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Original Article

The effect of fresh goat's milk on anthropometric overview in healthy women

[El efecto de la leche fresca de cabra en la descripción antropométrica en mujeres sanas]

Yusni Yusni[1]*, Maryatun Maryatun[2]

[1]Department of Physiology, Faculty of Medicine, Universitas Syiah Kuala, 23111 Banda Aceh, Indonesia.
[2]Department of Internal Medicine, Faculty of Medicine, Universitas Syiah Kuala/dr. ZainoelAbidin Hospital, 23111 Banda Aceh, Indonesia.
*E-mail: yusni@unsyiah.ac.id

Abstract

Context: Most people believe that goat milk contains high fat; therefore, regular consumption of goat milk will increase body weight. This assumption needs to be proven to be able to utilize the use of milk to improve public health.

Aims: To analyze the effects of fresh goat milk on body weight and body mass index (BMI) in women.

Methods: The research was an experiment study (pretest-posttest with control group design). A total of 18 volunteers, female, healthy, and aged 18-19 years have participated in the study. The subjects were divided into two groups: intervention group (treated with fresh goat milk) and control group (untreated with goat milk). Fresh goat milk is given in the morning between 08:00-09:00 a.m with a dose of 1× 250 mg/day and given for 110 days. Subjects for both groups were not given a special diet and without any dietary restrictions during the study as well as treatment. The subjects used had met the inclusion and exclusion criteria as subjects.

Results: The results showed that there was a significant decrease of weight (before = 51.22 and after = 48.83; p = 0.001) and BMI (before = 21.18 and after = 20.02; p = 0.001) after goat milk consumption in the trial group. In the control group, there were no difference in weight (before = 53.72 and after = 53.05; p = 0.066) and BMI (before = 22.04 and after = 22.07; p = 0.068) before and after intervention of fresh goat milk.

Conclusions: Regular consumption of fresh goat milk decreased weight and BMI; therefore, goat's milk can be useful for healthy nutrition for women; meanwhile, many factors that influence anthropometry were not analyzed in this study. Further research is needed for its use in reducing body weight in people with overweight/obesity.

Keywords: body mass index; goat milk; weight; women.

Resumen

Contexto: La mayoría de la gente cree que la leche de cabra contiene mucha grasa; por lo tanto, el consumo regular de leche de cabra aumentará el peso corporal. Esta suposición debe probarse para poder utilizar el uso de leche para mejorar la salud pública.

Objetivos: Analizar los efectos de la leche fresca de cabra sobre el peso corporal y el índice de masa corporal (IMC) en mujeres.

Métodos: La investigación fue un estudio experimental (pretest-postest con diseño de grupo control). Un total de 18 voluntarios, mujeres, sanos y de entre 18 y 19 años, han participado en el estudio. Los sujetos se dividieron en dos grupos: grupo de intervención (tratado con leche fresca de cabra) y grupo de control (no tratado con leche de cabra). La leche fresca de cabra se administra por la mañana entre las 08: 00-09: 00 a.m con una dosis de 1× 250 mg/día y se administra durante 110 días. Los sujetos de ambos grupos no recibieron una dieta especial y sin restricciones dietéticas durante el estudio y el tratamiento. Los sujetos utilizados habían cumplido los criterios de inclusión y exclusión como sujetos.

Resultados: Los resultados mostraron que hubo una disminución significativa del peso (antes = 51,22 y después = 48,83; p = 0,001) y del IMC (antes = 21,18 y después = 20,02; p = 0,001) después del consumo de leche de cabra en el grupo de prueba. En el grupo control, no hubo diferencia en peso (antes = 53,72 y después = 53,05; p = 0,066) e IMC (antes = 22,04 y después = 22,07; p = 0,068) antes y después de la intervención de leche fresca de cabra.

Conclusiones: El consumo regular de leche fresca de cabra disminuyó el peso y el IMC; por lo tanto, la leche de cabra puede ser útil para una nutrición saludable de las mujeres; mientras tanto, muchos factores que influyen en la antropometría no fueron analizados en este estudio. Se necesita más investigación para su uso en la reducción del peso corporal en personas con sobrepeso/obesidad.

