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〔Original〕

Fact-finding survey for preventive guidance on Atherosclerosis for psychiatric day care users in Aomori Prefecture: Study on brachial-ankle pulse wave velocity (baPWV) and lifestyle-related factors

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Abstract

Objective: For psychiatric day care users, improvement and maintenance of specific neurological manifestations and support for living activities have been focused on. However, few surveys on unhealthy lifestyle in the current state have been performed even though a higher prevalence of metabolic syndrome (MetS) than in inpatients and cardiometabolic risk have been reported. In this study, the relationship between brachial-ankle pulse wave velocity (baPWV) and lifestyle-related factors was investigated in psychiatric day care users in Aomori Prefecture, Japan.

Methods: The subjects were 109 psychiatric day care users at medical institutions in Aomori Prefecture (male: 62, female: 47). The measurement items were age, sex, height, body weight, BMI, body fat percentage, grip strength, blood pressure, pulse pressure, mean blood pressure, and baPWV. Using a self-completed questionnaire, we obtained the following information from each subject: smoking amount (pack-years), history of present illness, past medical history, confirmation of drug history handbook, and the presence of exercise habits.

Results: In males in the 20–39 years old group, no significant correlation was noted between the baPWV value and lifestyle-related factors. On the other hand, in female in the corresponding group, a significant positive correlation was noted between the baPWV value and BMI and body fat percentage ($p<0.001$, $p<0.001$). In the 40–49 and 50 years old or older groups, no significant correlation was noted between the baPWV value and lifestyle-related factors in males or females.

Conclusion: For psychiatric day care users, in addition to conventional improvement of neurological manifestations and support for living activities, comprehensive approaches to poor physical health are important. Taking measures against by sex and age may delay the progression of atherosclerosis, which is the outcome of poor physical health.

Keywords: psychiatric day care users, preventive guidance on Atherosclerosis, metabolic syndrome (MetS), brachial-ankle pulse wave velocity (baPWV), lifestyle-related factors

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Introduction

Among schizophrenia spectrum disorders, schizophrenia is a mental disease-causing cognitive impairment as a symptom, in addition to neurological manifestations such as hallucinations and delusions[1]. Its onset is in adolescence to young adulthood around 20 years old and follows a chronic course while demonstrating functional remission after these characteristic symptoms are observed as an acute symptom[2–6]. Regarding the annual worldwide incidence of schizophrenia, although there is significant variation, it develops in approximately 15 in 100,000 population, the lifetime risk for development is approximately 7.2 in 1,000 population[7], and the prevalence is approximately 0.28%[8]. Regarding the pathology of schizophrenia, in general, the characteristic neurological manifestations develop in young adulthood and follow a chronic course while negatively influencing physical activities. Although many surveys and studies have been performed, the cause of disease or developmental mechanism has not yet been elucidated due to the diversity in the course and outcomes of schizophrenia.

The life expectancy of schizophrenia patients is shorter than that of the general population and this tendency is increasing[9, 10]. In psychiatric day care users, the prevalence of metabolic syndrome (MetS) is higher than that in inpatients[11] and cardiometabolic risk have been reported[12].

MetS is the whole of obesity, hypertension, dyslipemia, and hyperglycemia induced by unhealthy lifestyles, i.e., long-time lifestyle-related disease promotes atherosclerosis and induces the high-risk pathology of arteriosclerotic disease[13–15]. Ischemic heart disease and cerebrovascular disease are representatives of this arteriosclerotic disease, and are included in the main cause of death worldwide[16].

Regarding the evaluation of atherosclerosis, several methods have been used. Blood pressure measurement is a representative index[17]. However, this measurement is strongly influenced by psychological factors of the subjects. Recently, an evaluation value acquired by brachial-ankle pulse wave velocity (baPWV) measurement is used as an index with high clinical reliability[18]. In addition, the measurement method of baPWV being noninvasive and simple, it reflects the stiffness of the central and peripheral arterial walls, being strongly correlated with the grade of atherosclerosis and atherosclerosis-associated risk of cardiovascular disease [19–21].

For patients, mainly those with schizophrenia exhibiting functional remission and using psychiatric day care, in addition to focusing on improvement of neurological manifestations, the necessity of psychosocial or occupational rehabilitation has been proposed and practiced[22]. However, few surveys have been performed on related factors considered to have an influence on atherosclerosis such as lifestyle and physical condition. In this study, the relationship between baPWV, an index of atherosclerosis, and lifestyle-related factors was surveyed in psychiatric day care users at multiple facilities in Aomori Prefecture, Japan.

