number of the health checkup items had significantly improved by 2015 when compared to 2012, in both the attendance and non-attendance groups. The female non-attendance group demonstrated especially prominent changes in some results. A past study similarly found that health checkup results improved after a year even among individuals who did not receive specific health guidance[5]. It is possible that some individuals in the non-attendance group reviewed their own lifestyle habits after having received their health checkup results, even without having received health guidance. Another possible reason for this finding is that they received health checkups annually or attended health guidance in 2013 or 2014 (which we did not study) and reviewed their lifestyle habits during those years. Past research has shown annual medical checkups might lead to significant improvements in body mass index and abdominal circumference[12]. Another study confirmed this—those who received

checkups every year reported significant improvements in their body weight, abdominal circumferences, and DBP—and further found that individuals who did not receive continuous health checkups did not exhibit significant improvements in their test results, despite utilizing the health guidance service[13]. Another possible reason for the improvement is an increase in the number of people who received consultations from medical institutions for hypertension and hyperlipidemia, which led to a subsequent improvement in medication prescriptions.

The decrease in DBP among males within the attendance group was large and significant. Since we observed no significant change in the consultation status among males in the attendance group, it is possible that attending health guidance is what helped these participants improve their lifestyle habits (e.g., reducing their salt intake), which in turn led to a decrease in DBP. Among the female non-attendance group, the increase was significant and large for HDL-C, and we observed a significant increase in the number who received medical consultations for hyperlipidemia. A possible reason for the increase in HDL-C is that the arteriosclerotic disease prevention guidelines recommend exercise therapy[14], meaning that doctors might have recommended that these females exercise during consultations, instead of just prescribing medication. Accordingly, it may be that the provision of health guidance in medical institutions has a significant effect.

We found a significant increase in annual medical fees among both males and females, regardless of whether or not they received health guidance. These findings might be related to the medical fees for cancer and mental disorders. The health guidance in Town B recommends that individuals consult medical institutions based on their checkup results[15], which could have resulted in their seeking appropriate consultation at medical institutions, thus increasing their medical fees.

3. Limitations and future tasks

The study period was only three years, so it is necessary to perform a similar analysis over a longer period. Furthermore, it is also necessary to determine if individuals annually attend health checkups, health guidance, and treatment. It might be also pertinent to explore associations health checkup results and medical fees after excluding the fees for medical consultations for diseases other than lifestyle-related ones. Lifestyle-related illnesses are the main reason for starting long-term nursing care in about 20% of cases[16]. As such, the prevention of lifestyle-related illness might help to prevent individuals from developing a need for long-term care. We must continually evaluate these factors, including the care given to individuals after they receive health guidance.

Conclusion

We examined the associations between health guidance attendance and health checkup results after three years, along with medical fees and medical consultation status medical. Our main findings were as follows:

1. Among the males, the attendance group showed a significant decrease in DBP and LDL-C, while the non-attendance group exhibited a significant decrease in body weight and SAP. Among the females, the attendance group showed a significant decrease in body weight, DBP, and LDL-C, while the non-attendance group showed a significant decrease in DBP and LDL-C.
2. The decrease in DBP for males in the attendance group was significantly greater than that in the non-attendance group. Among females, the increase in HDL-C was significantly greater in the non-attendance group than in the attendance group.
3. The results indicate that, along with the provision of health guidance, coordinating with medical institutions is important.

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特定健康診査受診者の保健指導受講の有無と 3 年後の健診・医療データとの関連の検討

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要　旨

特定健康診査を受診した者において保健指導受講の有無が，3 年後の健診結果，医療機関への受診状況と関連するか検討することを目的とした。対象者は，A 県 B 町国民健康保険加入者で，平成 24 年度に特定健診を受診し保健指導対象となった者のうち，平成 27 年度に特定健診を受診し医療機関の受診状況等が把握できた 250 名とした。

3 年後の変化として，男性の受講群で拡張期血圧，LDL-C が非受講群と比べ有意に低下し（$p<0.001$，$p=0.005$），女性の受講群では体重，拡張期血圧，LDL-C が非受講群と比べ有意に低下した（$p=0.043$，$p=0.011$，$p=0.002$）。平成 27 年度から平成 24 年度のデータを減じて算出した変化量は，男性の拡張期血圧で受講群が -4.12 ± 7.20 で非受講群と比べ有意に大きく（$p=0.014$），女性の非受講群では HDL-C の変化量が 2.95 ± 8.33 で受講群と比べ有意に大きかった（$p=0.042$）。また，女性の非受講群で「高血圧症」「脂質異常症」の受診者の割合が受講群と比べ有意に増加した（$p=0.039$，$p=0.010$）。男性の受講群において拡張期血圧の低下と，変化量に有意差があった理由として，保健指導を受講し，生活習慣の見直しを行った可能性が考えられた。また，女性の非受講群で HDL-C が有意に増加した理由として，医療機関受診により運動療法が行われた可能性があり，保健指導受講とともに医療機関との連携が重要であると示唆が得られた。