Palabras Clave: índice de masa corporal; leche de cabra; peso; mujeres.

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AUTHOR INFO
ORCID: 0000-0002-2351-8027 (YY)

INTRODUCTION

Goat milk is one of balanced healthy food that has many health benefits, therefore fresh goat milk can be consumed every day. However, based on our experience some young women refuse to consume goat milk because it is thought to increase weight. Determinants of adults weight include genetic, physical activity, and diet (high-carbohydrates, high-fat and low-fiber food intake) (Swinburn et al., 2004; Duvigneaud et al., 2007). Several studies have linked the consumption of dairy milk and dairy product with changes in body weight. A meta-analysis found that milk and dairy product consumption was not positively related to body weight (Chen et al., 2012; Schwingshackl et al., 2016). Research by Schwingshackl et al. (2016) found that yogurt has useful for weight with a positive impact to reduce weight gain and risk of obesity.

The intake of high-calorie foods and high-fat was resulting in increased accumulation of fat in adipocytes cells and lead to obesity (Duvigneaud et al., 2007). Prevalence of obesity and overweight has increased dramatically in the world including (Roemling and Qaim, 2012; Rachmi et al., 2017; Harbuwono et al., 2018). In Indonesia, about 23.1% of adults are obese (Harbuwono et al., 2018). The prevalence of obesity in Indonesia was higher in women (32.9%) than in men (19.7%) (Ministry of Health Republic of Indonesia, 2015; Harbuwono et al., 2018). The etiology of obesity is very complex and the risk factors for obesity include low physical activity or high sedentary behavior and diet (Essamy et al., 2017; Fruh, 2017; Rachmi et al., 2017). According to data from WHO, the amount of sedentary behavior is 20% of adult males and 27% of adult females, in 2010 (Chan and Chestnov, 2014). The imbalance between food consumption and physical activity have a risk to cause overweight or obesity in sedentary women (Nishida, 2004; Swinburn et al., 2004). Consumption of high-fat and high-carbohydrate foods and also due to lack of physical activity will increase the percentage of body fat, therefore it will cause overweight or obesity (Swinburn et al., 2004; Alexander and Wang, 2015).

The controversial perspective in Indonesian society is the consumption of milk including goat milk can increase weight and risk factors for overweight or obesity. It requires verification with a scientific study of the effect of goat milk consumption on anthropometry value (weight and BMI) in sedentary female. The results of this study confirm that goat milk as an inhibitory effect of weight gain and anti-obesity diet. Goat milk has contained Medium Chain Triglycerides (MCTs) (Getaneh et al., 2016). MCTs plays a role in inhibiting of appetite, reducing of the hunger hormone, ghrelin those effects to satiety (St-Onge and Jones, 2002; St-Onge et al., 2003; Marten et al., 2006; Huth et al., 2010). This study aims to determine the effect of giving goat milk on changes in body weight values and body mass index in adult women.

MATERIAL AND METHODS

Subject and research design

This study was an experiment study (pretest-posttest with control group design). This research was conducted from March to September 2016 at the Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, Aceh, Indonesia. Research subjects were 18 healthy female and aged 18-19 years. The inclusion criteria for the subjects were women, physically and mentally healthy, did not consume milk except goat's milk given to the experimental group or supplements containing high calcium, and were not on a special diet or therapy. The exclusion criteria for the subject were refusal as a subject and an athlete.

Subject divided into two groups: Nine people as an intervention group and nine people as a control group. An intervention group was a group that given fresh goat milk. The control group was a group without consuming goat's milk. The smallest number of subjects in this study was conducted using a sample calculation formula for experimental research. The number of samples was

nine people for each group that had met the inclusion and exclusion criteria of the sample. The determination of the subject as a control or intervention group was determined by simple random sampling using tables for random sampling. Subject recruitment procedures can be seen in Fig. 1.

