

## National Prevalence of Obesity

# Obesity as a poverty-related emerging nutrition problems: the case of Indonesia

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### Summary

Obesity is a major contributor to the global burden of chronic disease and disability. In developing countries like Indonesia, obesity often co-exists with undernutrition. Data from national basic health research 2007 showed that overnutrition was found among all age groups, on a double digit scale, with similar magnitude in urban and rural areas and higher prevalence in adult female. In contrary to 14% undernourished children under the age of 5 years, 12% of their counterparts were overnourished; for 6–14 years 10% vs. 6%; and for 15 years and above 15% vs. 19%. The purpose of the review is to raise awareness on the increasing obesity problem and to set recommendations to prevent obesity. Stunted adults in developing countries are 1.2 times more likely to be overweight than non-stunted adults. Approaches to overcoming obesity in adulthood emphasize dietary changes, increasing physical activity and behaviour modification. It is important for Indonesia to target nutrition intervention for female adolescents, pregnant woman to first 2 years of life, initiate nutrition education for school-age children and disseminate Holistic Healthy Framework Approach with key message 'Initiate healthier food choices'. Prompt Nutrition Guidelines and the use of lower body mass index cut-off should be considered.

**Keywords:** Indonesia, nutrition, obesity, poverty.

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### Introduction

The prevalence of overweight and obesity has been increasing rapidly in both developed and developing countries across all population groups and affecting all ages. Globally, obesity has reached epidemic level, with more than 1 billion adults overweight and at least 300 million of them clinically obese (1). Obesity is a major contributor to the global burden of chronic disease and disability. Obese individuals suffer from increased risk of developing serious medical conditions such as non-insulin-dependent (type 2) diabetes, coronary heart disease, hypertension and stroke, gall bladder disease, certain types of cancer (endometrial, ovarian, breast, cervical, prostate, colorectal, gall bladder, pancreatic, hepatic and renal) and psychosocial problems.

Obesity refers to an abnormally high proportion of body fat. It may result from undesirable weight gain caused by increased consumption of energy-dense foods high in saturated fats and sugars, concomitant with reduced physical activity. Obesity can be defined in absolute or relative terms. It is typically evaluated in absolute terms by measuring body mass index (BMI), which is body weight in kilograms divided by the square of a person's height in meters;  $\text{kg m}^{-2}$ ). It is also evaluated in terms of its distribution through waist circumference or waist-hip circumference ratio measurements. In addition, the presence of obesity needs to be regarded in the context of other risk factors and comorbidities. Adult individuals with BMI of 25.0–29.9 are considered to be overweight, those with BMI of 30.0–39.9 are considered to be obese, those with BMI of

40.0 or higher are considered to be severe obesity and those with BMI of 35.0 or higher in the presence of at least one other significant comorbidity are considered to have morbid obesity (2).

In the case of Indonesia, although undernutrition is still a major public health problem, especially in poor population, prevalence of obesity is emerging as a public health problem. Data from national basic health research in 2007 showed that overnutrition were found among all age groups (3). In contrary to 14% undernourished children under the age of 5 years [defined as weight-for-height (WFH) < -2 SD], 12% of their counterparts were overnourished (defined as WFH > 2 SD). Undernutrition among children aged 6–14 years was 13% and 11% for male and female, respectively (defined as BMI < -2 SD), while overnutrition among the same age groups was 10% and 6% for male and female, respectively (defined by BMI > 2 SD). The same trend existed for population 15 years and above, i.e. 15% prevalence of undernutrition (defined as BMI < 18.5) vs. 19% overweight and obese (defined as BMI 25–27 and >27, respectively), which is equivalent to about 43 million people.

The prevalence of overweight was higher in urban than in rural population, while the prevalence gap was wider in the older age groups. The prevalence of overweight in children under the age of five was 12% in both urban and rural areas (3). Its prevalence in children aged 6–14 years was 9% in urban and 7% in rural, with higher prevalence among the boys (11% urban vs. 9% rural boys and 7% urban vs. 6% rural girls). For age above 15 years, the prevalence of overweight and obesity for urban and rural areas was 24% and 15%, respectively.