Subjects and Methods

1. Subjects

Among 122 psychiatric day care users of medical institutions in Aomori Prefecture, those with a missing measured value during the survey and those who requested withdrawal during measurement were excluded, and the remaining 109 users (male: 62, female: 47) were selected as the subjects.

2. Measurement items and measurement methods

(1) Questionnaire survey

A self-completed questionnaire was distributed to the subjects beforehand through occupational therapists in charge at the medical institutions. The questionnaire was collected after confirming the content of the responses by a personal interview on the measurement day. The survey items were age, sex, history of present illness, past medical history, and confirmation of drug history handbook. Regarding lifestyle, smoking status and exercise habits were surveyed. Regarding the smoking status, pack-years was calculated from the daily smoking amount and duration of smoking. Regarding exercise habits, the presence and type were asked.

(2) Grip strength

Grip strength was measured using an M-type hand dynamometer (KILO HAND DYNAMO METER SAKAI, Tokyo Japan).

(3) Physique and body composition

Regarding the physique, the height and body weight were measured and the body mass index (BMI) was calculated. To measure body composition using TANITA MC-190 (TANITA Co. Ltd. Tokyo Japan), the body fat percentage was measured employing bioelectrical impedance analysis.

(4) Blood pressure

Blood pressure was measured using a digital automated sphygmomanometer (HEM-1020 Omron, Tokyo Japan). In addition, the pulse pressure and mean blood pressure were calculated from the measured systolic and diastolic blood pressure.

(5) baPWV

For baPWV measurement, PWV/ABI (Omron Colin Co.Ltd. Tokyo Japan) was used. baPWV was calculated as follows: Pressure measurement cuffs were wrapped around the bilateral upper arms and ankles, pressure was applied, the time lag in the rise time of pulse waves between the upper arm and ankle was determined from the volume pulse waveform record, and this value was divided by the distance from the heart to the measurement site as baPWV (distance/Δ time: cm/sec). The mean of the bilateral baPWV values was regarded as the measured value. During measurement, personal space was secured by setting a partition screen in consideration of the psychological influence on the subjects.

3. Statistical analysis

As physique, blood pressure, and baPWV are influenced by sex and age, the subjects were divided into 3 groups of each sex: 20−39, 40−49, and 50 years old or older. The age, BMI, body fat percentage, systolic blood pressure, diastolic blood pressure, pulse pressure, mean blood pressure, grip strength, baPWV, and smoking amount (pack-years) were compared using One-way ANOVA among the 3 age groups of each sex. For subsequent multiple analysis, Tukey's test was used. For the presence of exercise habits, the chi-square test was used.

Regarding the relationship between an index of atherosclerosis, baPWV, and lifestyle-related factors, multiple regression analysis was performed regarding baPWV as a response variable and lifestyle-related factors, BMI, body fat percentage, grip strength, pulse pressure, mean blood pressure, and smoking amount (pack-years) as explanatory variables. For the correction items, the presence of treatment for hypertension, diabetes mellitus, dyslipemia, and previous hospitalization were selected.

For data analysis, SPSS ver.12.0J (SPSS Inc., Chicago, IL, USA) was used. These analyses were performed by sex and a p value < 0.05 was considered statistically significant.

4. Ethical considerations

To the directors and persons in charge of management of the facilities used by the subjects, the study was explained using a study summary describing the purpose and methods, and approval was received. To the subjects, the objective, arbitrariness of cooperation for the survey, disadvantages, protection of personal information, and handling and management of data were explained, and consent to participation and cooperation in the study were received before the study.

In the survey, one or more occupational therapists working for each hospital were assigned as persons in charge of the subjects of this study. The condition of the subjects was observed, and a system for receiving consultation by physicians and care by clinical psychologists in case of a change noted in physical condition was prepared.

The ethics committee of the Aomori University of Health and Welfare approved this study (Approval Number: 1331).

