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Influence of post-disaster evacuation on childhood obesity and hyperlipidemia

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Abstract

Background: The objectives of this study were to determine the longer-term trends in childhood obesity and hyperlipidemia among residents of Fukushima Prefecture 5 years after the Great East Japan Earthquake.

Methods: We evaluated the changes in height, weight, body mass index (BMI), BMI SD score, low-density lipoprotein-cholesterol (LDL-CHO), high-density lipoprotein-cholesterol (HDL-CHO), and triglyceride (TG) in residents aged 7 to 15 years who had lived in the evacuation zone between 2011 and 2015.

Results: 1) The mean BMI SD score in all residents in 2011 was 0.113, and the mean BMI SD score in all residents gradually decreased from 2011 to 2015. 2) Serum LDL-CHO levels and TG levels in all residents with a BMI value ≧+2SD in 2011 were higher than those in residents with a BMI value < +2SD. 3) The frequency of residents with an LDL-CHO level ≧140 mg/dl in 2012, 2013, 2014 did not decrease in comparison with that in 2011, whereas the frequency of residents with an LDL-CHO level ≧140 mg/dl in 2015 was lower than that in 2011. The frequency of residents with a TG level ≧120 mg/dl increased over the 5 years.

Conclusions: These results suggest that a number of pediatric residents suffered from obesity and hyperlipidemia. Furthermore, the long-term observation indicated an improvement in obesity, although the improvement in lipid abnormalities was delayed compared with that in

obesity. Thus, it is necessary to continue with health checks for these residents with obesity and/or hyperlipidemia.

The Pacific coast of the northern area of Japan was struck by the most destructive earthquake ever recorded in Japan at 14:46 (Japan Standard Time) on March 11, 2011. The epicenter was in the Pacific Ocean approximately 130 kilometers east of the Tohoku coastline, and the hypocenter was at a depth of approximately 32 kilometers below sea level. This earthquake had a magnitude of 9.0 on the Richter scale. It was the most powerful earthquake ever known to have hit Japan, and one of the 5 most powerful earthquakes in the world since modern record-keeping began in 1900 [1-4]. The earthquake and subsequent tsunami caused a serious accident at the Fukushima Daiichi Nuclear Power Plant, forcing more than 160,000 residents of Fukushima Prefecture to be evacuated. To monitor the long-term health of residents, the Fukushima Health Management Survey (FHMS) was started immediately after the disaster. The early results of the FHMS have already shown increases in body weight and higher incidences of diabetes, dyslipidemia, atrial fibrillation, hypertension, renal dysfunction and metabolic syndrome among adult residents [5-9], and some residents aged 15 years or under developed obesity and hyperlipidemia in 2011. [10]

Although more than 6 years have passed since the disaster, over 90,000 residents of Fukushima Prefecture have not yet returned to their homes. Previous assessments of childhood obesity and hyperlipidemia using FHMS data showed that the mean body weight had decreased in both males and females in 2012 in comparison to 2011; however, there were no differences in the frequency of male or female residents with high low-density lipoprotein-cholesterol (LDL-CHO) or high triglyceride (TG) values between 2011 and 2012. These results reflected only the relatively short-term effects; however, the longer-term effects of the disaster on health and lifestyle factors associated with obesity and hyperlipidemia remain unclear. Therefore, the objectives of this study were to determine the longer-term trends in obesity and hyperlipidemia among residents of Fukushima Prefecture 5 years after the disaster.

Methods

The study was carried out under the auspices of the Committee for Human Experiments at the Fukushima Medical University School (the Institutional Review Board Approval No 1319). Informed consent was obtained from all residents aged 15 years or under (or their parents) who received health checks.

The Fukushima prefectural government decided to conduct what it called the FHMS to assist in the long-term health management of residents, to evaluate the health impacts of the accident, to promote the future well-being of residents, and to determine whether long-term low-dose radiation exposure has any effect of their health [6-8]. The framework of the FHMS is shown in Figure 1. Comprehensive health checks (CHCs) are part of the overall FHMSs and we sought to review the data regarding evacuee health, assess the incidence of various diseases, and improve their overall health status.

