Effect of electroacupuncture on Indonesian patients with excess body weight

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Abstract. Excess body weight is a public health problem worldwide. This has led to an increase in the morbidity and mortality of excess body weight-related diseases, such as hypertension, type 2 diabetes mellitus, hyperlipidemia, and cardiovascular disease. Weight-loss methods include diet, physical activity, behavioral therapy, medications, surgery, and acupuncture. There has been much interest in the management of excess body weight via electroacupuncture (EA) therapy. This study aimed to determine whether EA at ear and/or body acupuncture points can achieve a body weight loss of ≥1% per week in patients with excess body weight. This was a case series with a sample size of 28. The study sample data were taken from the medical records of patients in the Cipto Mangunkusumo Hospital Acupuncture Clinic who received acupuncture therapy and met the inclusion criteria. The success criterion for body weight loss was a loss of 1%–2% per week from the previous body weight. The percentage of body weight loss in patients with excess body weight was 1.11% per week, with a success rate of 89.28%.

1. Introduction
Excess body weight has increasingly become a public health concern worldwide [1]. According to Palou et al (2000) and Cabyoglu et al. (2006), excess body weight will become a serious problem in the 21st century [2]. In the developed countries, such as the USA, Canada, Australia, and Europe, excess body weight is already a serious health problem and is increasingly being seen in the developing countries, such as Iran and China [3,4].

According to the Indonesian Basic Health Research data, in 2007, the prevalence of excess body weight in Indonesia was 19.1% (8.8% overweight and 10.3% obese) [5], whereas in 2010, the total prevalence was 21.7% for the categories of overweight and obesity [6]. The increasing prevalence of overweight as well as the increasing morbidity and mortality made this problem is becoming more serious worldwide [7,8]. Excess body weight in male adolescents will increase early mortality in adulthood [9]. Several chronic diseases, such as hypertension, diabetes, cardiovascular disease, hyperlipidemia, dyslipidemia, and osteoarthritis, are associated with excess body weight [10,11].

Weight-loss methods include diet, physical activity, behavioral therapy, acupuncture, drugs (pharmacotherapy), and surgery [12,13]. There has been much interest in the use of acupuncture for the
treatment of excess body weight in the last decade. In 1996, the World Health Organization (WHO) established excess body weight as a disease that can be overcome with acupuncture [14]. Cho SH et al. have stated that acupuncture therapy is a relatively safe management modality for obesity treatment [15]. According to the American Dietetic Association (ADA) guidelines, the criterion for significant weight loss is 1%–2% per week [16]. Currently, the Department of Medical Acupuncture RSCM uses the success criteria for weight loss following the ADA guidelines. Additionally, the Department of Medical Acupuncture Cipto Mangunkusumo Hospital Work Instructions defines a successful rate of excess weight loss as ≥1% loss per week after acupuncture treatment [17]. The purpose of this study was to determine the effect of electroacupuncture (EA) at ear and/or body acupuncture points on the body weight loss of ≥1% per week in patients with excess body weight.

2. Methods
This study was designed as a case series and conducted at the Cipto Mangunkusumo Hospital Medical Records Unit using medical records from the Registration section of the Polyclinic of the Department of Medical Acupuncture Cipto Mangunkusumo Hospital from 9 December, 2013, through 24 December, 2013. The researchers did not meet with, call, or conduct interviews with patients and/or the families of patients. The study sample data were obtained from the medical records of visitors who received treatment for excess body weight in the Polyclinic from July 2012 through June 2013 and who fulfilled the inclusion criteria. The sample size was medical records data of 28 patients. The inclusion criteria were patients aged 18–65 years, those with body mass index (BMI) ≥25 kg/m², male and female patients, those who received EA therapy ≥4 times in 2 weeks, and those who received EA therapy at the ear and/or body points. The exclusion criteria were patients who received EA therapy <2 times per week and who had incomplete medical record data.

The instruments used in this study were disposable acupuncture needles of 0.18 × 7 mm and 0.25 × 40 mm (Huanqiu brand), 70% isopropyl alcohol, cotton, timers, and weight and height scales, electrostimulators (KWD 808 type I and KWD 808 type II; Great Wall brand or SMY 104 and SDZ V type; Hwato brand).

