Introduction

The management of body weight and lifestyle habits is important for the maintenance of health in working people. Accurate self-perception of weight status is thought to be an important aspect of maintaining ideal body weight and successful obesity or leanness-related disease prevention and management. Overweight and underweight are dominant risk factors for noninfectious chronic diseases, also called noncommunicable diseases (NCDs). NCDs have recently become important targets for health interventions worldwide. According to the Global Status Report on Noncommunicable Diseases 2014, NCDs account for 68% of deaths worldwide. Many studies have found that most NCDs are associated with unhealthy lifestyle habits, such as unhealthy diet, physical inactivity, smoking, and excessive alcohol consumption. In Japan, the incidence of NCDs is increasing because more people are becoming overweight or underweight, resulting in a major public health problem. Middle-aged and elderly populations are often overweight and young women are likely to be underweight. A 2013 study found that >30% of men aged 40–69 years old were overweight, and 21.5% of women aged 20–29 years old were underweight. During the second term of the National Health Promotion Movement in the 21st Century (Health Japan 21 [second term]), goals will be established for maintaining ideal body weight, eating a healthy diet, exercising routinely, and increasing physical activity.

Body weight is an easy measurement for people to monitor themselves. The ability to recognize and maintain an ideal body weight is important for preventing many NCDs. Previous studies on ideal body weight and body image have focused on children or adolescent females, but few of these studies have addressed male workers. Few studies have focused on BMI and on weight self-perception in the working population, and our review of the literature found none that examined the relationship between weight perception and lifestyle habits. We investigated weight self-perceptions and health-related behaviors of male Japanese bus drivers and described the impact of weight perception and lifestyle on their physical condition and health problems.

Subjects and Methods

Study design and subjects

The study population consisted of male bus drivers aged 20–65 years old from Ishikawa Prefecture, Japan working at one transportation company. The response rate was 91.2% (537/589 male employees). Five bus drivers with missing information on weight perception were excluded from the analysis, resulting in a final sample of 532 participants. The study was approved by the Institutional Review Board of Osaka City University.

Methods

A self-administered questionnaire was used to assess weight self-perceptions and 10 lifestyle characteristics during health examinations in the summer of 2014. The participants were grouped into three categories based on their self-perception of weight (overweight, normal weight, and underweight). Participants’ self-perception of weight was compared with actual BMI to assess overestimation, accurate estimation, and underestimation of body weight. We also examined the association between laboratory test results, 10 health-related behaviors, and perceived weight status within the three BMI categories.

Results

The percentages of the total participants who perceived themselves as overweight, normal weight, and underweight were 64.3%, 23.1%, and 12.6%, respectively. In total, 56.0% of total participants accurately perceived their body weight. In addition, the weight perception of many participants appeared to have been affected by actual body weight and laboratory test results. Only three health-related behaviors showed a significant difference among BMI classifications; however, other health-related behaviors, such as dietary habits, alcohol consumption, and smoking behaviors, were worse than national survey data for all groups.

Conclusions

The results suggest the possibility that male bus drivers’ weight self-perception is associated with laboratory test results and that having a good self-perception of weight leads to better lifestyle habits.
BMI were excluded and the study included 532 participants. Data were collected as part of the annual health examinations of the drivers from July to August 2014. Self-administered questionnaires were mailed to the transportation company and distributed to the participants before their annual health examination. This study was approved by the ethics committee of the Osaka City University Graduate School of Human Life Science (approval number 10-104, 2014). Written informed consent was obtained from each participant after study aims, topics, and information on data confidentiality were explained.

Data collection and analysis

The annual health examination included medical history, physical examination, anthropometric measurements, and measurements of diastolic and systolic blood pressure, serum lipid levels (triglyceride [TG], low-density lipoprotein cholesterol [LDL-CHOL], high-density lipoprotein cholesterol [HDL-CHOL]) and hemoglobin A1c (HbA1c). BMI was calculated as weight divided by height squared (kg/m²) and was categorized using the WHO recommendations: <18.5 (underweight, n = 16), 18.5–24.9 (normal weight, n = 345), and ≥25.0 kg/m² (overweight, n = 171). The Specific Health Checkup was administered to participants ≥40 years old (n = 414). This program, initiated by the Japanese government in 2008, included measurement of waist circumference and classification of participants based on the definition and diagnostic criteria for metabolic syndrome in Japanese people.