The purpose of the review is to raise awareness on the increasing obesity dilemma in Indonesia, particularly in those with underlying underweight and stunting early in life and to define recommendation to prevent it. The review is divided into three aspects: (i) insight into fetal programming Barker hypothesis and stunting on one hand and fatty tissue as an endocrinologic organ on the other hand; (ii) the implication of obesity in Indonesia and (iii) approaches to overcoming obesity. Part of the information used for this review was taken from a seminar organized jointly between the Indonesian Danone Institute Foundation and the School of Health Nutrition, Faculty of Medicine, Gadjah Mada University, Yogyakarta in 2007.

## Results and discussion

The Barker hypothesis (4) proposes that low birth weight or accelerated post-natal weight gain after the age of 2 years, or a combination of the two may predispose to obesity and as a consequence hypertension, cardiovascular disease and type 2 diabetes in adults. Studies in five developing countries confirmed that lower birthweight and

undernutrition in childhood were risk factors for high glucose concentrations, blood pressure and harmful lipid profiles, especially for children who had rapid post-natal weight gain after infancy (5). The increasing rate of obesity in developing countries in children who were undernourished in the first 2 years has to be evaluated with a close measurement of height and weight and BMI. Recommendations should be followed by restriction of overnutrition and over-eating. In light of the hormonal regulation, Professor Friedman (6) developed a novel concept on weight regulation by finding hormones that are produced in the adipocyte and interact with other organs. The finding leads to the discovery of a new role of the adipose tissue that functions as an endocrinologic organ, and not just as cells for energy storage (7).

Many possible pathophysiological mechanisms are involved in the development and maintenance of obesity. This field of research had been almost unapproached until leptin was discovered. Since this discovery, many other hormonal mechanisms have been elucidated that participate in the regulation of appetite and food intake, storage patterns of adipose tissue, and development of insulin resistance. Since leptin's discovery, ghrelin, orexin, PYY 3–36, cholecystokinin, adiponectin and many other mediators have been studied. The adipokines are mediators produced by adipose tissue; their action is thought to modify many obesity-related diseases.

Leptin and ghrelin are considered to be complementary in their influence on appetite, with ghrelin produced by the stomach modulating short-term appetitive control (i.e. to eat when the stomach is empty and to stop when the stomach is stretched). Leptin is produced by adipose tissue to signal fat storage reserves in the body, and mediates long-term appetitive controls (i.e. to eat more when fat storages are low and less when fat storages are high). Although administration of leptin may be effective in a small subset of obese individuals who are leptin-deficient, many more obese individuals are thought to be leptin-resistant. This resistance is thought to explain in part why administration of leptin has not been shown to be effective in suppressing appetite in most obese subjects.

While leptin and ghrelin are produced peripherally, they control appetite through their actions on the central nervous system. In particular, they and other appetite-related hormones act on the hypothalamus, a region of the brain central to the regulation of food intake and energy expenditure. There are several circuits within the hypothalamus that contribute to its role in integrating appetite, the melanocortin pathway being the best understood. The circuit begins with an area of the hypothalamus, the arcuate nucleus, that has outputs to the lateral hypothalamus (LH) and ventromedial hypothalamus (VMH), the brain's feeding and satiety centres, respectively.

The arcuate nucleus contains two distinct groups of neurons. The first group coexpresses neuropeptide Y (NPY) and agouti-related peptide (AgRP) and has stimulatory inputs to the LH and inhibitory inputs to the VMH. The second group coexpresses pro-opiomelanocortin (POMC) and cocaine- and amphetamine-regulated transcript (CART) and has stimulatory inputs to the VMH and inhibitory inputs to the LH. Consequently, NPY/AgRP neurons stimulate feeding and inhibit satiety, while POMC/CART neurons stimulate satiety and inhibit feeding. Both groups of arcuate nucleus neurons are regulated in part by leptin. Leptin inhibits the NPY/AgRP group while stimulating the POMC/CART group. Thus, a deficiency in leptin signalling, either via leptin deficiency or leptin resistance, lead to overfeeding and may account for some genetic and acquired forms of obesity.