Target group

The target group consisted of residents aged 7 to 15 years who had lived in Hirono-machi, Naraha-machi, Tomioka-machi, Kawamata-machi Kawauchi-mura, Okuma-machi, Futaba-machi, Namie-machi, Kazurao-mura, Iitate-mura, Minami-soma City, Tamura City or the part of Date city specifically recommended for evacuation.

The residents aged 7 to 15 years have received health checks at 656 pediatric medical institutions in and outside the prefecture since January 2011.

Evaluation items

In addition to assessing the effects of radiation, additional variables were specified according to age in order to assess health, prevent lifestyle-related diseases, and identify or treat diseases at an early stage. The survey items for children aged 7 to 15 years consisted of height, weight, blood pressure, red blood cell (RBC) count, hematocrit (Hct), hemoglobin (Hb), platelet count, and white blood cell (WBC) count. Upon request, aspirate aminotransferase (AST), alanine aminotransferase (ALT), γ-glutamyl transpeptidase (γ-GTP), TG, HDL-CHO, LDL-CHO, hemoglobin A1c (HbA1c), fasting plasma glucose concentration, serum creatinine (Cr), and uric acid (UA) were also assessed. Among of them, we evaluated the changes in height, weight, body mass index (BMI), BMI SD score, LDL-CHO, high-density lipoprotein-cholesterol (HDL-CHO), and triglyceride (TG) from 2011 to 2015.

Definitions

The following laboratory data were obtained from all participants: height, weight, HDL-CHO, LDL-CHO, and TG. Hyperlipidemia was defined as LDL-CHO $\geq$ 140 mg/dL, TG $\geq$ 120 mg/dL, and/or HDL-CHO $<$ 40 mg/dL.

Assessment of BMI

BMI was calculated as weight in kilograms divided by height in meters squared. Due to the fact that BMI in childhood changes substantially with age, the comparison of BMI among children of different age groups is difficult. For that reason, it was necessary to standardize the data. Cole constructed centile curves for BMI using the lambda-musigma method, which was adopted by Inokuchi *et al.* for the Japanese population. [11,12] Therefore, we are now able to express BMI as SDS. We converted the BMI of all children to BMI SDS using calculation software. [13,14]

Statistical analysis

Means or prevalence for baseline variables of interest were compared between the residents with a greater than BMI +2SD score and those with a less than BMI +2SD score, using Student's t-test or chi-squared tests. Based on 2011, changes in LDL-C, HDL-C, and TG each year from 2012 to 2015 were compared using a Student's paired t-test, McNemar's test or binomial link model.

SAS version 9.3 (SAS Institute, Cary. North Carolina. USA) was used for all analyses. All probability values for statistical tests were two-tailed and p values of <0.05 were regarded as statistically significant.

Results

1) Baseline characteristics for residents aged 7 to 15 years from 2011 to 2015 (Table 1)

In 2011, 11,079 of the residents aged 7 to 15 years received health checks, whereas 7007, 6023, 5432, and 4604 of those aged 7-15 years received health checks in 2012, 2013. 2014, and 2015, respectively.

2) BMI SD score and lipid function including LDL-C, HDL-C, and TG values, in residents aged 7 to 15 years in 2011 (Table 2)

The mean BMI SD scores for all residents, the male group and the female group were 0.113 (-2.487-6.819), 0.116 (-2.487-6.262), and 0.109 (-2.105-6.819), respectively. The number of residents per degree of BMI SD score for all residents, the male group and female group in 2011is shown in Table 3.

The mean LDL-CHO levels for all residents, the male group and the female group were 94.2±23.1 92.0±23.4, and 96.3±22.6 mg/dl, respectively. The number of residents with an LDL-CHO level of more than 140mg in the three groups was 390 (3.5 %), 190 (3.4 %), and 200 (3.6 %), respectively, while the number of residents with an LDL-CHO level of less than 140mg in each of the three groups was 10689 (96.5 %), 5385 (96.6 %), and 5304 (96.4 %), respectively.

