

【Original】

私立大学の中年男性職員における特健階層および腹部肥満区分に基づく健康意識、行動変容ステージ、保健指導の要望に関する調査研究

Survey of Health Awareness, Stage of Change, and Application for Health Guidance Based on Stratification of Specific Health Checkups and Classification of Abdominal Obesity among Middle-Aged Male Employees at a Private University

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キーワード： 特定健診, 腹部肥満, 健康意識, 行動変容ステージ, 保健指導

Key Words : specific health checkups, abdominal obesity, health awareness, stage of change, health counseling

抄録

〔目的〕 職域従事者の健康意識、特定健診（特健）、行動変容ステージ（ステージ）、保健指導希望を特健支援レベルと腹部肥満分類の組み合わせに基づき調査した。〔方法〕 2012年度の特健を受けた40歳以上の男性（275名）を積極的支援、動機付け支援、情報提供のみに階層化した。健康状態、前回の特健結果、ステージ、保健指導希望をアンケートした。生体インピーダンス法で内臓脂肪レベル（内レ）（レベル10は内臓脂肪面積100cm²に相当）を測定した。腹部肥満を4カテゴリー化（非肥満：腹囲<85cmかつ内レ<10、見た目肥満：腹囲≥85cmかつ内レ<10、かくれ肥満：腹囲<85cmかつ内レ≥10、内臓肥満：腹囲≥85cmかつ内レ≥10）した。さらに腹部肥満のカテゴリーに特健の支援レベルを組み合わせ、病的状況、前病的状況、正常に分類した。〔結果〕 調査対象者の36%が病的状況（内臓肥満かつ積極的あるいは動機付け支援）であった。健康状態への意識は腹部肥満や特健結果と関連した。病的状況によって保健指導を受ける受診者割合に差はなかった。〔結論〕 病的状況の者はステージの準備期に生活習慣を改善することが望ましい。将来の健康危機に乏しい多くの人々は保健指導を受けず、生活習慣を改善する意思がない。

Abstract

Objective: The present study assessed employee via awareness of health conditions, specific health checkups, stage of change, and application of specific health guidance. Data were assessed based on a combination of specific health checkup support levels and abdominal obesity within an occupational field. **Methods:** A total

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of 275 male employees who were ≥ 40 years old underwent a specific health checkup in 2012. These participants were stratified into either the positive support level or motivational support level, or were deemed to have a clean bill of health. Questionnaires were administered to collect data about health conditions, previous specific health checkup results, stage of change, and participant willingness to receive health counseling. Visceral fat level (a visceral fat level of 10 is equivalent to 100 cm² of visceral fat) was measured via bioimpedance analysis. Participants were then divided into the following abdominal obesity categories: non-obesity (waist circumference < 85 cm and visceral fat level < 10), apparent obesity (waist circumference ≥ 85 cm and visceral fat level < 10), potential obesity (waist circumference < 85 cm and visceral fat level ≥ 10), and visceral obesity (waist circumference ≥ 85 cm and visceral fat level ≥ 10). Participants were further classified into morbid, pre-morbid, and normal groups, in combination with obesity categories and support levels for specific health checkups. **Results:** Of surveyed participants, 36% were within the morbid group (visceral obesity group with a positive or motivational support level). Awareness of health conditions corresponded with abdominal obesity and specific health checkup results. The level of contemplation and preparation was highest among morbid categories. There were no significant differences in percentages of participants willing to undergo health counseling by morbid categories. **Conclusion:** It is desirable for participants within the morbid group to improve their lifestyles through specific health guidance during the preparation stage of change. Many individuals lack awareness of future health risks, and are therefore unwilling to improve their lifestyles without specific health guidance.

I . Introduction

In 2008, the Japanese Ministry of Health, Labor, and Welfare (MHLW) required that all citizens between the ages of 40 and 75 years undergo specific health checkups (SHCs) and receive specific health guidance (SHG) at either the positive support level (PSL) or motivational support level (MSL). Body mass index (BMI) and waist circumference (WC) were included as essential components of stratification criteria. Though some participants' results were not within normal levels, those with BMI and WC results below a predetermined level did not receive SHG. A previous study by the authors reported on the importance of visceral adiposity evaluation for preventive health (Dote et al., 2014a). In the present study, SHG was only provided to those who applied for it. Yes or no answers pertaining to SHG were collected from questionnaires that were included in the MHLW's "Standard Program of SHCs and SHG". In 2013, the MHLW reported that SHC im-

