

## Hormonal contraception as a risk factor for obesity

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### Abstrak

Kontrasepsi hormonal berhubungan dengan perubahan dalam metabolisme beberapa zat gizi yang dapat menyebabkan terjadinya peningkatan berat badan. Penelitian ini bertujuan untuk menguji risiko obesitas pada pemakai kontrasepsi hormonal di Kabupaten Kulon Progo, Jogjakarta. Rancangan penelitian potong lintang digunakan untuk menentukan prevalensi obesitas pada penderita kontrasepsi. Sampling klusters acak sistematis dengan desa sebagai klusternya, digunakan untuk memilih 647 pemakai kontrasepsi di Kulon progo. Sebagai kasus didapat 102 pemakai yang 'obese' dan 102 orang sebagai kontrol, sebelumnya dilakukan kesetaraan untuk umur dan status sosial ekonomi pada kasus dan kontrol. Rancangan kasus kontrol dalam penelitian ini dilakukan untuk mengevaluasi risiko obesitas di antara pemakai kontrasepsi hormonal. Penelitian ini menunjukkan prevalensi obesitas di antara pemakai kontrasepsi di Kulon Progo adalah 15.9%. Pemakai kontrasepsi hormonal memiliki risiko menjadi obesitas sebesar 9.4 kali (95% CI: 1.1 – 81.5). Pemakai kombinasi pil terlihat memiliki risiko tertinggi, diikuti oleh pemakai susuk, sedangkan risiko pemakai 'implant' sama dengan pemakai kontrasepsi non hormonal. Risiko obesitas tidak berhubungan dengan asupan energi ataupun keluaran energi. Peningkatan risiko obesitas pada pemakai kontrasepsi hormonal tetap signifikan setelah dilakukan kontrol terhadap usia, paritas, berat badan awal, status sosial ekonomi, asupan energi dan keluaran energi serta obesitas pada orang tuanya. Kami menyimpulkan bahwa risiko obesitas lebih besar pada pemakai kontrasepsi hormonal dibandingkan dengan pemakai kontrasepsi nonhormonal. Pemakai kombinasi pil memiliki risiko tertinggi. (*Med J Indones 2005; 14: 163-8*)

### Abstract

Hormonal contraception is related to change in the metabolism of some nutrients that may lead to an increase in body weight. The aims of this study is to assess the risk of obesity in hormonal contraceptive users in the District of Kulon Progo, Jogjakarta, Indonesia. A cross sectional study was used to determine the prevalence of obesity among users of contraception. A systematic cluster random sampling, using villages as clusters, was used to choose 647 users of contraception in Kulon Progo. A hundred and two obese cases and 102 control, matched-for-age and socioeconomic status, controls were included in the case control study used to evaluate the risk of obesity among users of hormonal contraception. The prevalence of obesity among users of contraception in Kulon Progo was 15.9%. Users of hormonal contraception has a increased risk for obesity, OR: 9.4 (95% CI: 1.1 – 81.5). Users of combination pills faced the highest risk, followed by users of injected progesterone depot, while the risk in implant users was the same as that in users of non-hormonal contraception. The risk of obesity was significantly higher after 7 years of hormonal contraception use. The risk of obesity was neither related to energy intake nor expenditure. The increased risk of obesity in users of hormonal contraception was still significant after controlling for age, parity, initial weight, socioeconomic status, energy intake and expenditure, and parental obesity. We conclude that the risk of obesity is higher in users of hormonal contraception compared to the non-hormonal ones. Users of combination pills face the highest risk of obesity. (*Med J Indones 2005; 14: 163-8*)

**Keywords:** hormonal contraception, family planning, obesity, case control study

Family planning, as one of the Indonesian Government's program for development, strives to promote welfare by creating small, happy and prosperous families. One of the main efforts in Family Planning is birth arrangement, i.e. having 'ideal' number of children, ideal birth spacing between children and ideal age to give birth.<sup>1,2</sup> Most

of the success of birth arrangement is related to the use of contraception. There are many reasons for choosing one mode of contraception e.g. its effectiveness, its convenience or its minimal side effects.<sup>3,4,5</sup>

In the last five years there are an increase in the use of hormonal contraception in the District of Kulon Progo, Jogjakarta, Indonesia.<sup>6</sup> Hormonal contraception is known to be related to weight gain.<sup>5,7</sup> Progesterone in a steroid contraceptive drug influences the metabolism of nutrients, i.e. by promoting anabolism and by increasing appetite. Estrogen leads to the deposition of fat in the

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subcutaneous tissue and causes increased absorption of salt and water. The weight gain occurs gradually.<sup>8,9</sup>

Obesity is closely related to some diseases such as hypertension, coronary heart diseases, diabetes mellitus and respiratory diseases. Epidemiological studies have shown the increased risk of mortality and morbidity to such diseases in people with obesity.<sup>10</sup>

The study is intended to assess the risk of obesity in hormonal contraceptive users in the District of Kulon Progo, Jogjakarta, Indonesia.