The mean HDL-CHO levels for all residents, the male group and the female group were 62.5±13.7, 62.2±14.2, and 62.7±13.2 mg/dl, respectively. The number of residents with a HDL-CHO level of less than 40mg in the three groups was 325 (2.9 %), 172 (3.1 %), and 153 (2.8 %), respectively, while the number of residents with a HDL-CHO level of more than 40mg in each of three groups was 10754 (97.1 %), 5403 (96.9 %), and 5351 (97.2 %).

The mean TG levels for all residents, the male group and the female group were 76.5±50.0, 75.5±51.9, and 77.6±48.0 mg/dl, respectively. The number of residents with a TG level of more than 120mg in the three groups was 1416 (12.8 %), 717 (12.9 %), and 699 (12.7 %), respectively, while the number of residents with a TG value of less than 120mg in each of three groups was 9663 (87.2 %), 4858 (87.1 %), 4805 (87.3 %), respectively.

3) Comparison of serum LDL-CHO, HDL-CH, and TG levels between residents with a BMI score more than +2SD and those with a BMI score less than +2SD in 2011 (Table 4)

A comparison of BMI SD score between residents with a score more than +2SD and those with a score less than +2SD in 2011 revealed that serum LDL-CHO level and TG level for all residents, the male group and the female group with a BMI score more than +2SD were higher than those in residents with a BMI score less than +2SD. In addition, the serum HDL-CHO level for all residents, the male group and the female group with a BMI score more than +2SD was lower than that in residents with a BMI score less than +2SD.

4) The change in BMI SD score and lipid function including LDL-CHO, HDL-CHO, and TG values, in residents aged 7 to 15 years from 2011 to 2015

a) BMI SD score

For all residents, the male group and the female group, the change in BMI SD score tended to decrease over the 5-years period ($p<0.0001$), with the BMI SD score in 2011 higher than that in 2012, 2013, 2014, and 2015 (Table 5). Furthermore, the frequency of residents with a BMI score more than +2SD in 2011 was higher than that in 2012, 2013, 2014, and 2015, with the frequency of residents with a BMI score more than +2SD decreasing with time over the 5 years (Fig. 2).

b) LDL-CHO

For all residents, the male group and the female group, the serum LDL-CHO levels in 2012, 2013, and 2014 did not show any decrease compared with those in 2011. However, the serum LDL-CHO levels in 2015 were lower than those in 2011 (Table 5). Furthermore, the frequencies of residents with a serum LDL-CHO level of more than 140 mg/dl in 2012, 2013, and 2014 did not show any decrease compared with those in 2011, and the frequency of residents with a serum LDL-CHO level of more than 140 mg/dl in 2015 was lower than that in 2011 (Fig 2).

c) HDL-CHO

The mean HDL-CHO levels for all residents in 2011, 2012, 2013, 2014, and 2015 were 62.5±13.7, 61.2±12.9, 61.4±12.9, 61.6±12.8, and 60.6±12.5, respectively (Table 5), and the frequencies of residents with a HDL-CHO level of less than 40 mg/dl in 2011, 2012, 2013, 2014, and 2015 were 2.9, 2.6, 3.0, 2.4, and 2.7 (Fig. 2). The mean HDL-CHO level tended to decrease over the 5-year period; however, there was no clear trend in the frequency of residents with a HDL-CHO level of less than 40 mg/dl over the 5 years.

d) TG

The mean TG levels for all residents in 2011, 2012, 2013, 2014, and 2015 were 76.5±50.0, 77.2±48.9, 78.8±50.9, 79.3±51.6, and 79.1±53.5, respectively (Table 5), and the frequencies of residents with a TG level of more than 120 mg/dl in 2011, 2012, 2013, 2014, and 2015 were 12.8, 12.8, 14.2, 14.9, and 13.8 (Fig. 2). Further, the frequency of residents with a TG level of more than 120 mg/dl increased over the 5 years ($p<0.0002$).