plementation reached its highest point during 2011 (Ministry of Health, Labor and Welfare, 2013), with 52.53 million employees participating at a rate of 45%. However, the percentage of employees eligible for SHG was only 17.8%, with 15.9% participating. These rates were affected by awareness of health conditions and SHC results. The authors' previous study detailed health conditions and SHC awareness levels within an occupational field population. This study assessed clinical and counseling data for information on weight control and found that individuals ≥ 40 years old tend to demand less explanation of SHC results that are easy to understand and implement. Notably, weight management and effective guidance were highly necessary within the workplace, regardless of gender and age (Dote et al., 2015). This study details participants' results based on awareness of health conditions, SHC results, and willingness to apply for SHG. In addition to the previously mentioned factors, participants'

stages of change (SOC) should be considered for health management education programs that encourage regular exercise and dietary changes (Takahashi et al., 2011). Selection of morbid subjects included consideration of visceral adiposity, in addition to participation at the PSL or MSL. The objective of the present study was to survey the awareness of health via SHCs, SOC, and application of SHG. Data were assessed based on a combination of specific health checkup support levels and abdominal obesity according to WC and visceral fat level (VFL).

II. Participants and Methods

1. Participants

Participants included regular faculty or staff members who were ≥ 40 years old and had jobs that primarily involved sedentary work at a private university in Osaka, Japan. Each participant underwent a SHC, implemented by private mutual aid insurance, in October 2012, except for those who received a comprehensive medical examination. A self-administered questionnaire was provided to

participants, and those who requested total body composition analysis were included in this study. Study participants included 275 men (mean age, 53.3 ± 8.6 years).

2. Questionnaires about Health Conditions and Previous Specific Health Checkup Results

Yes or no answers from the questionnaire are displayed in Table 1. Participants with health conditions were classified as “well” or “not well,” and were further divided into two groups according to individual assessment of previous SHC results (classified as “good” or “not good”).

3. Questionnaires about Stage of Change (SOC) and Participant Willingness to Receive Health Counseling

Information on SOC and willingness to undergo health counseling was obtained using standard questionnaires included in the “Standard Program of SHCs and SHG,” which was initiated by the Ministry of Health, Labor and Welfare (2007) (Table 1).

4. Stage of Change Categorization

Lifestyle modification steps taken by participants were categorized into the following three groups:

Table 1 Questionnaire items relating to health conditions, previous SHC results, stage of change, and willingness to undergo health counseling.

Questionnaire choices relating to health conditions and previous SHC results	Choices → Abbreviations
I feel healthy and there were no problems with my previous SHC results.	“Well” and “Good”
I feel healthy, but there were some problems with my previous SHC results.	“Well” and “Not good”
I feel unhealthy, but there were no problems with my previous SHC results.	“Not well” and “Good”
I feel unhealthy, and there were some problems with my previous SHC results.	“Not well” and “Not good”
Questionnaire items relating to lifestyle modifications and health counseling	Choices → SOC Category
Are you going to start or have you started lifestyle modifications (i.e., increasing physical activity or improving dietary habits)? ① I have no plans to start. ② I will start in the future (i.e., within six months). ③ I will start soon (i.e., in one month). ④ I have already started (<6 months ago). ⑤ I have already started (≥ 6 months ago).	① → I ② or ③ → II ④ or ⑤ → III
Are you willing to receive health counseling about lifestyle modifications if the opportunity arises? ① Yes ② No	① → Request for health counseling

Information regarding requests for health counseling and stage of change was obtained through standard questionnaires included in the “Standard Program of SHCs and SHG,” which was initiated by the Ministry of Health, Labor and Welfare (2007).

“I have no plans to start” (SOC I, pre-contemplation); “I am going to start in the future (i.e., within 6 months)” and “I am going to start soon (i.e., in a month)” (SOC II, contemplation and preparation); and “I have already started (<6 months ago)” and “I have already started (≥6 months ago)” (SOC III, action and maintenance) (Table 1).