Acupuncture was performed as follows: the body weight and height were recorded for all patients and BMI was calculated. With the patient in the prone position, aseptic and antiseptic actions were performed on the spot to be punctured. A 0.18 × 7-mm needle was then used to make the puncture in the bilateral ears. The most frequently made puncture was at the point of hunger until a puncture sensation was reached, after which the needle was connected to the electrode of the electrostimulator and mounted on both right and left ear points. A 0.25 × 40-mm needle was used to make punctures at the ST 36 Zusanli point in the area of the bilateral inferior extremity and at the ST 25 Tianshu, ST 28 Shuidao, CV 12 Zhongwan, CV 9 Shuifen, and CV 4 Guanyuan perpendicular points in the abdominal area until there was a puncture sensation. The hunger, ST 25 Tianshu, and ST 28 Shuidao points were connected to an electrostimulator cable mounted on the right and left points, and the CV 12 Zhongwan (4 in above the umbilicus center) and CV 4 Guanyuan (3 in below the umbilicus center) points were also connected to an electrostimulator cable. The CV 9 Shuifen and ST 36 Zusanli points were not connected to an electrostimulator. After the electrode was connected, the electrostimulator was turned on for 20–30 min. The most frequently given stimulus was the dense disperse wave type with low intensity. After EA, the electrostimulator was switched off and removed and the needles were removed. The punctures were performed twice per week along with weight recording.

The success criterion for weight loss per week was a loss of 1%–2% of the previous body weight. Unsuccessful weight loss was considered to be that of <1% of the previous weight. Data were recorded in a parent table, which were then statistically processed using SPSS version 17 and MS Word Excel and are presented in a tabular format.

3. Results
Table 1. Characteristics of study subjects.

| Variable             | Cases (n) | Cases (%) |
|----------------------|-----------|-----------|
| Sex                  |           |           |
| Male                 | 2         | 7.1       |
| Female               | 26        | 92.9      |
| Age (years)          |           |           |
| 18–30                | 5         | 17.9      |
| 31–40                | 10        | 35.7      |
| 41–50                | 7         | 25        |
| 51–60                | 4         | 14.3      |
| 61–65                | 2         | 7.1       |
| Education            |           |           |
| No school            | 1         | 3.6       |
| Elementary school    | 1         | 3.6       |
| Junior high school   | 3         | 10.7      |
| Senior high school   | 15        | 53.6      |
| Academician/undergraduate | 8       | 28.6      |
| Occupation           |           |           |
| Housewife            | 14        | 50        |
| Civil servant        | 2         | 7.1       |
| Private employee     | 12        | 42.9      |
| BMI                  |           |           |
| Overweight           | 14        | 50        |
| Obese class 1        | 8         | 28.6      |
| Obese class 2        | 3         | 10.7      |
| Obese class 3        | 3         | 10.7      |

BMI: body mass index

Table 2. Weight loss per week in the overweight and obese groups

| Variable     | Mean duration of therapy (weeks) | Weight loss during therapy (%) | Weight loss per week (%) |
|--------------|----------------------------------|--------------------------------|--------------------------|
| Overweight   | 5.78                             | 6.00                           | 1.04                     |
| Obese        | 4.78                             | 5.67                           | 1.19                     |
| Total        | 10.56                            | 11.67                          | 1.11                     |

Table 2 shows that overweight group experienced a mean weight loss of 1.04% per week and the obese group (comprising obese class 1, 2, and 3) experienced a mean weight loss of 1.19% per week. The excess body weight group, which was a combination of both groups, experienced an average weight loss of 1.11% per week, while the proportion of patients who achieved weight loss is shown in Table 3.