Discussion

The Great East Japan Earthquake and Fukushima Daiichi nuclear disaster forced people to evacuate their homes without notice, caused them to change their lifestyle in terms of diet, exercise patterns, and other personal habits, to adapt to a completely new situation, and produced a good deal of anxiety with regard to radiation exposure. In response to this situation, the Fukushima prefectural government made the decision to implement what they termed FHMS to assist in the long-term health management of residents and to evaluate the health impact of the nuclear disaster and forced evacuation. We previously reported, in a comparison of height and body weight between 2011 and 2012, that the mean height increased whereas the mean body weight decreased in both males and females in 2012 in comparison to 2011. In addition, with regard to lipid function, no significant differences in the prevalence of high LDL-CHO or high TG values were observed in either males or females in the 7-15 year age group between 2012 and 2011. Thus, in order to clarify the influence of obesity and hyperlipidemia over a long period after such a disaster, we evaluated BMI SD scores, LDL-CHO, HLD-CHO and TG over a 5-year period in residents aged 7 to 15 years.

Childhood obesity is a serious public health problem, not only in Japan, but worldwide. According to the Central for Disease Control and Prevention, the prevalence of obesity in children aged 6 to 11 years has increased substantially from 7% in 1980 to nearly 18% in 2012. Likewise, the prevalence of obesity in adolescents aged 12 to 19 years has increased from 5% to nearly 21% during the same period. [15-17] Strong evidence has indicated the persistence of childhood obesity into adulthood, with childhood obesity considered a multisystem disease.

With regard to pediatric obesity after the Great East Japan Earthquake, based on our short-term follow up, we reported that some residents aged 7 to 15 years developed obesity during the period from 2011 to 2012. Ono et al. retrospectively investigated obesity in young children through a survey of the pre-existing health examination data in early childhood (aged 1-3 years) and found that the children who were affected by the Great East Japan Earthquake in early childhood were overweight. [14] In addition, Kikuya et al. reported that the incidence of overweight in young children (3.5-4.5 years) was significantly more common in the three prefectures (Fukushima, Miyagi, Iwate prefecture) affected by the Great East Japan Earthquake than in other prefectures after the disaster. [18] However, there have been no reports on the relationship between pediatric obesity and hyperlipidemia after the disaster base on a long-term follow-up.

With regard to the evaluation of obesity, BMI is used in adult; however, as BMI values change significantly with age in children, we used BMI SD score to objectively evaluate BMI. [14] Unfortunately, our previous report presented only a review of changes in weight and we could not make any statistical evaluations.

As to the BMI SD score in 2011, our findings regarding the mean BMI SD scores for all residents, the male group and the female group aged 7 to 15 years were 0.113, 0.116, and 0.109, respectively, indicating that the mean BMI in each of the three groups was higher than that in standard Japanese children aged 7 to 15 years. Furthermore, as to the change in childhood obesity over the 5 years, the mean BMI SD scores in all residents, the male group and the female group aged 7 to 15 years gradually decreased from 2011 to 2015. The causes of the increase in obesity in pediatric participants in Fukushima Prefecture after the Great East Japan Earthquake were shown to be as follows. 1) After the accident at the Fukushima Daiichi Nuclear Power Plant, children ceased to play outside to avoid radiation exposure, and their level of physical activity decreased. 2) The evacuated children often ate instant food for convenience. 3) A lack of sleep and excessive mental stress experienced during life as evacuees. However, it seems that these risk factors have gradually decreased and obesity levels have improved over the course of five years since the earthquake. Thus, we think that the improvement in obesity has gradually improved over the five-year period after the disaster in association with normalization of the residents' lifestyle, diet, exercise patterns, mental stress levels, and sleep patterns.

Excessive mental stress developed

With regard to the relationship between obesity and hyperlipidemia, our results showed that the number of patients with hyperlipidemia including high LDL-CHO, low HDL-CHO level, and/or high TG levels was higher in the obese group than in the non-obese group, suggesting a strong association between obesity and hyperlipidemia.

