Could the Sasang constitution itself be a risk factor of abdominal obesity?

Eunsu Jang, Younghwa Baek, Kihyun Park and Siwoo Lee*

Abstract

Background: Abdominal obesity (AO) is a medical condition in which excess body fat accumulates in the abdomen. It may cause adverse effects on health and result in reduced life expectancy or increased health problems. While various genetic approaches have explained the risks of AO in Western society, the Sasang constitution (SC) has been identified as a risk factor in Korean medicine. Different SC types are associated with different fat distribution, body shapes and susceptibility to diseases. We evaluated whether the SC type could be a risk for AO in a cross-sectional study among Koreans.

Methods: In total, 2,528 subjects aged over 30 years were recruited from 23 medical clinics. We collected waist circumference (WC), weight, height, and some clinical information for AO from the subjects. A Chi-square test and a one-way ANOVA were performed according to SC type (p < .05), while multiple logistic regression was used to produce odds ratios (ORs).

Results: The rates of AO in Tae-eumin (TE), Soeumin (SE), and Soyangin (SY) types were 63.7%, 14.7%, and 32.8% in males and 84.8%, 41.7%, and 52.8% in females, respectively. The TE type was associated with increased AO prevalence compared with the SE and SY types in males (OR 1.79; 95% CI 1.02–3.15, p = 0.044 and OR 1.74; 95% CI 1.18–2.58, p = 0.006, respectively) and females (OR 1.51; 95% CI 1.03–2.23, p = 0.037 and OR 1.88; 95% CI 1.32–2.68, p < 0.001, respectively) after adjusting for age, BMI, hypertension, diabetes mellitus, hypertriglyceridemia, and low HDL cholesterol.

Conclusions: This study suggested that SC, particularly the TE type, might be significantly and independently associated with AO and could be considered a risk factor in predicting AO.

Keywords: Abdominal obesity, Sasang constitutional medicine, Prevalence, Waist circumference, Risk factor

Background

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems [1]. Obesity, especially abdominal obesity (AO), is a substantial risk factor for hypertension, metabolic disease, cardiovascular disease, gallbladder disease, osteoarthritis, and sleep apnea [2].

Furthermore, the waist circumference (WC) plays pivotal roles in those diseases because of its central fat distribution [3-7]. Therefore, the World Health Organization (WHO) has classified obese guide according to not only body mass index (BMI) but also WC [8] and the National Cholesterol Education Program Adult Treatment Panel III also has defined AO as one of important factors for metabolic syndrome [9]. Eventually, the WHO has identified that human beings should overcome AO in the 21st century and observed that the wait for a cure may take a long time [10]. The fundamental cause of AO is presumed to be a combination of environmental factors (inappropriate eating and physical inactivity) and the organism’s genes, such as the 5-HT2A gene and glucocorticoid receptor (GR) gene in Western society [11-15].

Sasang constitutional medicine (SCM) is a tailored Korean traditional medicine that classifies human beings into four constitutions: Taeyangin (TY), Soyangin (SY), Tae-eumin, (TE), and Soeumin (SE) [16]. Each
constitution is classified by characteristics of body shape, face, voice, and psychological and physiological aspects [17,18], and those characteristics are different from one constitution to another [19]. Therefore, each constitution has a different susceptibility to pathology and several chronic diseases. Hypertension and diabetes mellitus (DM) were revealed to be associated with a specific Sasang constitution (SC) [19-23].

According to SCM theory, lung hypo-function and liver hyper-function are related to a large WC, and the TE type is associated with hyperactive liver function and a developed waist area [16,17]. We hypothesize that SC could be a risk for AO. Several family studies have been conducted to investigate the genetic evidence for SC, and they found that SC could be not only inherent but also a risk factor for obesity [24,25]. However, there has been no clinical study to show that SC could a risk factor for AO.

In this study, we present indirect evidence of whether SC could be a risk factor for AO among Koreans.

Methods
This was a cross-sectional study conducted from Nov. 2007 to Jul. 2011 in 23 Korean medical clinics (KMCs).