Results

1. Characteristics of the subjects

The subjects were 62 males and 47 females. Of these, the male 20−39, 40−49, and 50 years old or older groups included 16 (34.1 ± 4.7 years old), 16 (43.9 ± 3.3 years old), and 30 (60.4 ± 6.6 years old) subjects, respectively. Of females, the 20−39, 40−49, and 50 years old or older groups included 18 (32.3 ± 3.4 years old), 13 (43.8 ± 3.4 years old), and 16 (60.3 ± 6.9 years old) subjects, respectively (Table 1−1 and 1−2).

The grip strength was significantly decreased in the 50 years old or older group compared with those in the 20−39 and 40−49 years old groups in males ($p<0.05$). The baPWV was significantly increased in the 50 years

Table 1-1. Characteristics of the subjects (Male n=62)

		20–39 years old group (n=16)	40–49 years old group (n=16)	50 years old or older group (n=30)
Age (year)		34.1 ± 4.7	43.9 ± 3.3*	60.4 ± 6.6*†
Height (cm)		163.1 ± 30.5	168.6 ± 6.0	161.6 ± 15.0
Body weight (kg)		82.6 ± 19.8	76.9 ± 14.6	71.0 ± 13.9
BMI (kg/m^2)		28.4 ± 6.3	27.0 ± 4.7	26.2 ± 4.2
Body fat percentage (%)		27.8 ± 8.3	26.1 ± 6.7	25.8 ± 5.6
Grip strength (kg)		43.2 ± 8.6	44.0 ± 6.6	35.9 ± 8.9*†
Systolic blood pressure (mmHg)		141.8 ± 16.0	137.1 ± 21.1	138.2 ± 21.1
Diastolic blood pressure (mmHg)		84.9 ± 7.7	84.1 ± 12.2	83.4 ± 13.2
Pulse pressure (mmHg)		57.0 ± 11.3	52.9 ± 12.7	54.8 ± 11.7
Mean blood pressure (mmHg)		103.9 ± 9.8	101.8 ± 14.6	101.7 ± 15.3
baPWV (cm/sec)		1351.9 ± 152.5	1316.8 ± 121.5	1542.5 ± 315.2*†
Smoking amount (pack-years)		10.6 ± 12.1	25.7 ± 18.6*	25.8 ± 22.6*
Exercise habit	No	6 (37.5)	6 (37.5)	10 (33.3)
	Yes	10 (62.5)	10 (62.5)	20 (66.7)

Mean ± SD or n (%)
One-way ANOVA: multiple comparison of each measured value among the age groups (Tukey's test) or Chi-square test
* Significant on comparison with the 20–39 years old group ($p<0.05$)
† Significant on comparison with the 40–49 years old group ($p<0.05$)
BMI: Body Mass Index
baPWV: brachial-ankle pulse wave velocity

Table 1-2. Characteristics of the subjects (Female n=47)

		20–39 years old group (n=18)	40–49 years old group (n=13)	50 years old or older group (n=16)
Age (year)		32.3 ± 3.4	43.8 ± 3.4*	60.3 ± 6.9*†
Height (cm)		148.1 ± 26.3	152.1 ± 21.3	149.6 ± 20.2
Body weight (kg)		65.6 ± 12.5	71.5 ± 15.5	64.0 ± 14.6
BMI (kg/m^2)		26.4 ± 5.0	28.9 ± 6.1	26.7 ± 5.2
Body fat percentage (%)		37.3 ± 8.1	40.8 ± 7.8	37.4 ± 6.7
Grip strength (kg)		28.8 ± 5.1	25.3 ± 7.7	20.7 ± 4.2*
Systolic blood pressure (mmHg)		125.8 ± 19.5	136.1 ± 16.2	134.3 ± 18.5
Diastolic blood pressure (mmHg)		80.7 ± 20.3	86.0 ± 15.0	85.9 ± 13.9
Pulse pressure (mmHg)		45.1 ± 8.9	50.1 ± 20.3	48.4 ± 16.3
Mean blood pressure (mmHg)		95.7 ± 19.6	102.7 ± 12.1	102.1 ± 13.5
baPWV (cm/sec)		1133.6 ± 110.8	1206.0 ± 92.2	1429.8 ± 236.6*†
Smoking amount (pack-years)		5.2 ± 10.3	6.2 ± 10.0	7.8 ± 12.0
Exercise habit	No	9 (50.0)	5 (38.5)	7 (43.8)
	Yes	9 (50.0)	8 (61.5)	9 (56.3)