As an onset mechanism of hyperlipidemia in obesity, it has been shown that an increase in visceral obesity increases FFA in the portal vein blood, promotes lipoprotein synthesis, and leads to hyperlipidemia. Furthermore, obesity induces insulin resistance. Insulin resistance promotes the development of a highly atherogenic lipid profile including increased levels of TG and LDL-CHO, as well as decreased levels of HDL-CHO. Second, insulin resistance leads to hyperglycemia by impairing peripheral glucose uptake, promoting hepatic glucose output and facilitating beta-cell failure.[19]

As to hyperlipidemia in 2011, the frequencies of residents with an LDL-CHO level of more than 140mg, an HDL-CHO level of less than 40mg, and a TG level of more than 120mg were 3.5 %, 2.9 %, and 12.8 %, respectively. In addition, regarding the change in hyperlipidemia over the 5 years, clear differences from the change in obesity were observable. Although the frequency of residents with high LDL-CHO level did not show any decline from 2011 to 2014, the frequency of residents with high LDL-CHO level in 2015 was lower than that in 2011. In addition, the serum TG level tended to increase throughout the 5 years, whereas the TG level in 2015 tended to be lower than that in 2014. That is, the improvement in lipid abnormalities was delayed in comparison with the improvement in obesity.

With regard to the obesity and hyperlipidemia in adult participants, Takahashi et al. reported a 4-year longitudinal change in obesity, hyperlipidemia, and liver dysfunction in 20,395 adult participants in Fukushima Prefecture after the Great East Japan Earthquake. They found the incidence of obesity in 2013-2014 was lower than that in 2011-2012, and the incidence of dyslipidemia in 2013-2014 was higher than that in 2011-2012. This contradiction between obesity and dyslipidemia in adults was similar to that in children. Although the precise reasons for this finding remain unclear, one possible reason could be differences in the mechanisms of disease onset or the effect of overweight on hyperlipidemia. It is necessary to continue with the health checks for residents with hyperlipidemia in future and to observe whether improvement in lipid abnormalities can be achieved through continuing improvement in their lifestyle habits.

The limitations of our study include the following. 1) There is no data available on the laboratory findings for pediatric residents who were living in the evacuation zone before the Great East Japan Earthquake. Thus, we must judge the impact of the earthquake on residents by using changes in data after the disaster. 2) There is a decline in the frequency at which residents receive health checks over time. These findings appear to indicate a decrease in interest in the health checks provided by the Fukushima Health Management Survey. This decrease in the number of child residents who received health checks could affect the results of our study and it is, therefore, necessary to encourage interest in these health checks through advertising and better education.

In conclusion, the findings presented herein suggest that a number of children living in the evacuation zone at the time of the disaster suffered from obesity and hyperlipidemia, with a strong association observed between the two conditions. Furthermore, over long-term (5-year) observation indicated an improvement in obesity, although the improvement in lipid abnormalities was delayed compared that in obesity. Thus, it is necessary to continue with the health checks for these residents with obesity and/or hyperlipidemia.

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Disclosure

The authors declare no conflict of interest.

Author contributors

Drs Kawasaki, Nakano and Hosoya conceptualized and designed the study, drafted the initial manuscript, and reviewed and revised the manuscript.

Drs Yasumura, Ohira, Satoh, Suzuki, Sakai, Ohtsuru, Takahashi and Kobashi designed the data collection instruments, collected data, carried out the initial analyses, and reviewed and revised the manuscript.

Dr Kamiya conceptualized and designed the study, coordinated and supervised data collection, and critically reviewed the manuscript for important intellectual content.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Figure legends

Figure 1: Framework of the Fukushima Health Management Survey

The Fukushima Health Management Survey consists of a basic survey and 4 detailed surveys; namely, the thyroid ultrasound examination, comprehensive health check, mental health and lifestyle survey, and pregnancy and birth survey

Figure 2: Changes in BMI and lipid functions from 2011 to 2015

Comparison of the frequency of residents with a BMI score more than +2SD, the frequency of residents with a serum LDL-CHO level of more than 140 mg/dl, the frequency of residents with a serum HDL-CHO level of less than 40 mg/dl, and the frequency of residents with a serum TG level of more than 120 mg/dl from 2012 to 2015 with those in 2011.