In his lecture 'How undernutrition is associated with obesity and related diseases later in life', the above points were reiterated by Professor Dr Emanuel Lebenthal MD from International Institute of Pediatric Gastroenterology and Nutrition, Jerusalem. Small body size at birth followed by undernutrition with low BMI in the first 2 years of age and increased  $z$ -score or BMI after that age are associated with a high total fat mass in relation to lean body mass in adult life and with fat deposition on the trunk and liver. As stunting remains a problem in most developing countries, despite the virtual eradication of wasting in many, providing food supplements may be beneficial and should be followed to prevent obesity. The acknowledgement of the rising rates of obesity in young children in developing countries should lead to a careful reassessment of the energy needs of children participating in the feeding programmes and to the improvement of the quality of the foods provided.

Although national data on obesity across age groups were available only in 2008, its alarming condition in Indonesian urban areas has been observed in previous studies more than one decade earlier. The prevalence of obesity, defined as having BMI more than 95th percentile of Centers for Disease Control and Prevention (CDC) 2000 growth reference, in elementary schoolchildren in two urban locations, Yogyakarta and Denpasar, was 10% and 16%, respectively (8,9). Another survey in urban and rural households in Yogyakarta found that 8% of adolescents in urban and 2% in rural were obese, also defined as having BMI more than 95th percentile of CDC 2000 growth reference (10). Similar situation existed among the adults. In a nationwide survey of the provincial capitals in 1996/1997, 15% of male and 24% of female 18 years and older were overweight and obese (defined by BMI  $>25$  and  $>27$ , respectively), with the highest prevalence among 40–49 years (11).

Evidence that stunted Indonesian adults are more likely to be overweight than non-stunted adults was presented by Professor Hamam Hadi, MD, MS, ScD from Faculty of

Medicine, Gadjah Mada University, Yogyakarta. From a study covering 2700 adults aged 18–55 years in Bali, the prevalence of overweight (defined as having BMI  $> 25$ ) was higher in stunted (defined as WFH  $z$ -score  $> 2$  SD NCHS reference) than in non-stunted adults (22% and 19%, respectively) (9). Moreover, stunted adults were 1.2 times (OR: 1.23, 95% CI: 0.99; 1.52) more likely to be overweight than non-stunted adults. Moreover, further analysis indicated that stunted women were 1.5 times (OR: 1.5, 95% CI: 1.13; 2.1) more likely to be overweight than non-stunted women. Stunting as a more adequate indicator of poverty in Indonesia has been suggested (12).

Concurrent with the increased trend of obesity, the current prevalence of non-communicable diseases increased to 32% for hypertension among people above the age of 18 years, 8% for stroke among people above 15 years old and 7% for heart diseases (3). Ischemic heart disease, diabetes mellitus and hypertensive heart disease are among the top 10 causes of death in Indonesia, contributing to more than one-third (37%) deaths (13). If unhealthy lifestyle such as less consumption of fruit and vegetable in combination with less physical activity is continued by most of the Indonesian people, more serious health consequences can be expected in the near future. Most (94%) of the people above the age of 10 years ate vegetable and/or fruit less than the minimum 5 portion per day in a 7-day period (3). About half of the people of the same age group were not exercising enough, i.e. less than 10 min per activity and less than 150 min for 5 days within a week. Consuming once or more sweet and salty food daily was common (65% and 25%, respectively).

The direct cost of obesity was estimated 2% of the total health expenditure or amounted to 278 billion rupiahs, stated by Professor Ir. Hardinsyah Ridwan, MS, PhD from Department of Community Nutrition, Faculty of Human Ecology and Ir. Rina Oktaviani, MS, PhD from Department of Economics, Faculty of Economics and Management, Bogor Agricultural University, in their lecture on the economic cost of obesity. The cost will be higher if the indirect cost such as losses in productivity, income or other supporting cost is measured. This implies that efforts on the early prevention of obesity are urgently required; otherwise, healthcare cost for controlling both undernutrition and obesity of Indonesians will be higher and be burden of future development. Furthermore, a decrease on productivity will influence macro- and sectoral economic performance of Indonesia.