Intervention and examination

Fresh goat milk was given for 110 days from April 11, 2016 to July 29, 2016, every morning with a dose of 250 mL/day. Fresh goat's milk obtained from goat farmers in Banda Aceh, Indonesia. Fresh goat's milk has been certified for consumption from the Agricultural Research and Technology Center (Baristan) Aceh, Indonesia. Anthropometric (body weight, body height and BMI) measurements were performed 2 times, before (0 day) and after goat milk intervention (day 111). Measurement of weight using weight scales. Height measurements were carried out using a high scale. The research subjects used were by the inclusion and exclusion criteria, therefore the results of this study could describe the effect of goat's milk on the anthropometric value.

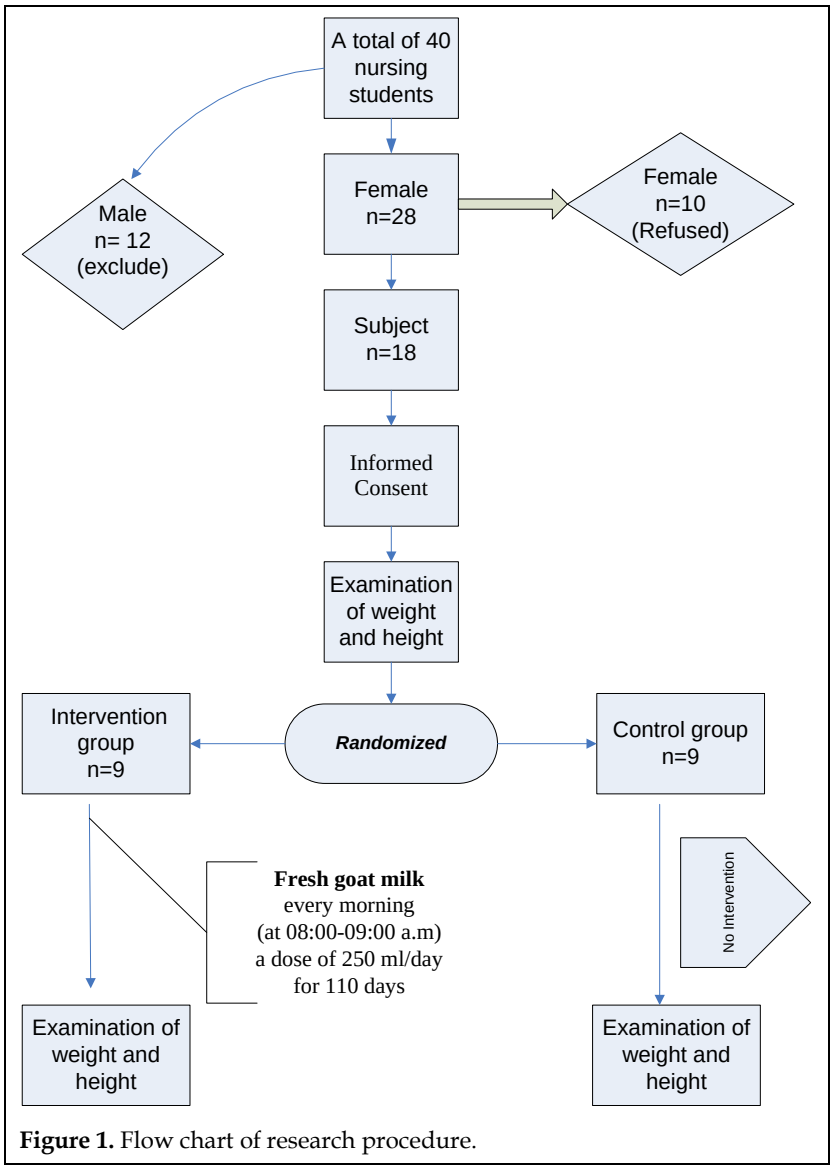

Figure 1. Flow chart of research procedure.

Data analysis and ethical approval

Independent sample t-test was performed to analyze the difference of weight and BMI before and after goat milk consumption in control and trial group. Paired t-test ($p<0.05$) was used to analyze changes in body weight and BMI before and after the intervention of goat's milk in both groups. This study has received approval from the ethics committee of health research, Faculty of Medicine, Universitas Syiah Kuala, Banda Aceh, Aceh province, Indonesia. All subjects have signed written informed consent. This research has been registered and gotten the ethical approval for research that uses humans as subjects with the registration number 304/KE/FK/2015.