Framework of the Fukushima Health Management Survey

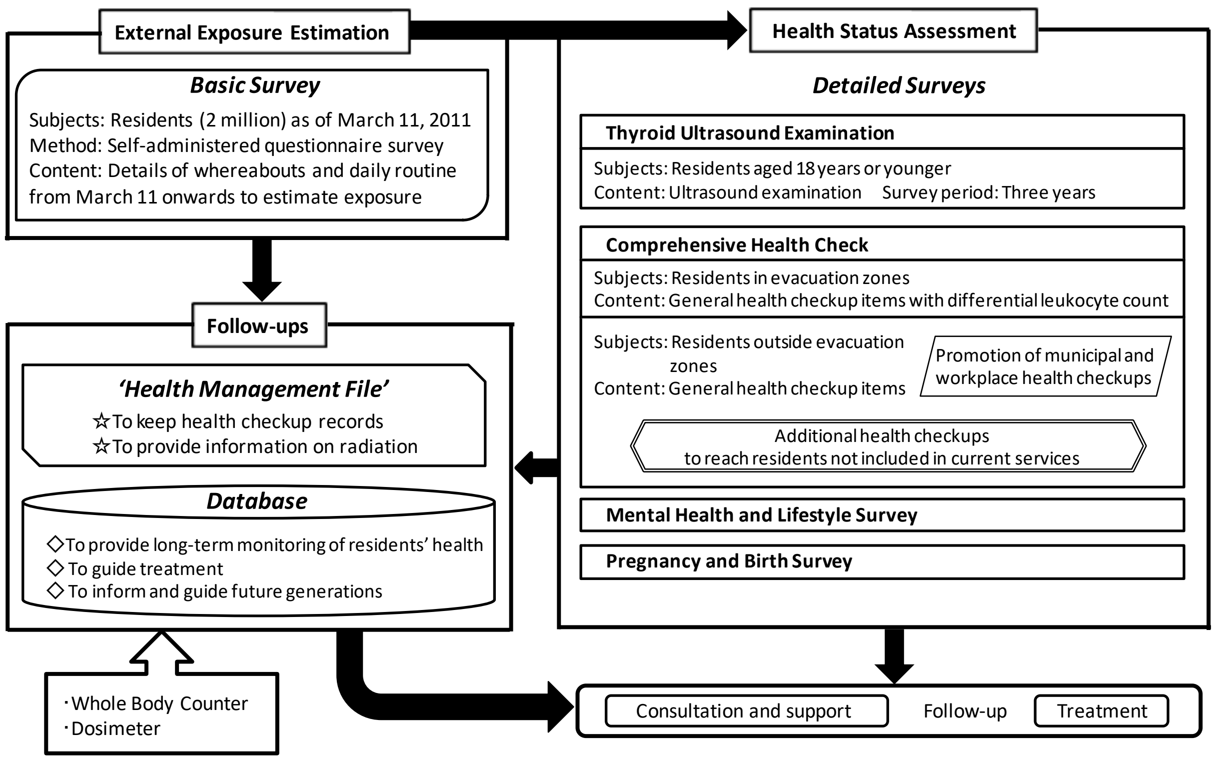

Fig. 1

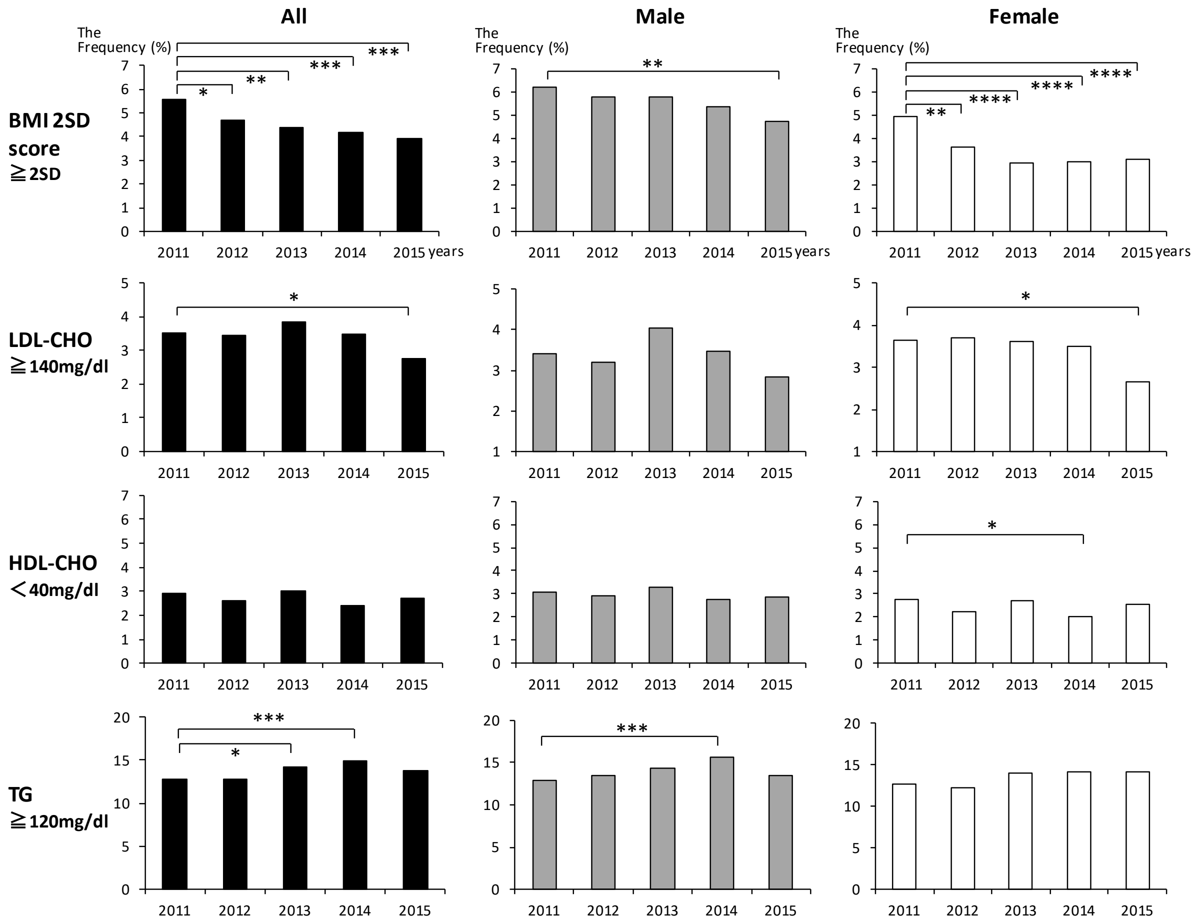
All
Male
Female
The Frequency (%)
BMI 2SD score ≧2SD
LDL-CHO ≧140mg/dl
HDL-CHO ＜40mg/dl
TG ≧120mg/dl
2011
2012
2013
2014
2015 years

Fig. 2

Table 1: A comparison of the characteristics of the residents aged 7 to 15 years who received health checks from 2011 to 2015

	2011	2012	2013	2014	2015
The numbers of residents	11,079	7,007	6,023	5,432	4,604
The mean age (years)	11.5 (2.6)	11.3 (2.5)	11.2 (2.4)	11.2 (2.4)	11.2 (2.5)
Gender (male : female)	5,575 : 5,504	3,590 : 3,417	3,085 : 2,938	2,772 : 2,660	2,396 : 2,208

Table 2: The number of residents by BMI SD score for all residents, the male group and the female group

The degree of BMI SD score	All residents Group number (%)	Male Group number (%)	Female Group number (%)
BMI SD score ≧ 2 SD	616 (5.6)	346 (6.2)	270 (4.9)
2 SD ＞ BMI SD score ≧ 1 SD	1,277 (11.5)	632 (11.3)	645 (11.7)
1 SD ＞ BMI SD score ≧ -1 SD	8,042 (72.6)	4,038 (72.4)	4,004 (72.8)
-1 SD ＞ BMI SD score ≧ -2 SD	1,135 (10.2)	553 (9.9)	582 (10.6)
-2 SD ＞ BMI SD score	9 (0.1)	6 (0.1)	3 (0.1)