Table 3. Proportion of patients who achieved weight loss of $\geq 1\%$ and $< 1\%$ per week in the $\geq 6$-week and $< 6$-week acupuncture groups.
Variable | Weight loss ≥1% per week | Weight loss <1% per week | Total n (%) |
|---------|--------------------------|--------------------------|-------------|
|         | n (%)                    | n (%)                    |             |
| Acupuncture ≥6 weeks | | | |
| Overweight | 9 (32.143) | 1 (3.571) | 10 (35.714) |
| Obese | 7 (25) | 0 (0) | 7 (25) |
| Total | 16 (57.143) | 1 (3.571) | 17 (60.714) |
| Acupuncture <6 weeks | | | |
| Overweight | 3 (10.714) | 1 (3.571) | 4 (14.286) |
| Obese | 6 (21.429) | 1 (3.571) | 7 (25) |
| Total | 9 (32.143) | 2 (7.143) | 11 (39.286) |
| Acupuncture ≥6 and <6 weeks | | | |
| Total | 25 (89.286) | 3 (10.714) | 28 (100) |

Furthermore, no side effects were noted in the medical records.

4. Discussion

This was a case series study of medical records of 28 patients with excess body weight who met the inclusion criteria for acupuncture therapy at the Polyclinic of the Department of Medical Acupuncture Cipto Mangunkusumo Hospital Jakarta from July 2012 to June 2013. The determination of the July 2012 period in this study followed the beginning of the use of medical indicators at the Department of Medical Acupuncture Cipto Mangunkusumo Hospital and of the success criteria for weight loss following the American Dietetic Association guidelines.

The number of female subjects (92.9%) was greater than that of men (7.1%) in this study. According to the Riskesdas data, the prevalence of excess body weight was lower in men (13.9%) than in women (23.8%) in 2010 [6]. This study also found a lower percentage of excess body weight in men (7.1%) than in women (92.9%).

The highest percentage of subjects in this study was of those aged 31–40 years (35.7%), whereas the lowest percentage was of those aged 61–65 years (7.1%). According to the Riskesdas data, in 2007, adults with excess body weight were defined as those aged ≥15 years, whereas in 2010, they were defined as those aged ≥18 years [1,6]. In the present study, adults were defined according to the Riskesdas 2010 criteria of ≥18 years. According to Riskesdas 2007, the prevalence of excess body weight increased until the age of 45–54 years and subsequently declined [5], whereas according to Riskesdas 2010, the prevalence increased after the age of 35 years and then declined after the age of 60 years in men and women [6]. The present study results were more similar to those in the Riskesdas 2010 report than to those in the Riskesdas 2007 report because the subjects were mostly aged 31–40 years. Because the results of this study resembled those of Riskesdas 2010 showing that excess body weight increased at an increasingly younger age, morbidity and early mortality are expected to increase in adults [9]. Therefore, excess body weight is currently a public health problem worldwide, and according to Palou et al. (2000) and Cabyoglu et al. (2006), excess body weight is expected to become a serious problem [1,2,7,8]. Several chronic diseases associated with excess body weight, such as hypertension, diabetes, cardiovascular disease, hyperlipidemia, dyslipidemia, and osteoarthritis, will prematurely occur during adulthood, which will decrease the secondary productivity associated with morbidity and mortality during early adulthood [10,11,17]. The health costs associated with the prevalence of overweight and obesity in the USA are estimated to be $254 billion, including $208 billion for the loss
of secondary productivity associated with premature morbidity and mortality and $46 billion as a direct health cost. If tendencies toward excess body weight strengthen and continue, then the health costs will be $861–$957 billion, which is 16%–18% of the USA health care costs [18]. Therefore, excess body weight is a very important problem that must be addressed to decrease morbidity and mortality.

In this study, the most frequent educational level attained was high school (53.6%) and the least frequent levels were did not pass primary school/no school and elementary school (3.6%). Table 1 data shows that 53.6% of patients with excess body weight achieved only a senior high school education, whereas 28.6% had college or higher education, which indicates that higher education may lead to a better understanding of the greater risks of developing diseases associated with excess body weight.

With regard to occupation, the highest percentage of subjects in this study were housewives (50%) and the lowest percentage were civil servants (7.1%), which may reflect that housewives had more time to visit the Department of Medical Acupuncture to undergo the examination.