Participants’ ideal body weight (kg) was assessed in one question on the survey. Participants’ ideal BMI was calculated as ideal body weight divided by actual height squared (kg/m²). The difference between participants’ ideal BMI and actual BMI was calculated for each participant. In the questionnaire, there were five choices (very fat, rather fat, average, rather thin, and very thin) for participants to indicate their weight self-perception. The responses were categorized as perceived overweight (“very fat” and “rather fat”), normal weight (“average”), and underweight (“very thin” and “rather thin”). Participants’ self-perceptions of weight were compared with actual BMI to assess overestimation, accurate estimation, and underestimation of body weight.

Diastolic and systolic blood pressure and laboratory values associated with lifestyle-related diseases (serum TG, LDL-CHOL, HDL-CHOL, and HbA1c levels) were age-adjusted and compared with the mean values for the three actual BMI categories and for perceived weight status only within normal weight groups. Participants who were being treated for any disease were excluded from this part of the analysis, as shown in Table 1 (142 participants).

A self-administered questionnaire was used to identify 10 health-related behaviors, including dietary habits (4 items), routine exercise (2 items), smoking status (1 item), desire to have a healthier lifestyle (1 item) and desire to obtain specific health guidance (1 item). These characteristics were used to assess healthy lifestyle, which is strongly associated with a decreased risk of NCDs.

Statistical analysis

The mean ± standard deviation (SD) of continuous variables and the prevalence (%) of categorical variables were calculated. All statistical tests were two-sided, and p values of < 0.05 were considered to be statistically significant. We used chi-square tests to compare percentages, Mann–Whitney U-tests to compare continuous variables between two groups, and Jonckheere–Terpstra trend tests to test for the independence of three or more groups. We calculated the adjusted least squares mean by analysis of covariance. All statistical analyses were performed using the software Statistical Package for Social Sciences, version 22 (SPSS Inc., Chicago, IL, USA).

Results

Demographics and health status of the study participants

The demographic characteristics and health status of the participants are shown in Table 1. The percentages of the total participants who perceived themselves to be in the overweight, normal weight, and underweight groups were 64.3%, 23.1%, and 12.6%, respectively. The mean age and body height were not significantly different among the groups. The mean body weight and mean BMI were higher in the perceived overweight group, and these values significantly decreased sequentially in the perceived overweight, normal weight, and underweight groups.

The mean participants’ ideal BMI and the difference between participants’ ideal BMI and actual BMI were greater in the perceived overweight group and lower in the perceived underweight group. Ideal BMI and actual BMI were closest among participants who had an actual BMI of 20–21 (data not shown). Figure 1 shows the concordance of perceived weight for each unit of actual BMI. Overestimation occurred among participants whose actual BMI was <25.0. In addition, for BMIs 18.5–24.9, the proportion of participants who overestimated their weight increased with increasing actual BMI. Underestimation occurred among participants whose actual BMI was 18.5–22.9. Most of the participants whose actual BMI was <18.5 perceived themselves to be thin and most of those whose actual BMI was ≥25.0 perceived themselves to be fat, demonstrating concordance between actual body type and self-evaluation.

Some participants were being treated for lifestyle-related diseases, including 16.7% who were taking anti-hypertensive drugs, 7.5% who were taking anti-cholesterol drugs, and 7.1% who were using insulin injections. Participants self-perceived as overweight were more likely to be taking anti-hypertensive and anti-cholesterol drugs or insulin injections. Cerebrovascular accidents, heart disease, renal failure, and anemia were each experienced by ≤1% of the sample.

Abdominal circumference and metabolic syndrome were only measured for participants who were ≥40 years old. The mean age of participants ≥40 years old were significantly different between the perceptive overweight and underweight groups. Abdominal circumference sequentially decreased from the perceived overweight group to the underweight group. In all, 65.3% of the perceived overweight group and 12.5% of the perceived normal weight group had metabolic or pre-metabolic syndrome. Few participants in the perceived underweight group met the definition or diagnostic criteria for metabolic syndrome in Japanese people.
Concordance between perceived weight and actual BMI

Table 2 shows participants’ self-perception of weight status: 56.0% of all participants accurately perceived their body weight. The percentage of accurate self-perception was 97.1% in the overweight, 33.9% in the normal weight, and 93.7% in the underweight groups. In normal weight participants, overestimation (51.0%) was much more prevalent than underestimation (15.1%).