Mean ± SD or n (%)
One-way ANOVA: multiple comparison of each measured value among the age groups (Tukey's test) or Chi-square test
* Significant on comparison with the 20–39 years old group ($p<0.05$)
† Significant on comparison with the 40–49 years old group ($p<0.05$)
BMI: Body Mass Index
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old or older group compared with that in the 20–39 and 40–49 years old groups ($p<0.05$). The smoking amount (pack-years) was significantly increased in the 40–49 and 50 years old or older groups compared with those in the 20–39 years old group ($p<0.05$, $p<0.05$). On the other hand, in females, the grip strength was significantly decreased in the 50 years old or older group compared with that in the 20–39 years old group ($p<0.05$), and the baPWV was significantly increased in the 50 years old or older group compared with those in the 20–39 and 40–49 years old groups ($p<0.05$, $p<0.05$).

2. The presence of underlying disease and previous hospitalization

Regarding underlying diseases in the subjects, in males, schizophrenia accounted for 80% or higher in each age group, followed by anxiety disorder and alcohol addiction. In females, schizophrenia accounted for 75% or higher in each age group, followed by mental retardation. In addition, in males, 14 (87.5%), 14 (87.5%), and 29 (96.7%) subjects in the 20–39, 40–49, and 50 years old or older groups had a hospitalization history, respectively. Of females, 14 (77.8%), 8 (61.5%), and 16 (100.0%) had a hospitalization history, respectively (Table 2).

3. Treatment of lifestyle-related diseases

Of males, 1 (6.3%), 1 (6.3%), and 1 (3.3%) subject in the 20–39, 40–49, and 50 years old or older groups were being treated for hypertension, respectively, 1 (6.3%), 1 (6.3%), and 1 (3.3%) were being treated for dyslipemia, respectively, and 1 (6.3%), 1 (6.3%), and 1 (3.3%) were being treated for diabetes mellitus, respectively.

Of females, 1 (6.3%) in the 50 years old or older group was being treated for hypertension, 1 (7.7%) and 1 (6.3%) were being treated for dyslipemia in the 40–49 years old and 50 years old or older groups, respectively, and 1 (7.7%) and 1 (6.3%) were being treated for diabetes mellitus in the 40–49 years old and 50 years old or older groups, respectively (Table 3).

Table 2. The presence of underlying disease and previous hospitalization

		Male			Female		
		20–39 years old group (n=16)	40–49 years old group (n=16)	50 years old or older group (n=30)	20–39 years old group (n=18)	40–49 years old group (n=13)	50 years old or older group (n=16)
Schizophrenia		16 (100.0)	13 (81.3)	25 (83.3)	16 (88.9)	10 (76.9)	14 (87.5)
Anxiety disorder		0 (0.0)	2 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Conversion disorder		0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (6.3)
Bipolar disorder		0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.7)	0 (0.0)
Personality disorder		0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.7)	0 (0.0)
Neurosis		0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.7)	0 (0.0)
Psychogenic reaction		0 (0.0)	0 (0.0)	1 (3.3)	0 (0.0)	0 (0.0)	0 (0.0)
Mood disorder		0 (0.0)	0 (0.0)	1 (3.3)	0 (0.0)	0 (0.0)	0 (0.0)
Depressive disorder		0 (0.0)	1 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (6.3)
Alcohol addiction		0 (0.0)	0 (0.0)	3 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)
Mental retardation		0 (0.0)	0 (0.0)	0 (0.0)	2 (11.1)	0 (0.0)	0 (0.0)
Hospitalization history	No	2 (12.5)	2 (12.5)	1 (3.3)	4 (22.2)	5 (38.5)	0 (0.0)
	Yes	14 (87.5)	14 (87.5)	29 (96.7)	14 (77.8)	8 (61.5)	16 (100.0)

n (%)

Table 3. Treatment of lifestyle-related diseases

	Male			Female		
	20–39 years old group (n=16)	40–49 years old group (n=16)	50 years old or older group (n=30)	20–39 years old group (n=18)	40–49 years old group (n=13)	50 years old or older group (n=16)
Treatment of hypertension	1 (6.3)	1 (6.3)	1 (3.3)	0 (0.0)	0 (0.0)	1 (6.3)
Treatment of dyslipemia	1 (6.3)	1 (6.3)	1 (3.3)	0 (0.0)	1 (7.7)	1 (6.3)
Treatment of diabetes mellitus	1 (6.3)	1 (6.3)	1 (3.3)	0 (0.0)	1 (7.7)	1 (6.3)

n (%)