Study subjects and size
The study size was assumed from a Bernoulli distribution. We calculated a sample size of at least 600 subjects of each constitution on the basis of a 95% confidence interval and a 4% margin of error. The eligible subjects were recruited from KMCs among individuals over 30 years old whose constitution had been confirmed by experts in SC. Individuals who could not understand and follow the researcher’s indication or keep their measurement posture because of severe physical/mental illness were excluded. The detailed researcher’s indication and the subjects’ measurement posture were described in Jang’s study [26]. The subjects with body deformation such as lump or congenital malformation in the measurement location, or pregnant women were also excluded. A total of 2,598 subjects (931 males and 1,667 females) were recruited from 23 KMCs. Three of them were excluded because of missing data. A total of 67 TY types were also excluded because of their low proportion in the Korean population. In total, 2,528 subjects (909 males and 1,619 females) were included in the final analysis. A flowchart of the study design is shown in Figure 1.

This study was approved by the Korea Institute of Oriental Medicine (KIOM) Institutional Review Board.

Figure 1 The flow chart of the study.
Written informed consent for participation in this study was obtained from each of the subjects.

**Sasang constitutional diagnosis**

An SCM expert at each hospital diagnosed individual SC types. For accurate diagnoses, we strictly adhered to defined qualifications of the experts and subject criteria. The SCM experts had more than 5 years of experience in clinical practice. The administration of constitution-specific pharmaceuticals was used as an additional method to confirm the subject SC. A more detailed procedure of diagnosing SC was described in Song’s study [27].

**Data collection**

We collected WC measurements to determine the AO prevalence according to SC. We also collected data on age, sex, body mass index (BMI), and blood pressure and blood samples to control for the influence of confounding factors, which are important risk factors for AO [28,29]. WC was measured around the level of the umbilical scar of the subjects, who took their upper clothing off and stood in an erect posture with their arms folded in front of their chest [26]. BMI was indirectly calculated through the weight and height, and the blood pressure was measured from each subject’s left upper arm after enough rest. To reduce measurement bias among the KMCs, all instructors were educated by KIOM at least once per year, and KIOM monitored the progress of the data collection. All instructors followed a standard operation procedure (SOP) that was developed for the “Korea Constitution Multicenter Study” [26,30].

Blood samples were collected after more than 12 hours of fasting, and the fasting blood glucose, triglyceride (TG) and HDL cholesterol levels were tested by an authorized institution.

### Diagnostic criteria

Hypertension was diagnosed by following the guidelines of the 7th Report of the JNC as \( \geq 90 \) mmHg for diastolic pressure, \( \geq 140 \) mmHg for systolic pressure or taking medicine for the treatment of high blood pressure [31]. DM was diagnosed with the ADA criteria as \( \geq 126 \) mg/dl of fasting plasma glucose or taking medicine for the treatment of DM [32]. Hypertriglyceridemia was diagnosed as TG \( \geq 150 \) mg/dl, and low HDL cholesterol was diagnosed as HDL cholesterol <40 mg/dl in males and <50 mg/dl in females. To diagnose AO, we followed the WHO Report of Asia-Pacific guideline of WC \( \geq 90 \) cm for males and \( \geq 80 \) cm for females [33].

**Table 1 The Characteristics of subjects according to gender and constitution**

| Variables                              | TE          | SE          | SY          | P value |
|----------------------------------------|-------------|-------------|-------------|---------|
| Number (%)                             | 407 (44.8)  | 191 (21)    | 311 (34.2)  |         |
| Age (years)                            | 52.5 ± 12.1b| 48.5 ± 12.2ad| 528 ± 12.4a | <0.001  |
| BMI (kg/m²)                            | 25.8 ± 2.8bc| 21.9 ± 2.5bd| 23.7 ± 2.6bc| <0.001  |
| Systolic blood pressure (mmHg)         | 127.2 ± 14.5bc| 120.4 ± 14.6bd| 122.8 ± 14.5c| <0.001  |
| Diastolic blood pressure (mmHg)        | 81.7 ± 10.5bc| 77.4 ± 11.3bd| 79.7 ± 10.1c | <0.001  |
| Fasting blood glucose (mg/dl)          | 105.6 ± 31.2| 100.8 ± 33.7| 105.8 ± 33.6| 0.17    |
| TG (mg/dl)                             | 170.0 ± 106.4b| 126.0 ± 67.1ad| 158.3 ± 106.0c| <0.001  |
| HDL cholesterol (mg/dl)                | 39.1 ± 9.6bc| 43.2 ± 9.9b | 41.8 ± 11.1c | <0.001  |
| WC (cm)                                | 92.4 ± 7.4  | 82.2 ± 7.1  | 86.5 ± 7.9  | <0.001  |