To overcome the double-burden problem faced by Indonesia, topped with inadequate and very low coverage of health services, low awareness and poor health seeking behaviour, a holistic approach is needed. It is important for Indonesia to: (a) spread a broader awareness of challenges of nutrition, including through nutrition education for school-age children, and applying balance diet and physical

activity as early as possible; (b) disseminate widely Key message 'Initiate healthier food choices'; (c) have a Holistic Healthy Framework Approach; (d) continue with basic research (epigenomic) as part of study in fast food and environment and (e) target programmes on: (i) pregnant women because this can reduce the number of small for gestational age infants and thus will reduce stunting of children; (ii) 'Window of opportunity' period, i.e. pregnancy to first 2 years of life, including support for exclusive breastfeeding and adequate and proper complementary feeding; (iii) female adolescents, reproductive age; (iv) schoolchildren for behaviour change and (v) to increase variety of health food such as fruit and vegetables the programmes can be targeted to specific sectors, such as supermarket. Attention should be made on the following: (a) wise distribution of food supplementation for stunted children; (b) quality of the food supplementation and (c) involvement of other stakeholders in combating obesity, other than Ministry of Health.

Dr Damayanti Rusli Sjarif, MD, SpA(K) from Department of Child Health, Faculty of Medicine, University of Indonesia, Jakarta, pointed out that prevention of obesity should largely focus on parent education about healthy lifestyle. In infancy, parent education should centre on promotion of breastfeeding, recognition of signals of satiety and delayed introduction of solid foods. In early childhood, education should include proper nutrition, selection of low-fat snacks, good exercise/activity habits and monitoring of television viewing. In cases where preventive measures cannot totally overcome the influence of hereditary factors, parent education should focus on building self-esteem and address psychological issues.

Achieving a healthy weight and an acceptable waist in adult must be carried out through dietary changes, increase physical activity and behaviour modification, confirmed Professor Sidartawan Soegondo, MD, PhD, FACE from Division of Endocrinology and Metabolism, Department Faculty of Medicine, University of Indonesia, Jakarta, in his lecture. Adopting an eating style that promotes weight loss must include lowering total calorie intake, e.g. by eating more plant-based foods – fruits, vegetables and whole grains, limit sugar, refined carbohydrates and some types of fat. One of the best ways to lose body fat is through steady aerobic exercise, such as walking for more than 30 min most days of the week. Changes in lifestyle, which include changes on how to think, feel and act, will result in a new approach to eating and activity.

It is timely for Indonesia to have Nutrition Guidelines, which consist of messages related to food consumption, healthy lifestyle, physical exercise and monitor nutritional status. The Guidelines should be simple enough to be understood by people with low educational level (about 40% of the population have only primary education) (14). However, it should be comprehensive enough to include

information on quantity of food (portion), quality (variety) and action to be followed (e.g. exercise regularly, monitor nutritional status). The Guidelines should be socialized to all age groups, with children as priority. A design that is popular for children should be sought after so that materials in the Guidelines can be easily understood by them. When children like it, the mothers and ultimately the parents will help disseminate the messages. In addition, BMI cut-off points of observed risk for Asian population of  $22 \text{ kg m}^{-2}$  to  $25 \text{ kg m}^{-2}$  (15) may be promoted to Indonesians. Asians generally have higher percentage of body fat than white people of the same age, sex and BMI; this lower cut-off may be a good early warning system. A perspective cohort study in Taiwan showed that death risk for Asians is 5 BMI unit points lower than the Caucasians, thus supporting the BMI cut-off of  $23 \text{ kg m}^{-2}$  for overweight in Asian population (as compared with  $25 \text{ kg m}^{-2}$  recommended internationally) (16).

Putting an end to malnutrition will lay the foundation for improving the health and well-being of the present generation and lead to benefits for the future generations. Thus, nutrition is the fundamental element to alleviate poverty, reduce undernutrition and consequently obesity.

### Conflict of Interest Statement

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