5. Body Composition Measurement

Visceral fat levels were measured via bioelectrical impedance analysis (BIA) using a body composition analyzer (MC-190; Tanita Corp., Tokyo, Japan). Recommended BIA measurement conditions were explained to each participant, and the following instructions were provided: 1) fast for four hours and do not drink alcohol for eight hours prior to measurements; 2) empty bladder prior to measurements; and 3) do not exercise for eight hours prior to measurements. Participants were instructed to stand on the footplate and to grasp the handgrip with electrodes. Current was emitted by the electrodes, through participants’ feet and hands, and was detected at the heels and palms. The body composition analyzer applies electricity at frequencies of 5, 50, 250, and 500 kHz throughout the body. Whole body impedance was then measured using a bilateral foot-hand electrical pathway. This analyzer automatically calculates the percentage of body fat using equations that are preprogrammed by the manufacturer. The coefficient of variation for

BIA measurements was 0.4%, as determined by five repeated measurements in seven adult participants. Visceral fat levels from 1 to 59 were translated into area values. For example, a VFL of 10 is equivalent to a visceral fat area (VFA) value of 100 cm². According to Japanese diagnostic criteria, WCs of 85 cm in men and 90 cm in women are equivalent to a VFA value of 100 cm², as determined by computed tomography (CT) measurements.

6. Waist Circumference and Visceral Fat Levels

Participants were divided into the following abdominal obesity categories: non-obesity (WC <85 cm and VFL <10), apparent obesity (WC ≥85 cm and VFL <10), potential obesity (WC <85 cm and VFL ≥10), and visceral obesity (WC ≥85 cm and VFL ≥10) (Table 2).

7. Specific Health Checkup Support Levels

Participants were stratified into either the PSL or MSL, or were deemed to have a clean bill of health (CB) (Ministry of Health, Labor and Welfare, 2007). Table 2 shows the distribution of support levels and abdominal obesity categories.

8. Obesity Categories and Support Level Groups

Participants were divided into the following categories: normal (non-obesity and CB), pre-morbid (potential obesity and CB, potential obesity and MSL, or visceral obesity and CB), and morbid (visceral obesity and PSL, or visceral obesity and MSL) (Table 3).

Table 2 Distribution of obesity categories according to waist circumference (WC), visceral fat level (VFL), obesity categories, and support levels for specific health checkups among male participants ≥40 years old (n=275).

Obesity Category	Standard of Two Dimensions	Percentage (N)	Support levels			
			Obesity Category	PSL	MSL	CB
Non-obese	WC <85 cm and VFL <10	30.9% (85)	Non-obese	none	none	30.9% (85)
Apparent obesity	WC ≥85 cm and VFL <10	0% (0)	Apparent obesity	none	none	none
Potential obesity	WC <85 cm and VFL ≥10	24.4% (67)	Potential obesity	none	1.5% (4)	22.9% (63)
Visceral obesity	WC ≥85 cm and VFL ≥10	44.7% (123)	Visceral obesity	27.3% (75)	8.7% (24)	8.7% (24)
			Total	27.3% (75)	10.2% (28)	62.5% (172)

Positive support level (PSL), motivational support level (MSL), clean bill of health (CB). A VFL of 10 is equivalent to a visceral fat area value of 100 cm².

Table 3 Distribution of morbid categories according to obesity categories and support levels among male participants ≥ 40 years old (n=275).

Obesity Category	Support Level	Morbid Category (N)	Mean Age (SD)
Non-obese	CB	Normal (85)	48.8 (7.2)
Potential obesity	CB	Pre-morbid (91)	56.6 (8.3)
Visceral obesity	MSL		
Visceral obesity	PSL	Morbid (99)	54.2 (8.5)
	MSL		

Age: $p < 0.01$ normal versus pre-morbid and normal versus morbid using the Tukey-Kramer method.

Table 4 Distribution of morbid categories according to health conditions and previous specific health checkup (SHC) results among morbid categories for male participants ≥ 40 years old.

Health Condition SHC Awareness (N)	Well		Not Well		Other
	Good	Not Good	Good	Not Good	
Normal (85)	81.2% (69/85)	11.8% (10/85)	3.5% (3/85)	2.4% (2/85)	1.1% (1/85)
Pre-morbid (91)	72.5% (66/91)	18.7% (17/91)	4.4% (4/91)	3.3% (3/91)	1.1% (1/91)
Morbid (99)	56.6% (56/99)	31.3% (31/99)	4.0% (4/99)	6.1% (6/99)	2.0% (2/99)

Yes or no questions were as follows:

How would you describe your current health condition (“Well” or “Not well”)?

Describe your previous SHC results (“Good” or “Not good”). Other: Non-responder

$p < 0.10$ among morbid categories (Pearson's χ^2 test).