RESULTS

Table 1 shows that no significant differences between physical characteristics including age, height, and blood pressure among the control group and treatment group ($p>0.05$). The results of this study indicate that the subject characteristics such as age, height, and blood pressure (systolic and diastolic) between the control and trial groups were not different; in consequence, the two groups were eligible for comparison.

The results of independent sample t-test ($p<0.05$) showed that weight and BMI before and after fresh goat milk intervention between groups were not significantly different ($p>0.05$), as shown in Table 2. The results of this analysis were followed by paired t-test analysis to analyze the effect of giving goat milk on the variables (weight and BMI) in each group, and the results are as in Table 3.

Analysis of paired t-test to determine the difference in weight and BMI before and after consuming fresh goat's milk between the control group and also the goat milk can be seen in Table 3. The results showed that the mean of weight and BMI decreased significantly ($p<0.001$) after consuming fresh goat milk in the trial group while in the control group did not show a difference in weight and BMI before and after treatment. The results of this study showed that the consumption of goat milk can lose weight and BMI. Therefore, regular consumption of fresh goat's milk does not lead to weight gain in sedentary female.

Table 1. Physical characteristics of research subjects before intervention (n = 9).

Parameters	Groups	Mean ± SD	P-value
Age (year)	Control	18.77 ± 0.44	1.000
	Goat milk	18.77 ± 0.44	
Height (cm)	Control	156.28 ± 3.09	0.65
	Goat milk	155.67 ± 2.65	
Systolic (mmHg)	Control	108.89 ± 11.66	0.313
	Goat milk	104.44 ± 5.28	
Diastolic (mmHg)	Control	75.56 ± 5.27	0.176
	Goat milk	74.11 ± 7.81	

Table 2. The difference of weight and BMI before and after intervention in control and trial group (n = 9).

Parameters	Data	Groups	Mean ± SD	P-value
Weight (kg)	Before	Control	53.72 ± 3.78	0.605
		Goat milk	51.22 ± 5.50	
	After	Control	53.05 ± 4.77	0.390
		Goat milk	48.83 ± 5.85	
BMI (kg/cm2)	Before	Control	22.04 ± 2.13	0.475
		Goat milk	21.18 ± 2.67	
	After	Control	22.07 ± 2.41	0.305
		Goat milk	20.02 ± 2.84	

Table 3. Comparison of weight and BMI before and after intervention in control and trial group (n = 9).

Parameters	Groups	Data	Mean ± SD	P-value
Weight (kg)	Control	Before	53.72 ± 3.78	0.066
		After	53.05 ± 4.77	
	Goat milk	Before	51.22 ± 5.50	0.001
		After	48.83 ± 5.85	
BMI (kg/cm^2)	Control	Before	22.04 ± 2.13	0.068
		After	22.07 ± 2.41	
	Goat milk	Before	21.18 ± 2.67	0.001
		After	20.02 ± 2.84	

DISCUSSION

In this study was found that goat's milk can reduce weight and also BMI in sedentary women. Milk is one of the sources of nutrients recommended as a well-balanced diet and healthy. Milk consumption including goat milk is beneficial to maintain health as well as dietary balance (Schwingshackl et al., 2016). Goat milk contains 3.5% protein, 3.8% fat, and 4.1% lactose. Lactose goat's milk is lower than cow's milk. Goat's milk has the same calories as cow's milk, which is about 70 kcal/100 mL (Mwenze, 2015). Goat milk also contains minerals and vitamins such as calcium, phosphorus, pantothenic acid, niacin, iron (in small quantities), folic acid, vitamin A, B1, B2, and vitamin B6, B12, C, D (Mwenze, 2015; Kim et al., 2016). Milk goat is a better source of nutrients when compared to cow's milk (Mccullough, 2006).