## METHODS

This is a case control study, using obese contraceptive users as cases and non-obese contraceptive users as controls. A preliminary survey was done to find the prevalence of obesity in contraceptive users in the district and was carried out before the main study.

The study was performed in August – October 2001 in Kulon Progo Jogjakarta. Study population were female contraceptive users living in the district during the study period. Subjects were excluded if they still gave breastfeeding or had chronic diseases such as tuberculosis and malaria.

The study was approved by the ethical committee of Gadjah Mada University, Jogjakarta, Indonesia. Informed consents were obtained from every eligible subject.

### Sampling procedures

For a cross sectional survey intended to find the prevalence of obesity in female contraceptive users, 10% of villages were randomly chosen from 88 villages in the district. All female contraceptive users in 9 villages underwent anthropometrics measurements. Interviewers in this study are fieldworkers family planning who had education background in health science. Interview was done in subjects' houses. There were 103 obese subjects, i.e. BMI (body mass index) of more than 25.

Our of those 103 obese subjects, 102 became cases. One obese contraceptive user moved out from the village before the second part of the study. For those 102 cases, 102 non-obese female contraceptive users i.e. BMI of 18.5 to 24.9, matched for age, families' socioeconomic status and village, were chosen as controls. Matched for age is two group (age  $\leq$  35 year,  $>$  35 year).

Families socioeconomic status is two group. One group is preprosperous and stage I prosperous, another is stage II, III and III plus. Preprosperous family : families that are unable to fulfill even the minimum quantity of their own basic needs, such of food, clothing, housing and health. Prosperous family stage I; families that are unable to fulfill their minimum basic needs, but are still unable to meet their socio-psychological needs, such as education, family planning, communication within family, interaction with their immediate social environment, and their needs for transportation services. Prosperous family stage II: families that are able to meet their basic needs and theirs socio-psychological needs, but are still unable to fulfill their development needs, such as the need to save and to obtain information. Prosperous family stage III: families that are capable of fulfilling their basic, socio-psychological and development needs, but are still unable to give sufficient contribution to societal life, in terms of monetary, material and in their active participation social activities. Prosperous family stage III plus: families that are capable of fulfilling all their needs, i.e. basic, socio-psychological, developmental and social participation.

### Data collection

Data were collected using questionnaire forms and anthropometrics measurements. Training of interviewers and testing of questionnaires were performed before the actual data collection. All interviewers spoke the native languages.

The subject's height was measured with a *microtoise* to the nearest 0.1 cm, while her weight was measured with a Seca digital scale (Germany) to the nearest 0.1 kg. Due to the tropical weather, light clothing was the custom in the area. Data on weight and height was converted to BMI (body mass index), which is weight (in kg)/square of height (in m). Waist and hip circumferences were measured with non-stretchable tapes to the nearest 0.1 cm. Waist was measured at the level of the navel, while hip was measured at the largest circumference of the hip girdle.

Data on contraceptive utilization included the types of contraception presently used, either hormonal or non-hormonal, and the duration of utilization. The data that respondents might have used hormonal contraceptive sometime in the past was also recorded. Data on her initial body weight before the utilization of the latest contraceptive method was taken from her Family

Planning member's card. Other data in the questionnaire were age, parity, level of education, occupation, obesity in either parents and socioeconomic status based on family's income and national standard. This national standard of assessing family welfare divided families into 5 levels of welfare based on ability to purchase food, decent clothing and housing, and health services.

Data on food intake were collected by a 24-hour dietary recall. The dietary recall was performed on three non-consecutive recall days, one of them had to be on Sundays or holidays. Data on energy expenditure were also collected by a 24-hour activity recall. This activity recall was also performed three times, on the same day of the dietary recall.

Data on food intake were analyzed using Food Processor II Nutrition Analysis System 2400 Foods-30 nutrients (Cetapharm/MSD version 3.14, Salem, Oregon, USA), while data on daily energy expenditure were the sum of basal metabolic rate, energy expended for a specific activity per kg body weight per hour – using list by Guthrie, 1986 – and specific dynamic action (Auliana, 1999). Statistical analysis was 95% confidence intervals performed using Epiinfo 2000 version 1.0,<sup>11</sup> and stata.<sup>12</sup>

## RESULTS

Survey in 9 villages in the district found 647 contraceptive users, 103 of whom were obese (15.9%). This preliminary study showed that the village with the highest prevalence of hormonal contraceptive users (62.6%) had the highest prevalence of obesity (27.9%).