9. Statistical Analysis

Pearson's χ^2 test was used for categorical variables among morbid categories. The Tukey-Kramer method was used to analyze variance in age. Statistical analysis was performed using SPSS® 12.0 software (SPSS Inc., Chicago, IL), with the level of statistical significance set at $p < 0.1$.

10. Ethical Considerations

This study was approved by the Ethics Committee of the Osaka Medical College (No. 679). Written and oral explanations were provided, and informed consent was obtained from each participant. Anonymity was ensured for protection of personal information.

III. Results

The combined percentage of potential obesity and visceral obesity groups was 69.1% (Table 2). The percentages of participants categorized into PSL, MSL, and CB strata were 27.3%, 10.2% and 62.5%, respectively (Table 2). The total percentage of participants with visceral obesity at the PSL or MSL was 36% (Table 2, 3). The percentage of participants in the non-obesity group with a CB was 30.9% (Table 3). Other combinations (including pre-morbid, as shown in Table 3) made up 33.1% of participants. There were significant differences in mean age between normal versus pre-morbid, as well as normal versus morbid participants (Table 3). Within normal, pre-morbid, and morbid groups, the percentages of participants deemed “well and good” were 81.2%, 72.5%, and 56.6%, respectively, and those deemed “well and not good” were 11.8%,

18.7%, and 31.3%, respectively (Table 4). There were significant differences among morbid categories. The lowest percentage of participants belonged to the morbid group in SOC I, whereas the highest percentage belonged to the morbid group in SOC II (Figure 1). There were no significant differences in those willing to undergo health counseling by morbid categories (Figure 2).

IV. Discussion

The authors' previous study reported that the percentage of PSL of male employees aged ≥ 40 years who received obligatory SHCs under the Industrial Safety and Health Law was 41% in 2011 (Dote et al., 2014b). The percentage of participants who were at the PSL in the current study (27.3%) was lower than the percentage in 2011 (Table 2). A possible reason for this variation is that this study consisted of voluntary male participants, who may be assumed to have a great deal of curiosity about health promotion and to be relatively healthy in comparison to the general population.

Of 314 male participants in the authors' previous study, 22.9% were classified as having potential

obesity (Dote et al., 2013). The percentage of potential obesity among healthy Japanese men has been reported to be between 20.2% (Sato et al., 2008) and 25.7% (Ohmachi et al., 2010). The value of 24.4% determined in this study was similar to these previous figures (Table 2). This study found 22.9% of participants to have a CB, and 44.7% had visceral obesity (Table 2). BMI and WC were included as essential components of SHC criteria. Visceral fat volume was left out of consideration for SHG in as far as BMI and WC below criteria. Therefore, it was suggested that they were out of SHG, even though they became potential of visceral obesity in this study. The percentage of visceral fat area exhibited an age-dependent increase, rising by 42.9% between ages 40 and 79 in Japanese men (Yamada et al., 2014).

Total percentages of participants with potential obesity and visceral obesity were 24.4% and 44.7%, respectively (Table 2). We found that, in our study population with a mean age of 53 years, the percentage of those with increased visceral fat reached 69.1%. Mean age in normal versus pre-morbid and morbid groups also differed significantly (Table

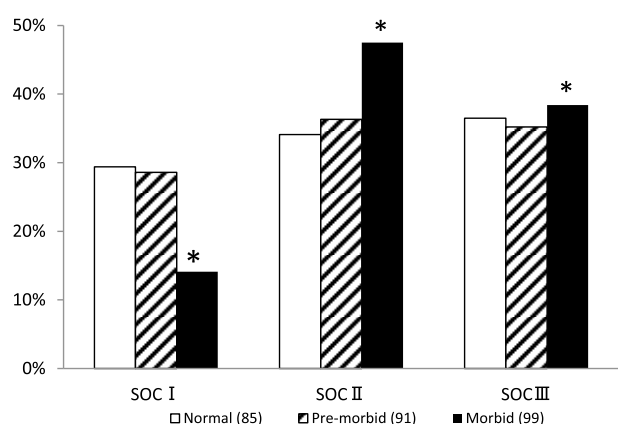


Figure 1 Distribution according to stage of change (SOC) categories among morbid categories in participants ≥ 40 years old. SOC I, pre-contemplation; SOC II, contemplation and preparation; SOC III, action and maintenance. (N) * $p < 0.10$ among morbid categories (Pearson's χ^2 test).