| Male                                    |            |             |             |         |
|-----------------------------------------|-------------|-------------|-------------|---------|
| Number (%)                             | 625 (38.6)  | 441 (27.2)  | 553 (34.2)  |         |
| Age (years)                            | 53.6 ± 12.9bc| 49.3 ± 12.9bd| 50.19 ± 12.1c| <0.001  |
| BMI (kg/m²)                            | 25.5 ± 3.0bc| 21.5 ± 2.5bd| 22.8 ± 2.6bc| <0.001  |
| Systolic blood pressure (mmHg)         | 122.6 ± 17.2bc| 116.2 ± 16.0bd| 117.3 ± 14.6c| <0.001  |
| Diastolic blood pressure (mmHg)        | 78.3 ± 11.7bc| 74.2 ± 11.3bd| 75.2 ± 10.5c | <0.001  |
| Fasting blood glucose (mg/dl)          | 101.7 ± 315c| 92.9 ± 15.6bc| 980 ± 32.1c | <0.001  |
| TG (mg/dl)                             | 137.2 ± 89.4bc| 100.8 ± 57.7ad| 115.9 ± 68.2ac| <0.001  |
| HDL cholesterol (mg/dl)                | 45.5 ± 12.3bc| 51.0 ± 12.6ad| 48.5 ± 12.4ac| <0.001  |
| WC (cm)                                | 88.9 ± 8.8  | 78.6 ± 8.1  | 81.2 ± 8.2  | <0.001  |

Data shown are the mean ± SD, unless otherwise indicated. aSoeumin and Soyangin differ significantly. bSoeumin and Tae-eumin differ significantly. cSoyangin and Tae-eumin differ significantly. TE, Tae-eumin; SE, Soeumin; SY, Soyangin; BMI, Body mass index; TG, Triglycerides; WC, Waist circumference.
Considering the influence of sexual differences, all analyses were separately conducted in males and females. A one-way ANOVA was used to compare continuous variables (Scheffé's post-hoc analysis). A Chi-square test was performed to compare the prevalence of AO according to SC. Multiple logistic regression was used to calculate odds ratios (ORs) for AO. To evaluate whether the SC could be a risk factor for AO, covariant variables, including age, BMI, hypertension, DM, hypertriglyceridemia, and low HDL cholesterol, were considered. We conducted all of the analyses using SPSS 17.0 software (SPSS Inc., Chicago, IL). The statistical levels of significance were considered to be p values <0.05.

Results

General characteristics

The distribution of SC into TE, SE, and SY types was 44.8%, 21%, and 34.2% in males and 38.6%, 27.2%, and 34.2% in females, respectively. The subjects' general characteristics, including age, body mass index, systolic blood pressure, diastolic blood pressure, fasting blood glucose, TG, HDL cholesterol, and WC, are shown in Table 1 according to gender and constitution.

The rate of AO according to SC

The rate of AO was 42.8% in males and 62.1% in females. The prevalence of AO differed significantly according to SC. The male AO rate according to constitution was 63.7% in the TE type, 14.7% in the SE type and 32.8% in the SY type, and the female AO rate according to constitution was 84.8% in the TE type, 41.7% in the SE type and 52.8% in the SY type. The details are shown in Table 2.

ORs for AO before and after adjustment

Table 3 shows a sequentially developed multiple logistic regression model of AO. Model 1 was crude, without adjustment, model 2 was adjusted for age and BMI, and model 3 was adjusted for age, BMI, hypertension, DM, hypertriglyceridemia, and low HDL cholesterol. Because the TE type was assumed to be a more dangerous risk factor than other types, the results were described as SE type versus TE type and SY type versus TE type.