Table 3: BMI SD score and lipid function in residents in 2011

	All residents Group	Male Group	Female Group
The mean BMI SD score	0.113 (-2.487〜6.819)	0.116 (-2.487〜6.262)	0.109 (-2.105〜6.819)
The mean LDL-CHO levels (mg/dl)	94.2±23.1	92.0±23.4	96.3±22.6
The mean HDL-CHO levels (mg/dl)	62.5±13.7	62.2±14.2	62.7±13.2
The mean TG levels (mg/dl)	76.5±50.0	75.5±51.9	77.6±48.0

means±SD (range)

Table 4: Comparison of serum LDL-CHO, HDL-CH, and TG levels between residents with a BMI score more than +2SD and those with a BMI score less than +2SD in 2011

	All			Male			Female		
	Residents with a BMI score more than +2SD (n=616)	Residents with a BMI score less than +2SD (n=10,463)	P	Residents with a BMI score more than +2SD (n=346)	Residents with a BMI score less than +2SD (n=5,229)	P	Residents with a BMI score more than +2SD (n=270)	Residents with a BMI score less than +2SD (n=5,234)	P
LDL-CHO (mg/dl)	107.3±27.0	93.4±22.6	P<0.001	110.2±28.0	90.8±22.5	P<0.001	103.7±25.3	96.0±22.3	P<0.001
HDL-CHO (mg/dl)	53.0±11.3	63.0±13.6	P<0.001	51.2±11.0	62.9±14.0	P<0.001	55.4±11.3	63.1±13.2	P<0.001
TG (mg/dl)	114.9±75.5	74.3±47.1	P<0.001	127.1±82.2	72.1±47.3	P<0.001	99.3±62.6	76.4±46.8	P<0.001

Table 5: Comparison of serum LDL-CHO, HDL-CHO and TG levels for all residents, the male group and female group who received health checks from 2012 to 2015 with those in 2011

	2011	2012	P	2013	P	2014	P	2015	P
BMI SD									
All	0.113 (1.05)	0.002 (1.02)	<0.001	-0.016 (1.00)	<0.0001	-0.045 (0.97)	<0.0001	-0.029 (0.97)	<0.0001
Male	0.116 (1.08)	0.026 (1.07)	<0.0001	0.020 (1.06)	<0.0001	-0.021 (1.01)	<0.0001	-0.004 (1.01)	<0.0001
Female	0.109 (1.08)	-0.022 (1.07)	<0.0001	-0.054 (1.06)	<0.0001	-0.070 (1.01)	<0.0001	-0.056 (1.01)	<0.0001
LDL-C (mg/dl)									
All	94.2 (23.1)	93.7 (22.7)	0.52	94.0 (23.3)	0.96	93.5 (22.9)	0.30	92.3 (22.9)	<0.0001
Male	92.0 (23.4)	92.1 (22.8)	1.000	92.4 (23.7)	0.92	91.5 (23.1)	0.82	90.9 (23.4)	0.17
Female	96.3 (22.6)	95.4 (22.5)	0.19	95.6 (22.7)	0.48	95.6 (22.5)	0.48	93.7 (22.3)	<0.0001
HDL-C (mg/dl)									
All	62.5 (13.7)	61.2 (12.9)	<0.001	61.4 (12.9)	<0.0001	61.6 (12.8)	<0.0001	60.6 (12.5)	<0.0001
Male	62.2 (14.2)	61.3 (13.4)	0.01	61.6 (13.5)	0.19	61.7 (13.4)	0.38	60.9 (13.0)	0.001
Female	62.7 (13.2)	61.2 (12.4)	<0.0001	61.3 (12.3)	<0.0001	61.4 (12.2)	<0.0001	60.4 (12.0)	<0.0001
TG (mg/dl)									
All	76.5 (50.0)	77.2 (48.9)	0.87	78.8 (50.9)	0.02	79.3 (51.6)	0.004	79.1 (53.5)	0.015
Male	75.5 (51.9)	76.2 (49.9)	0.95	77.9 (53.8)	0.14	79.4 (54.8)	0.01	77.3 (50.0)	0.49
Female	77.6 (48.0)	78.2 (47.8)	0.96	79.8 (47.7)	0.16	79.3 (48.1)	0.43	81.1 (57.0)	0.02

P : conpared to 2011