Weight perception and laboratory test results

Table 3 shows the comparison of systolic and diastolic blood
pressure and age-adjusted mean laboratory test results (serum TG, LDL-CHOL, HDL-CHOL, and HbA1c levels) in the three BMI categories, and self-perceived weight status in only the normal weight group. These data exclude participants being treated for any of the diseases shown in Table 1. In the normal weight group, serum TG and LDL-CHOL levels, which are affected by meal content, were higher in the overestimation group than the levels in both the accurate estimation and underestimation groups. Similar trends were also observed in blood pressure. However, serum HDL-CHOL levels were lower in the overestimation group. Except for HbA1c, the results of the medical assessments were significantly different (based on the Jonckheere-Terpstra test) across the self-perception of weight status in this study was overweight at 64.3%, and the concordance between self-evaluation and actual weight status was about half. Overestimation of weight status increased with higher actual body weight and BMI and the presence of any treatment and metabolic syndrome. Slightly more of the sample had a BMI of ≥25 (32.1%) than the 28.6% reported by the 2013 National Health and Nutrition Survey in Japan. A significant difference in mean age between perceptive overweight and underweight groups ≥40 years old were considered that the proportion of 60s at the perceptive underweight (23.4%) was higher than that of other groups (the perceptive overweight 15.1%, normal weight 19.8%). The proportion of participants ≥40 years old who had metabolic syndrome was greater than the national average in Japan in 2014 (30.7% and 21.0%, respectively). The participants worked irregular shifts unique to bus companies, and over one third were at high risk for lifestyle-related diseases. Incidentally, the bus company employing the participants in this study has provided health-related behaviors and healthy lifestyle

Health-related behaviors of the participants in the three actual BMI categories and, for the normal weight group, in perceived weight status are shown in Table 4. Significant differences among the three BMI categories were observed for “speed of eating,” “exercise frequency” and “lifestyle improvement awareness.” The largest proportion of participants (26.1%) with good exercise habits was found in the normal weight group. The largest proportion of participants who wanted a healthier lifestyle was in the overweight group and that proportion decreased with decreasing BMI. The proportion of fast eaters was higher in the overweight group, and the proportion of slow or normal-speed eaters was higher in both the normal weight and underweight groups. Overall, 40.2% of participants skipped breakfast, and 19.5% consciously ate a low-salt diet, suggesting that participants have some problematic eating behaviors. Furthermore, 80.1% were smokers, 63.0% were daily alcohol drinkers, and 29.9% had adequate sleep. These data indicate that the participants had many negative health characteristics.

Discussion

Health challenges and weight perception of male workers

This study investigated the association between weight perception and lifestyle in Japanese bus drivers. The most of participant self-perception of weight status in this study was overweight at 64.3%, and the concordance between self-evaluation and actual weight status was about half. Overestimation of weight status increased with higher actual body weight and BMI and the presence of any treatment and metabolic syndrome. Slightly more of the sample had a BMI of ≥25 (32.1%) than the 28.6% reported by the 2013 National Health and Nutrition Survey in Japan. A significant difference in mean age between perceptive overweight and underweight groups ≥40 years old were considered that the proportion of 60s at the perceptive underweight (23.4%) was higher than that of other groups (the perceptive overweight 15.1%, normal weight 19.8%). The proportion of participants ≥40 years old who had metabolic syndrome was greater than the national average in Japan in 2014 (30.7% and 21.0%, respectively). The participants worked irregular shifts unique to bus drivers. Shift work has a high risk of lifestyle-related diseases, and bus drivers have a higher incidence of ischemic heart disease risk factors related to their occupation. Although the present study was a cross-sectional study, the bus drivers were considered to be at high risk for lifestyle-related diseases. Incidentally, the bus company employing the participants in this study has provided health guidance to those drivers whose various laboratory test values indicated specific health problems. As the number of underweight participants in this study was small (n = 16), we were unable to study the association of underweight with lifestyle-related diseases in this group.