Table 2 Prevalence of abdominal obesity stratified by gender and constitution

| Variables | Constitution type | Total | P value |
|-----------|-------------------|-------|---------|
|           | TE    | SE    | SY    |       |
| Male      |       |       |       |       |
| AO        | 259 (63.7) | 28 (14.7) | 102 (32.8) | 389 (42.8) |
| NO        | 148 (36.3) | 163 (85.3) | 209 (67.2) | 520 (57.2) | <0.001 |
| Total     | 407 (100) | 191 (100) | 311 (100) | 909 (100) |
| Female    |       |       |       |       |
| AO        | 530 (84.8) | 184 (41.7) | 292 (52.8) | 1006 (62.1) |
| NO        | 95 (15.2)  | 257 (58.3) | 261 (47.2) | 613 (37.9) | <0.001 |
| Total     | 625 (100) | 441 (100) | 553 (100) | 1619 (100) |

Data are shown as the n (%). TE, Tae-eumin; SE, Soeumin; SY, Soyangin; AO, Abdominal obesity; NO, Non-obese.

Table 3 Adjusted odds ratios and 95% CI for abdominal obesity according to constitution

| Variables | Model 1 | Model 2 | Model 3 |
|-----------|---------|---------|---------|
|           | OR (95% CI) | P value | OR (95% CI) | P value | OR (95% CI) | P value |
| Male      |         |         |         |         |         |         |
| SE Type:TE Type | 1:10.19 (6.5–15.96) | <0.001 | 1:1.77 (1:01–3:16) | 0.045 | 1:1.79 (1:02–3:15) | 0.044 |
| SY Type:TE Type | 1:3.59 (2.63–4.9) | <0.001 | 1:1.72 (1:17–2:53) | 0.006 | 1:1.74 (1:18–2:58) | 0.006 |
| Female    |         |         |         |         |         |         |
| SE Type:TE Type | 1:7.79 (5.84–10.4) | <0.001 | 1:1.65 (1:13–2:41) | 0.01 | 1:1.51 (1:03–2:23) | 0.037 |
| SY Type:TE Type | 1:4.99 (3.79–6.56) | <0.001 | 1:1.9 (1:35–2:7) | <0.001 | 1:1.88 (1:32–2:68) | <0.001 |

Results from logistic regression analysis. Model 1- crude. Model 2- adjusted for age and BMI. Model 3- adjusted for age, BMI, hypertension, DM, hypertriglyceridemia, and low HDL cholesterol. TE, Tae-eumin; SE, Soeumin; SY, Soyangin; OR, odds ratio; CI, confidence interval.
The prevalence rates of AO in this study were relatively high compared with a previous study conducted by the Korean government [36]. For this reason, we assumed that the average age in this study was relatively higher.

Our study has several limitations. Previously, a large Korean family study suggested a significant association of chromosomes 8q11.22-23 and 11q22.1-3 with SC [25], and another study found that SC was associated with AO at the genetic level [34]. Family surveys and gene-level studies could be a good method to demonstrate whether SC is an inherent risk factor for AO. However, because our study had a cross-sectional design, we could not analyze the association between inherent SC and AO. In addition, we did not control for environmental factors, such as meals, lifestyle, and exercise habits, which are acquired risk factors for AO.

We believe that further studies on not only a direct comparison between constitutions considering acquired environmental factors for AO but also on inherent family SC are needed.

Conclusions

This study suggested that SC, especially the TE type, might be significantly and independently associated with AO. This finding reveals that SC should be considered a risk factor in predicting AO.

Abbreviations

TE: Tae-eumin; SE: Soeumin; SY: Soyangin; AO: Abdominal obesity; NO: Non-obese; WC: Waist circumference.

Competing interests

The authors declare that they have no competing interests.

Authors’ contributions

EJ carried out the qualitative data analysis and drafted the manuscript. YB carried out the statistical analysis. KIOM coordinated the study, participated in data collection, and contributed to the interpretation of data and content of this manuscript. SL conceived of this study, was the Principal Investigator, participated in its design and coordination, and contributed to the interpretation of data and content of this manuscript. KP also participated in the qualitative data analysis. All of the authors critically contributed to the final manuscript and approved the final version.