The percentages of subjects in the overweight and obese groups were the same in this study (50%; 14 subjects each), and excess body weight group was defined as a combination of the overweight and obese groups (BMI ≥ 25 kg/m²). The overweight and obese classifications were the same as the WHO classifications (overweight, BMI, 25–29.99 kg/m²; obese, BMI ≥ 30 kg/m²). Obesity included obese class I (BMI, 30–34.9 kg/m²), II (BMI, 35–39.9 kg/m²), and III (BMI ≥ 40 kg/m²). The study results showed that the overweight group achieved a mean weight loss of 1.04% per week and the obese group (obese classes I, II, and III) achieved a mean weight loss of 1.19% per week. The excess body weight group achieved a mean weight loss of 1.11% per week. According to the ADA guidelines, the significant weight loss criterion was a loss of 1%–2% per week [16]. Therefore, weight loss after acupuncture in the excess body weight group was considered significant for each week according to the ADA guidelines.

The percentage of subjects who received acupuncture of ≥6 weeks and achieved weight loss of ≥1% per week in the excess body weight group was 57.1% (overweight, 32.1%; obese, 25%), that of study subjects who received acupuncture of <6 weeks and achieved weight loss of ≥1% per week in the excess body weight group was 32.143% (overweight, 10.7%; obese, 21.4%), and that of excess body weight patients who underwent acupuncture therapy (≥6 weeks and <6 weeks) and achieved weight loss of ≥1% per week was 89.3%.

The acupuncture points used in this study were body and/or ear points that are used in evidence-based medicine (EBM) for the treatment of excess body weight. The acupuncture points of the body that were widely used according to the medical record data were ST 36 Zusanli, CV 12 Zhongwan, CV 9 Shuifen, CV 4 Ganyuan, ST 25 Tianzhui, and ST 28 Shuidao [18–21]. The widely used ear acupuncture point is the point of hunger [18,20] This point was chosen because ST 36 Zusanli along with other points have been shown to increase hunger center activity in the ventromedial hypothalamic nucleus in experimental studies in rats, and this point along with other points in EBM has been shown to decrease serum leptin levels, increase beta endorphin serum levels, and decrease body weight [2,18–20]; CV 12 Zhongwan, CV 9 Shuifen, and CV 4 Ganyuan along with other points in EBM have been shown to decrease serum leptin levels and body weight [4,18,20]; ST 25 Tianzhui along with other points in EBM have been shown to decrease serum leptin levels and body weight [4,18,20]; ST 25 Tianzhui along with other points in EBM have been shown to decrease serum leptin levels, increase beta endorphin serum levels, and decrease body weight [2,18,20]. ST 28 Shuidao in EBM has been shown to decrease body weight [18,20] and the hunger point along with other points in EBM have been shown to increase the sensation of fullness, suppress hunger, and decrease body weight [18,20].

Our study, compared with the study of Siswati et al (2005), showed a similar good success rate for the management of excess body weight using acupuncture; the success rate was 89.3% in the present study and 75% in the study by Siswati et al. The points used in this study and Siswati et al’s study were body and ear acupuncture points that are used for the management of excess body weight in EBM. This study only used a case series design for the acupuncture treatment of 28 patients, whereas in Siswati et al’s study, a single-blind randomized controlled trial (RCT) was conducted in 48 patients divided into the placebo acupuncture and acupuncture groups with 24 patients each. The criterion for significant weight loss in this study followed the ADA guidelines of a loss of 1%–2% per week, whereas that for a
significant weight loss of ≥6 kg and for effectiveness of between 3 to 6 kg was used in the study by Siswati et al [16-19]. The present study found a mean weight loss of 1.11% per week, whereas the study by Siswati et al found a mean weight loss of 3.658 kg in the acupuncture group and 2.716 kg in the placebopuncture group after 6 weeks [18].