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<table>
<thead>
<tr>
<th>Health-related behaviors of participants in three BMI categories and perceived weight status</th>
<th>Whole</th>
<th>Overweight (BMI ≥ 25.0)</th>
<th>Normal weight (18.5 ≤ BMI &lt; 25.0)</th>
<th>Underweight (BMI &lt; 18.5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Total (100%)</td>
<td>Total (100%)</td>
<td>perceived weight status</td>
</tr>
<tr>
<td><strong>p</strong></td>
<td></td>
<td>overestimation</td>
<td>accurate</td>
<td>underestimation</td>
</tr>
<tr>
<td><strong>n</strong></td>
<td></td>
<td>(51.0%)</td>
<td>(33.9%)</td>
<td>(15.1%)</td>
</tr>
<tr>
<td>Breakfast</td>
<td>skipping every morning</td>
<td>214 (40.2)</td>
<td>76 (44.4)</td>
<td>132 (38.3)</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>428 (80.5)</td>
<td>142 (83.0)</td>
<td>273 (79.1)</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>104 (19.5)</td>
<td>29 (17.0)</td>
<td>72 (20.9)</td>
</tr>
<tr>
<td>Speed of eating</td>
<td>fast</td>
<td>238 (44.7)</td>
<td>88 (51.5)</td>
<td>147 (42.6)</td>
</tr>
<tr>
<td>Alcohol consumption</td>
<td>daily drinker</td>
<td>335 (63.0)</td>
<td>100 (58.5)</td>
<td>222 (64.3)</td>
</tr>
<tr>
<td></td>
<td>non-daily drinker</td>
<td>197 (37.0)</td>
<td>71 (41.5)</td>
<td>123 (35.7)</td>
</tr>
<tr>
<td>Exercise frequency (2 times or more per week)</td>
<td>no</td>
<td>411 (77.3)</td>
<td>142 (83.0)</td>
<td>255 (73.9)</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>121 (22.7)</td>
<td>29 (17.0)</td>
<td>90 (26.1)</td>
</tr>
<tr>
<td>Dairy physical activity</td>
<td>no</td>
<td>454 (85.3)</td>
<td>146 (85.4)</td>
<td>293 (84.9)</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>78 (14.7)</td>
<td>235 (14.6)</td>
<td>52 (15.1)</td>
</tr>
<tr>
<td>Smoking behavior</td>
<td>smoker, former smoker</td>
<td>426 (80.1)</td>
<td>137 (80.1)</td>
<td>274 (79.4)</td>
</tr>
<tr>
<td></td>
<td>non-smoker</td>
<td>106 (19.9)</td>
<td>34 (19.9)</td>
<td>71 (20.6)</td>
</tr>
<tr>
<td>Adequate sleep</td>
<td>no</td>
<td>373 (70.1)</td>
<td>122 (71.3)</td>
<td>240 (69.6)</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>159 (29.9)</td>
<td>49 (28.7)</td>
<td>105 (30.4)</td>
</tr>
<tr>
<td>Lifestyle improvement awareness</td>
<td>no</td>
<td>378 (71.1)</td>
<td>133 (77.8)</td>
<td>236 (68.4)</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>154 (28.9)</td>
<td>38 (22.2)</td>
<td>109 (31.6)</td>
</tr>
<tr>
<td>Willing to receive the health guidance</td>
<td>no</td>
<td>424 (79.7)</td>
<td>133 (77.8)</td>
<td>277 (80.3)</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>108 (20.3)</td>
<td>38 (22.2)</td>
<td>68 (19.7)</td>
</tr>
</tbody>
</table>

Numerical value show number of people (percentage).

*chi-square test, among three BMI categories, or among three perceived weight status in normal weight group.

BMI: Body Mass Index (kg/m²)

n.s.: not significant
The average of our participants’ ideal BMI was about 22, generally considered the ideal or target BMI in Japan\textsuperscript{23}. However, the mean of participants’ ideal BMI gradually decreased in self-perception order of overweight (22.6±1.8), normal weight (21.3±1.3) and underweight (20.6±1.2). We suggest that the ideal BMI of these participants was influenced by their self-perception of weight status.