Acknowledgments

This research was supported by the National R&D Program through the National Research Foundation of Korea (NRF) funded by the Ministry of Education, Science and Technology (No. 2006-2005175) and Korea Institute of Oriental Medicine (KOM) grant funded by the Korean government (MEST) (No. K13070).

Received: 11 July 2012 Accepted: 8 February 2013
Published: 2 April 2013

References

1. Haslam DW, James WP: Obesity. Lancet 2005, 366:942(1197–1209).
2. Sim KW, Lee SH, Lee HS: The relationship between body mass index and morbidity in Korea. Korean J Obesity 2001, 10(2):147–155.
3. Kannel WB, Adrienne Cupples L, Ramaswami R, Stokes J, Kreger BE, Higgins M: Regional obesity and risk of cardiovascular disease; the Framingham Study. J Clin Epidemiol 1991, 44(2):183–190.
4. Bouchard C, Bray GA, Hubbard VS: Basic and clinical aspects of regional fat distribution. Am J Clin Nutr 1990, 52(5):946.

5. Pirinen RJ, Folsom AR, Kaye SA: Central adiposity and increased risk of coronary artery disease mortality in older women. Ann Epidemiol 1993, 3(1):33–41.

6. Detection EPO: Evaluation, and treatment of high blood cholesterol in adults. Executive summary of the third report of the National Cholesterol Education Program (NCEP) Expert panel on detection, evaluation, and treatment of high blood cholesterol in adults (Adult Treatment Panel III). JAMA 2001, 285(19):2486–2497.

7. Fujimoto WT, Bergstrom RW, Boyko EJ, Leonetti DL, Newell-Morris LL, Wahl PW: Susceptibility to development of central adiposity among populations. Obes Res 2012, 20(6):179–186.

8. WHO: Obesity: preventing and managing the global epidemic. World Health Organization technical report series no. 894. Geneva; Switzerland: World Health Organization; 2000.

9. Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, Gordon DJ, Krauss RM, Savage PJ, Smith SC Jr: Diagnosis and management of the metabolic syndrome. Circulation 2005, 112(17):2735–2752.

10. WHO: 2008–2013 action plan for the global strategy for the prevention and control of noncommunicable diseases. Geneva; Switzerland: World Health Organization; 2008-82.

11. Elliott SS, Keim NL, Stern JS, Teff K, Havel PJ: Fructose, weight gain, and the insulin resistance syndrome. Am J Clin Nutr 2002, 76(5):911–922.

12. Perez-Pozo S, Schold J, Nakagawa T, Sanchez-Lozada L, Johnson R, Lillo JL: Excessive fructose intake induces the features of metabolic syndrome in healthy adult men: role of uric acid in the hypertensive response. Int J Obes 2009, 34(3):454–461.

13. Choi ME: The not-so-sweet side of fructose. J Am Soc Nephrol 2009, 20(3):457–459.

14. Rosmond R, Bouchard C, Björntorp P: S-HT2A receptor gene promoter polymorphism in relation to abdominal obesity and cortisol. Obes Res 2012, 20(3):589–599.

15. Rosmond R, Chagnon YC, Holm G, Chagnon M, Pérusse L, Lindell K, Wahl PW: Susceptibility to development of central adiposity among populations. Obes Res 2012, 20(5):767–775.

16. Lee JM: Longevity and life preservation in oriental medicine (東醫養壽保元). Seoul, Korea: Kyung Hee Univ Press; 1996.

17. Kim JY, Pham DO: Sasang constitutional medicine as a holistic tailored medicine. Evid-Based Complementary Altern Med 2009, 6(Suppl 1):11–19.

18. Shin EB, Lee S, Kim JY, Earm YE: Physiome and sasang constitutional medicine. J Physiol Sci 2008, 58(7):433–440.

19. Lee T, Lee S, Choi B, Song I: A study on the prevalences of chronic diseases according to Sasang constitution at a health examination center. J Sasang Constitut Med 2005, 17(2):32–45.