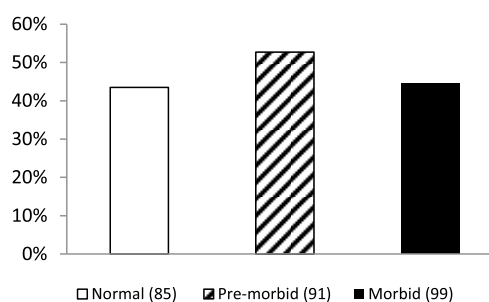


Figure 2 Distribution of those willing to undergo health counseling by morbid categories among male participants ≥ 40 years old. (N) ns by Pearson's χ^2 test

3). Therefore, it is important for middle-aged and elderly men to pay attention to visceral fat, rather than just WC and BMI.

The authors' previous study detailed information collected from male participants who were aged ≥ 40 years, according to health conditions and subjective assessment of previous SHC results (Dote et al., 2015). The percentage of participants considered "well" and "good" was 69.6%. According to the NHK Broadcasting Culture Research Institute, 70% of Japanese individuals between the ages of 40 and 70 years were aware of their healthy physical status in 2009 (Yamada and Sasaki, 2009). The results of the authors' previous study are consistent with those of the NHK study regarding Japanese middle-aged to elderly men. The NHK study also reported that only 64% of Japanese individuals maintained both physical and mental health (Yamada and Sakai, 2009). In this study, 81.2% of participants in the normal group were "well" and "good," whereas only 56.6% of participants belonged to this group among morbid participants (Table 4). Given the significantly lower percentage of participants in the morbid group relative to the normal group, psychological factors likely also affected health awareness. It is supposed that awareness of health conditions corresponds to visceral obesity and SHC results.

The authors' previous report compared the distribution of obesity group participants by SOC group. Nearly a quarter of SOC I participants, and half of participants in both SOC II and SOC III, were in the visceral obesity group (Dote et al., 2014a). The current study found the percentage of SOC II to be highest, and the percentage of SOC III to be second highest, among morbid categories (Table 5). Because interventions should be tailored to an individual's SOC, explicit identification of SOC by occupational health nurses (OHNs) could further enhance the adaptation of interventions to individual patients. OHNs could then tailor their motivational

interview skills to patients in the preparation stage more specifically than the other SOC levels (Noordman et al., 2013). This study found that participants in SOC II should be referred to health counseling, especially those found to be in preparation stages during this study.

The authors' previous study found the percentage of male health counseling applicants ≥ 40 years old to be 46.7%, which was lower than the percentage of male applicants < 40 years old (Dote et al., 2015). It has been suggested that barriers to health counseling and lifestyle improvement include job pressure and/or fatigue (Fukumoto et al., 2011; Blackford et al., 2013). However, the percentage of participants in the morbid group was similar that in the normal group among men ≥ 40 years old in this study (Table 6). Therefore, male participants in the morbid group might have little incentive to improve their lifestyles, regardless of unhealthy conditions. This would lead to a strong possibility of decreased future health risk awareness, because these participants did not currently have apparent diseases, regardless of their awareness of unhealthy conditions.

These participants would likely improve their health through individual efforts, without SHG. It is necessary for healthy, overweight patients to clearly identify their motivations. Accordingly, it is important to develop a more attractive guidance program for SHC recipients in order to increase the SHG rate. Patients should be followed-up, monitored, and guided through the lifestyle improvement process through individually-tailored interventions by OHNs (Phillips et al., 2014).

This study has two notable limitations. First, BIA works best for assessing the amount of change in fat mass. It is a useful method for measuring skeletal muscle, but is limited in its ability to measure visceral fat. Compared to MRI, BIA tends to overestimate visceral fat, especially in males (Pietiläinen et al., 2013). Second, it is difficult to make nationwide

generalizations from this study because the study population primarily included those with sedentary job responsibilities.

V. Conclusion

Of total participants, 36% were found to be within the morbid group (visceral obesity with PSL or MSL). Awareness of health conditions corresponded to abdominal obesity and SHC results. The highest percentage of participants belonged to the morbid group in SOC II. There were no significant differences in percentages of those willing to undergo health counseling by morbid categories. It is desirable for morbid group participants to improve their lifestyles through participation in SHG during the preparation stage. There is a possibility that these participants may lack future health risk awareness, and that they would be willing to improve their lifestyles through individual efforts without SHG.

Conflicts of Interest

The authors declare no conflicts of interest.

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