Table 4-1. Relationship between baPWV value and lifestyle-related factors in the 20–39 years old group

Response variable	Explanatory variables	Male (n=16)			Female (n=18)		
		β	p	R^2	β	p	R^2
baPWV	BMI (kg/m^2)	0.221	0.492	0.288	0.679	< 0.001	0.643
	Body fat percentage (%)	0.363	0.215	0.363	0.725	< 0.001	0.705
	Grip strength (kg)	0.252	0.403	0.305	0.291	0.254	0.267
	Pulse pressure (mmHg)	-0.462	0.105	0.432	0.189	0.490	0.217
	Mean blood pressure (mmHg)	-0.271	0.443	0.297	0.077	0.772	0.192
	Smoking amount (pack-years)	0.158	0.601	0.273	0.293	0.273	0.261

Correction items: presence of treatment for hypertension, diabetes mellitus, dyslipemia, and previous hospitalization

β: Standardized partial regression coefficient, R^2: Coefficient of determination

BMI: Body Mass Index

baPWV: brachial-ankle pulse wave velocity

Table 4-2. Relationship between baPWV value and lifestyle-related factors in the 40–49 years old group

Response variable	Explanatory variables	Male (n=16)			Female (n=13)		
		β	p	R^2	β	p	R^2
baPWV	BMI (kg/m^2)	-0.206	0.560	0.289	0.454	0.320	0.359
	Body fat percentage (%)	-0.250	0.497	0.300	0.452	0.228	0.402
	Grip strength (kg)	-0.052	0.746	0.492	-0.480	0.290	0.371
	Pulse pressure (mmHg)	0.274	0.570	0.288	-0.361	0.515	0.301
	Mean blood pressure (mmHg)	0.245	0.447	0.309	-0.410	0.452	0.316
	Smoking amount (pack-years)	-0.162	0.685	0.275	-0.280	0.484	0.308

Correction items: presence of treatment for hypertension, diabetes mellitus, dyslipemia, and previous hospitalization

β: Standardized partial regression coefficient, R^2: Coefficient of determination

BMI: Body Mass Index

baPWV: brachial-ankle pulse wave velocity

Table 4-3. Relationship between baPWV value and lifestyle-related factors in the 50 years old or older groups

Response variable	Explanatory variables	Male (n=30)			Female (n=16)		
		β	p	R^2	β	p	R^2
baPWV	BMI (kg/m^2)	-0.170	0.359	0.510	0.048	0.872	0.329
	Body fat percentage (%)	-0.217	0.248	0.521	0.071	0.830	0.330
	Grip strength (kg)	-0.197	0.279	0.564	0.058	0.850	0.330
	Pulse pressure (mmHg)	0.086	0.678	0.493	0.272	0.333	0.390
	Mean blood pressure (mmHg)	0.309	0.072	0.439	0.120	0.685	0.339
	Smoking amount (pack-years)	-0.032	0.848	0.490	0.029	0.933	0.238

Correction items: presence of treatment for hypertension, diabetes mellitus, dyslipemia, and previous hospitalization

β: Standardized partial regression coefficient, R^2: Coefficient of determination

BMI: Body Mass Index

baPWV: brachial-ankle pulse wave velocity

4. Relationship between the baPWV value and lifestyle-related factors

The correlations between the baPWV value and lifestyle-related factors in the subjects are shown in Table 4−1, 4−2, and 4−3.

In males in the 20–39 years old group, no significant correlation was noted between the baPWV value and BMI, body fat percentage, grip strength, pulse pressure, mean blood pressure, or smoking amount (pack-years). In contrast, in females, significant positive correlations were noted between the baPWV value and BMI and body fat percentage ($p<0.001$, $p<0.001$).

In the 40−49 and 50 years old or older groups, no significant correlation was noted between the baPWV value and BMI, body fat percentage, grip strength, pulse pressure, mean blood pressure, or smoking amount (pack-years) in either males or females.

Discussion

We cross-sectionally investigated the relationship between an index of atherosclerosis, the baPWV value, and lifestyle-related factors in psychiatric day care users by sex and age group. The characteristics of this study were as follows: The subjects were widely recruited with the cooperation of several facilities in Aomori Prefecture, Japan, and the actual state of poor physical health of psychiatric day care users was clarified by correcting for the presence of treatments for hypertension,
diabetes mellitus, dyslipemia, and hospitalization history in the analysis.