A study by Harahap et al (2008) and the present study achieved a similar good success rate for the management of excess body weight using acupuncture (89.3% in the present study and 70.8% in the study by Harahap et al). The same ear acupuncture points used for the management of excess body weight in EBM were used. The difference between these two studies was that the present study used body and/or ear acupuncture points, whereas the study by Harahap et al used only ear acupuncture points. In this study, an electrostimulator was used at almost all body and ear acupuncture points, whereas in the study by Harahap et al only a press needle was used. Our study used a case series design for acupuncture treatment of 28 patients, whereas the study by Harahap et al was a single-blind RCT in 48 patients divided into placebopuncture and acupuncture groups of 24 patients each. The success criterion in this study followed the ADA guidelines for a weight loss of 1%–2% per week, whereas a success criterion for a weight loss of ≥6 kg and for effectiveness of between 3 and 6 kg was used in the study by Harahap [16-18]. In this study, a mean weight loss of 1.11% per week was obtained, whereas in the study by Harahap et al, a mean weight loss of 3.08 kg was obtained in the acupuncture group and 2.48 kg in the placebopuncture group after 6 weeks [20].

In this study, an electrostimulator with a dense disperse wave was used. The type of dense disperse wave selected produces low and high frequencies for EA. The effectiveness of this method in regulating body weight has been shown in some studies and changes in some body biochemical parameters have been demonstrated that explain different aspects of the effects of acupuncture on patients with excess body weight. Kim et al (2001) conducted an experimental study using EA with a frequency of 100 Hz in normal mice, which was shown to increase the leptin levels [3-21]. Siswati et al. (2005) conducted a study using EA with high frequencies (scale 10) that achieved a weight loss of 3.7 kg, with a success rate of 75% for EA [18]. You and Hung (2005) and Jessica et al (2013) conducted experimental studies using 100-Hz frequency EA and observed an inhibition of weight gain as evidenced by a decrease in triglycerides and increase in HDL levels [22]. Cabioglu and Ergene (2006) conducted a study using EA with a frequency of 2 Hz and observed a weight loss of 4.5%, decrease in serum leptin levels, and increase in endorphin β levels [2]. Wang et al. (2008) reported the use of EA with a frequency of 2 Hz and observed a weight loss of 3.9 kg [21]. Fan et al. (2008) conducted an experimental study using EA with a frequency of 2–15 Hz for 49 days and showed that the EA group was more effective than the antiobesity drug group (sibutramine) in achieving weight loss via the regulation of adiponectin and insulin [22]. Darbandi et al. (2013) conducted a study using EA with a frequency of 30–40 Hz and observed decreases in the body fat mass and plasma leptin levels [4]. Chia et al. (2012) conducted a systematic analysis on the management of excess body weight using the thread embedding method and compared it with EA. Five of the eight non-RCT studies showed better efficacy of the thread embedding group than of acupuncture or EA. Two other studies found no difference between the thread embedding and acupuncture or EA groups. The sole RCT showed that the efficacy of the catgut embedding group was similar to that of the EA group [23].

In the present study, no side effects were reported in the medical records. Yung et al. (2011) reported a rare case study of the embedding method and observed erythematous swelling along with itching in the middle and lower abdomen. On dermatological examination, multiple nodules were found with more than one showing a soft consistency and a darker central appearance. After 6 months, the nodules slowly and spontaneously regressed and post-inflammatory hyperpigmentation occurred [24].

Cho et al. (2009) reported that the side effects of dry mouth, headache, sleeplessness, hypertension, palpitations, and dizziness were lower in the acupuncture group (16.7%) than in the medication group (42.9%) [15]. Long-term use of sibutramine and orlistat of >6 months have been approved by the FDA [25,26]. Sibutramine has been found to have adverse effects of increased heart rate and blood pressure. In October 2010, sibutramine was withdrawn from circulation because of increased cardiovascular and stroke events [26,27]. Orlistat was found to have side effects of decreased absorption of fat-soluble
vitamins and soft feces [26,28]. Cho et al stated that acupuncture therapy for excess body weight treatment was a relatively safe management modality [15]. Therefore, EA is relatively safe in the treatment of excess body weight.

5. Conclusion
EA performed at the ear and/or body acupuncture points achieved a weight loss of 1.11% per week in patients with excess body weight, with a success rate of 89.28%.

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