20. Lee TG, Koh B, Lee S: Sasang constitution as a risk factor for diabetes mellitus: a cross-sectional study. Evid-Based Complementary Altern Med 2009, 6(1):99–103.

21. Lee J, Lee E, Yoo J, Kim Y, Koh B: The sasang constitutional types can act as a risk factor for hypertension. Clin Exp Hypertens 2011, 33(8):525–532.

22. Choi K, Lee J, Yoo J, Lee E, Koh B: Sasang constitutional types can act as a risk factor for insulin resistance. Diabetes Res Clin Pract 2011, 91(3):e57–e60.

23. Song KH, Yu SG, Kim JH: Prevalence of metabolic syndrome according to Sasang constitutional medicine in Korean subjects. Evid-Based Complementary Altern Med 2012, 2012:646704.

24. Lee MK, Jang ES, Sohn HY, Park JY, Koh BH, Sung J, Kim JI, Kim JY, Seo JS: Investigation of genetic evidence for Sasang constitution types in South Korea. Genomics & Informatics 2009, 7(2):107–110.

25. Won HH, Lee S, Jang E, Kim K, Park YK, Kim YJ, Kim YS, Kim BY, Kim JY, Kim JW: A genome-wide scan for the sasang constitution in a korean family suggests significant linkage at chromosomes 8q11–12–23 and 11q22. J Altern Complement Med 2009, 15(7):765–769.

26. Jang E, Kim JW, Lee H, Kim H, Baek Y, Lee S: A study on the reliability of Sasang constitutional body trunk measurement. Evid-Based Complementary Altern Med 2011, 2012:604842.

27. Song KH, Yu SG, Cha S, Kim JY: Association of the apolipoprotein A5 gene –1131 T>C polymorphism with serum lipids in Korean subjects: Impact of Sasang constitution. Evid-Based Complementary Altern Med 2011, 2012:598394.

28. Després JP, Lernieux I: Abdominal obesity and metabolic syndrome. Nature 2006, 444(7121):881–887.

29. Sánchez-Castillo CP, Velázquez-Monroy O, Lara-Esqueda A, Berber A, Sepulveda J, Tapia-Contrera R, T. James WP: Diabetes and hypertension increases in a society with abdominal obesity: results of the Mexican National Health Survey 2000. Public Health Nutr 2005, 8(1):53–60.

30. KOM: Development of Diagnostic and Herbal Drug System based on Traditional Constitutional Korean Medicine. Daejeon; Korea: Korea Institute of Oriental Medicine; 2007.

31. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, Jones DW, Materson BJ, Oparil S, Wright JT Jr: Seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. Hypertension 2003, 42(6):1206–1252.

32. Association AD: Diagnosis and classification of diabetes mellitus. Diabetes Care 2010, 33(Suppl 1):S62–69.

33. WHO: The Asia-Pacific perspective: redefining obesity and its treatment. Geneva, Switzerland: World Health Organization; 2000.

34. Cha S, Koo J, Park BL, Jeong S, Choi SM, Kim KS, Shin HD, Kim JY: Genetic Effects of FTO and MC4R Polymorphisms on Body Mass in Constitutional Types. Evid-Based Complementary Altern Med 2011, 2011: doi:10.1093/ecam/ nep1162.

35. Kim JW, Jeon SH, Sull YK, Kim KI, Lee EJ: A study on the body shape classified by Sasang constitutions and gender using physical measurements. J Sasang Constit Med 2006, 18(1):54–61.

36. KCCDC: The Third Korea National Health and Nutrition Examination Survey (KNHANES III) 2005 Health Examination. Gwangcheon; Korea: Korea Centers for Disease Control and Prevention; 2006.

Submit your next manuscript to BioMed Central and take full advantage of:

- Convenient online submission
- Thorough peer review
- No space constraints or color figure charges
- Immediate publication on acceptance
- Inclusion in PubMed, CAS, Scopus and Google Scholar
- Research which is freely available for redistribution

Cite this article as: Jang et al.: Could the Sasang constitution itself be a risk factor of abdominal obesity? BMC Complementary and Alternative Medicine 2013 13:72.