In males, no significant association was noted between the baPWV value and lifestyle-related factors in any of the 20–39, 40–49, and 50 years old or older groups. However, of the characteristics of the subjects, the baPWV value was significantly higher in the 50 years old or older group than in the 20–39 and 40–49 years old groups. In a survey of the general population, regarding the association between the overall risk of death and baPWV value, the overall risk of death increased by 6.8-times in the group with a baPWV of 1,700 cm/sec or higher compared with that in the group with a baPWV value below 1,400 cm/sec[23]. In our study, although the baPWV value in the 50 years old or older group was not as high, the results suggested progression of atherosclerosis. As the background, the obesity indices, BMI and body fat percentage, were high in the 20–39 and 40–49 years old groups, although the differences were not significant. It was previously reported that obesity in young adulthood increases the incidence of cardiovascular disease[24, 25]. It has been also reported that in a cohort in which asymptomatic atherosclerosis was surveyed in middle-aged males, an extensive risk for sclerosis was present at a high probability even in subjects with a low MetS risk[26], suggesting that MetS accompanied by obesity progressed in relatively early adulthood and latently increased the risk of atherosclerosis. Second, the smoking amount (pack-years) was significantly higher in the 40−49 and 50 years old or older groups than in the 20−39 years old group. Regarding harmfulness of smoking on the cardiovascular system, it has a large influence on hemodynamics, such as increased systolic blood pressure and heart rate[27], and the association between continuous smoking and atherosclerosis has been reported[28]. As smoking is a strong risk factor for atherosclerosis[29], the load accumulated by smoking may have played a role in the progression of atherosclerosis. Third, the grip strength was significantly decreased in the 50 years old or older group compared with those in the 20–39 and 40–49 years old groups. Grip strength is an index representing changes in behavioral physical fitness with aging and it is also associated with the life prognosis[30]. This reduction of behavioral physical fitness can be interpreted as a result of continuation of an inactive condition due to MetS, in addition to negative symptoms, which are neurological manifestations, i.e., in elderly males, the state of low physical activity may have promoted atherosclerosis. Therefore, progression of atherosclerosis in males using psychiatric day care may be influenced by multiple factors, such as aging and lifestyle, in addition to underlying disease-associated neurological manifestations. Accordingly, when atherosclerosis is observed as an outcome of poor physical health, to prevent or remit it, it is necessary to view the entire lifetime of individual subjects and take measures based on periodic increases in lifestyle-related factors.

In females, a significant association was noted between the baPWV value and lifestyle-related factors, BMI, and body fat percentage in the 20–39 years old group. An index of atherosclerosis, the baPWV value, was high when indices of the state of obesity, BMI and body fat percentage, were high. Regarding

this, the association between atherosclerosis and obesity was frequently reported in preceding studies involving general population, as noted in males[31, 32]. In schizophrenia, the prevalence of MetS is higher than that in the general population, and in females, when obesity was noted in youth, atherosclerosis progressed with age asymptomatically, increasing the risk for ischemic heart disease or cerebrovascular disease[33, 34]. On the other hand, regarding female obesity, although body fat is likely to accumulate in the lower half of the body, such as the thighs and buttocks, due to estrogen, it transitions to visceral obesity as female hormones decrease with age and menopause, and causes MetS[35]. Therefore, greater importance was attached to the body fat distribution indicating regions with abnormal accumulation, rather than the absolute amount of accumulation, in several reports[36, 37], demonstrating the presence of several viewpoints for the relationship between atherosclerosis and obesity. However, lifestyles, such as inappropriate eating habits and a low physical activity level, are considered the cause of obesity in patients with underlying mental disease, such as schizophrenia[38], and outpatients are more likely to fall into this state than inpatients[39, 40], suggesting that psychiatric day care users are vulnerable to many environmental factors because activities are self-managed in many cases compared with inpatients whose daily life is controlled. Accordingly, for young females, it is important to position BMI and body fat percentage as predictors of atherosclerosis as primary prevention, and review lifestyles causing poor physical health. In the 40−49 and 50 years old or older groups, no significant association was noted between the baPWV value and lifestyle-related factors. However, when the baPWV value was compared among the 3 age groups, it was significantly higher in the 50 years old or older group than 20−39 and 40−49 years old groups. Regarding the influence of the age on the baPWV value, the increase in the baPWV value is small in young adulthood even over time, but in middle age and thereafter, this increase increases with age[41]. In addition, the value is lower in females than in males until the 50s, but the increase increases after menopause and the difference disappears after 60 years old[42], demonstrating a difference characteristic to females, whereas both BMI and body fat percentage were higher in this middle-aged and elderly group, although the differences were not significant. This suggested that obesity has a large influence on atherosclerosis in these age groups, for which progression of MetS is of concern. Females are likely to become obese after menopause, and large changes in the endocrine condition and stress susceptibility are considered the causes[43]. For middle-aged and elderly females, management of obesity-induced MetS is necessary, in addition to maintenance of better lifestyles from the early stage. To investigate the association between atherosclerosis and obesity, as obesity is present first and atherosclerosis is promoted thereafter, exhibiting a temporary course, a follow-up survey longer than a specific duration may be needed in the future.