Goat milk also contains more essential fatty acids (arachidonic acids and linoleic) as well as medium-chain triglycerides acids (MCTs), short-chain and medium-chain fatty acids (MCFAs) that are beneficial to humans (Holvik, 2013; Mwenze, 2015). MCFA can be absorbed without the need for re-esterification (Marten et al., 2006). MCFA absorption rate is as fast as oxidative metabolism; therefore MCFA inhibits fat deposits in adipose tissue (St-Onge and Jones, 2002; Marten et al., 2006). MCFA increases abdominal fat loss and blood fat profile (Vaquil and Rathee, 2017). Goat's milk fat is different from cow's milk fat and acts as a contributor nutrition for humans. The content of goat milk fat is capric, caprylic acids and MCT,

which have several features: (1) easier-digested and absorbed, goat's milk fat is short chain fat or MCTs; (2) Fatty acids play a role in the metabolism of cholesterol thus inhibiting gallbladder fat deposits; (3) useful as patient therapy with malabsorption: gallstones, steatore, chyluria, intestinal resection, epilepsy, coronary bypass and cystic fibrosis (Lad et al., 2017).

Regular consumption of goat milk is scientifically associated with decreased risk of diabetes, cardiovascular disease, stroke, hypertension, and obesity. Goat milk fats also contain polyunsaturated fatty acids (PUFAs), medium chain triglycerides (MCTs), and monounsaturated fatty acids (MUFAs) are useful for cardiovascular conditions (Alferez et al., 2001; Haenlein, 2004). Deposits of fat in the body obtained from the consumption of foods containing high fat, but different from goat's milk fat. The results of the research have shown that giving fat and weight gain from goat milk, lose weight and body fat while HDL, triglyceride, GOT and GPT become normal (Haenlein, 2004; Rodrigues et al., 2014). Research conducted in children states that children who consume goat milk for 2 weeks resulted in weight loss of about 9% (Tripathi, 2015). Consumption of goat milk not only further lowers total cholesterol and LDL fraction by 36% compared to the cow's milk (21%), but also can significantly increase of intestinal fat intake and decrease the synthesis of endogenous cholesterol (Clark and García, 2017; Rubio-Martín et al., 2017). Goat's milk contains different fats with cow's milk as conjugated linoleic acid (CLA) (Haenlein, 2017; Lad et al., 2017). CLA acts as a potent anticarcinogen, decreases the risk of cardiovascular disease as well as body fat, therefore goat milk is useful to prevent overweight and obesity (Rodrigues et al., 2014).

Goat milk also contains fat digesting enzymes (lipase). This enzyme plays a role in the digestion of fat, thus preventing or inhibiting fat accumulation (Jandal, 1996; Holvik, 2013). Goat milk also contains special fats such as butyric (C4:0), caproic (C6:0), caprylic (C8:0), capric (C10:0), lauric (C12:0), myristic (C14:0), palmitic (C16:0) and the essential omega-3 linolenic (C18:2). All these fats are easily digestible and absorbed (Mccullough, 2006; Getaneh et al., 2016). In addition, the fat globules of goat milk are smaller than cow milk so that the smaller size contributes to easily absorbed and better tolerated in people with gastrointestinal disorders.

This study has several limitations such as the absence of restrictions or regulation of the number of calories consumed for the subject, measurement of weight and BMI only before and after treatment of goat's milk (preferably a weekly time series), and this study is only conducted on subjects with normal BMI. Therefore, this research needs to be continued to provide scientific evidence of the benefits of goat milk in controlling body weight and BMI in overweight/obese women.

CONCLUSIONS

The consumption of fresh goat milk regularly results in weight loss and BMI in the sedentary female. Therefore, we recommended that goat milk can be consumed regularly as a well-balanced diet. Goat milk has the effect of inhibiting weight gain in healthy female. This research requires further research so that goat's milk can be widely used in the community as a source of healthy and balanced nutrition.

CONFLICT OF INTEREST

The authors declare no conflicts of interests.

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AUTHOR CONTRIBUTION:

Contribution	Yusni Y	Maryatun M
Concepts or ideas	x	
Design	x	
Definition of intellectual content	x	
Literature search		x
Clinical trial	x	x
Experimental studies	x	
Data acquisition		x
Data analysis	x	x
Statistical analysis	x	
Manuscript preparation	x	
Manuscript editing	x	x
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