Furthermore, from the results shown in Table 2, 97.1% of overweight (BMI ≥25) subjects recognized that they were overweight. The self-evaluation of many overweight subjects was appropriate, because they had already received health guidance. There were also 2.9% overweight participants who underestimated their BMI. This suggests that 2.9% participants who underestimated their BMI were not able to recognize their overweight condition themselves and needed advice on their appropriate perceived weight. Accordingly, we suggest that there is a need to educate obese and overweight people on weight loss and proper weight control to prevent NCDs.

Approximately half of the participants with actual BMI of 18.5–24.9 overestimated their BMI, and this proportion increased with increasing actual BMI. As previously mentioned, the proportion of our participants in late/middle age is high, and thus the effect of adolescents wanting to be slim is less of a factor. Normal-weight participants have fewer opportunities to receive health guidance and in many cases only receive the results of medical assessment and healthier lifestyles. We suggest that the effect of adolescents wanting to be slim is less of a factor. Normal-weight participants have fewer opportunities to receive health guidance and in many cases only receive the results of medical assessment and healthier lifestyles. We suggest that the effect of adolescents wanting to be slim is less of a factor.

Although weight self-perception is associated with the accumulation of body fat\textsuperscript{24}, body fat data were not obtained in this study. From the results shown in Table 3, the mean of participants’ laboratory test values gradually increased or decreased in perceived weight status order of overestimation, accurate estimation and underestimation in the normal weight group. Although the connection between medical test results and actual body weight is considered a matter of course, these results suggest that perceived weight status is similarly associated with the laboratory test values.

Challenges for a healthy lifestyle and weight perception of male workers

The normal-weight group had the highest proportion (slightly <30%) of participants with good exercise habits. Our results suggest that a low percentage of subjects having good exercise habits may increase obesity and NCD risk. In addition, bus drivers have the fundamental problem of a constantly low level of physical exertion because they spend much time sitting in the driver’s seat while at work. There is a need to consider measures to increase the physical activity of bus drivers.

Participants in the overweight group were more interested than other groups in improving their lifestyle, presumably because they have actual health problems and wanted to improve their health. Overall, many participants in this study had unhealthy eating habits. This result is similar to that of previous studies on the eating speed of obesity participants\textsuperscript{25}. In Breslow’s seven healthy practices\textsuperscript{19}, people who followed a healthy lifestyle increased their life span. Misawa \textit{et al.} reported a number of problematic dietary habits for bus drivers with irregular shift work\textsuperscript{26}. We suggest that there is a need to encourage male bus drivers to have healthier lifestyles.

This study did not include a detailed interview on stress; however, the high proportions of smokers and daily drinkers compared to national survey data\textsuperscript{6} imply that many participants were under chronic stress. The characteristic lifestyle of a bus driver in this study appeared to be closely associated with high rates of overweight and metabolic syndrome.

Limitations of the study

One limitation of this study was that the participants were male bus drivers from one office in Japan. Our data may not be applicable to workers in other occupations. This study was a cross-sectional study and the effect of weight perception and lifestyle on long-term health was not examined. A long-term follow-up study should be conducted.

Conclusion

We investigated weight self-perception and lifestyles of male Japanese bus drivers and the impact of weight self-perception and lifestyle on physical condition and health problems. Few participants had as much desire to be extremely slim as a younger sample, but some overweight participants underestimated their BMI. In addition, the weight self-perception of many participants appeared to have been affected by actual body weight and laboratory values. Only three health-related behaviors showed a significant difference among BMI classifications or in a comparison of the concordance of weight perception and actual BMI; however, other health-related behaviors, such as dietary habits, alcohol consumption, and smoking behavior, were worse than national survey data. These results suggest that the lifestyle of a bus driver has many very real problems. Since the health of bus drivers is also important for the safety of public transport, there is a need to implement appropriate guidance. Furthermore, having an appropriate self-perception of weight is associated with better results of medical assessment and healthier lifestyles. We suggest that it is important for working people to have both accurate weight self-perceptions and healthy behaviors.

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The authors state that they have no Conflict of Interest (COI).

REFERENCES