There are limitations of this study. As the subjects wanted to participate in the survey of poor physical health, there may have been a bias that they were a population having high health consciousness. Second, regarding the relationship with the indices of atherosclerosis, the baPWV value and lifestyle-related factors, it was difficult to determine a causal relationship because this was a cross-sectional study, for which a longitudinal study, such as cohort study, and intervention study, such as randomized controlled study, are necessary. Third, the influence of antipsychotics was unable to be corrected for. As MetS is generally observed in outpatients being treated using antipsychotics[44, 45], this point should be addressed in a study in the future.

Conclusions

For psychiatric day care users, in addition to conventional improvement of neurological manifestations and support for living activities, comprehensive approaches to poor physical health are important. This study suggested that obesity is a primary predictor for the prevention of atherosclerosis, especially for young females. Lifestyle-related factors, obesity, smoking, and behavioral physical fitness are latently highly reversible; therefore, taking measures against MetS by sex and age may delay the progression of atherosclerosis, which is the outcome of poor physical health.

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Conflict of interest

The authors declare no conflict of interest.

Authors' contributions

All authors contributed to the design and conception of this manuscript. Takanobu Iwama drafted the manuscript; Haruyuki Ito, Takako Kumagai, Yūki Iwafuji, Kiyoshi Koeda and Yōko Ishii were involved in critically revising it for important intellectual content. All authors gave final approval for this version of the manuscript to be published and take full responsibility for its content.

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青森県内の精神科デイケア利用者に対する動脈硬化の予防的指導に向けた実態調査：
上腕－足首脈波伝播速度（baPWV）と生活習慣関連要因についての研究

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要　　旨

目的：精神科デイケア利用者に対しては、これまで特異的精神症状の改善・維持や生活活動の支援に主眼がおかれてきた。しかしながら、メタボリックシンドロームの有病率が入院患者よりも高く、心血管代謝リスクが報告されているものの、現状においては不健康なライフスタイルに関する調査が少ない。本研究では、日本の青森県内における精神科デイケア利用者を対象に、上腕－足首脈波伝播速度（baPWV）と生活習慣関連因子との関係を検討した。

方法：対象者は、青森県内の各医療機関における精神科デイケア利用者109名（男性62名、女性47名）であった。測定項目は、年齢、性別、身長、体重、BMI、体脂肪率、握力、血圧、脈圧、平均血圧、baPWVであった。アンケート聴取項目は、喫煙量、現病歴、既往歴、お薬手帳の確認、運動習慣の有無であった。

結果：20–39歳群において男性では、baPWV値と生活習慣関連因子との間に有意な相関関係を認めなかった。他方、女性では、baPWV値とBMIならびに体脂肪率との間でそれぞれ有意な正の相関を認めた（$p < 0.001$、$p < 0.001$）。40–49歳群および50歳以上群においては、男女とも、baPWV値と生活習慣関連因子との間に有意な相関関係を認めなかった。

結論：精神科デイケア利用者に対しては、従来の精神症状の改善や生活活動の支援に加えて、身体的不健康に対しても包括的アプローチが重要である。男女別、年代別に各種対策を講じることは、動脈硬化の進展を軽減できる可能性がある。

キーワード：精神科デイケア利用者、動脈硬化の予防的指導、メタボリックシンドローム、上腕－足首脈波伝播速度（baPWV）、生活習慣関連要因