The reverse was also true, the less the hormonal contraceptive used, the less was the prevalence of obesity.

The hormonal contraceptives used by our respondents were combination pill (oral pill combination of estrogen and progesterone derivatives), intramuscularly injected depot of progesterone derivate and subcutaneous implantation of low-dose levonorgestrel or etonogestrel (implant). The non-hormonal contraceptives used were IUD (intra uterine devices) and tubectomy.

The hormonal contraceptive users had higher risk of being obese compared to the non-hormonal contraceptive users. The risk was highest for users of combination pill, followed by users of injected progesterone depot. Users of implant had no additional risk of obesity compared to the non-hormonal contraceptive users. The risk was still significant after controlling for age, parity, initial body weight, socioeconomic status, education, occupation, daily intake of energy and energy expenditure (see Table 1, 3 and 5).

There was no difference in the duration of contraceptive utilization between the obese group and the control group, but they had significantly different duration in using hormonal contraception (Table 2). This difference was still significant after adjustment of other variables in the multivariate model (Table 5) was done. A stratified analysis showed that utilization of hormonal contraception for more than seven years related to significantly higher risk of obesity (Table 4).

Obese parents tend to have obese daughter (Table 1 and 5). Hormonal or non-hormonal contraception did not show any significant effect on energy intake nor energy expenditure (Table 6).

Table 1. Univariate analysis of risk factors of obesity in users of contraception (for categorical variables)

Variable	Obese n = 102	Non-obese n = 102	Odds Ratio	95 % CI	p
<b>Methods of contraception</b>					
Hormonal	64	45	2.05	1.13 – 3.73	0.010
Non hormonal	38	57	1.00		
<b>Parity</b>					
Two or less	68	67	1.04	0.56 – 1.94	0.880
More than two	34	35	1.00		
<b>Level of Education</b>					
< 6 years education	65	67	0.92	0.50 – 1.70	0.770
≥ 6 years education	37	35	1.00		
<b>Occupation</b>					
Working outside	41	39	1.09	0.79 – 1.38	0.770
Housewives	61	63	1.00		
<b>Obese parents</b>					
Yes	37	19	2.49	1.25 – 4.97	0.004
No	65	83	1.00		

Table 2. Univariate analysis of risk factors of obesity in users of contraception (for continuous variables)

Variables	Obese Mean + SD <sup>=</sup>	Non obese Mean <sup>=</sup>	p
Total duration of using contraception (months)	66.2 ± 57.6	73.9 ± 68.2	0.390
Duration of using hormonal contraception (months)	65.0 ± 56.6	48.8 ± 37.7	0.046
Initial weight (kg)	52.9 ± 7.9	45.5 ± 6.1	< 0.001
Height (cm)	151.3 ± 5.6	150.7 ± 5.8	0.600
Waist and hip ratio	0.84 ± 0.05	0.81 ± 0.5	< 0.001
Energy expenditure (Kcal)	1889.8 ± 132.0	1759.7 ± 114.3	< 0.001
Intake of energy (Kcal)	1925.1 ± 123.6	1780.8 ± 101.9	< 0.001
Intake of energy (In % RDA <sup>‡</sup> )	92.3 ± 5.7	93.5 ± 4.5	0.080
% Intake of Fat <sup>§</sup>	23.6 ± 9.5	24.7 ± 9.3	0.400
% Intake of Carbohydrate <sup>§</sup>	63.5 ± 10.1	62.0 ± 10.4	0.300
% Intake of Protein <sup>§</sup>	12.0 ± 3.1	12.8 ± 3.8	0.120

<sup>=</sup>SD, standard deviation, <sup>‡</sup>RDA, recommended dietary allowance, <sup>§</sup>of total energy

Table 3. Types of contraception and risk of obesity

Contraceptive	Obese n = 120	Non-obese n = 120	Odds Ratio	95% CI	p
Hormonal					
Combination Pill	19 (18,63)	9 (8,82)	3,17	1.20 – 8.53	0.009
Injected progesterone depot	27 (26,47)	16 (15,69)	2,53	1.13 – 5.70	0.010
Implant	18 (17,65)	20 (19,61)	1,35	0.59 – 3.08	0.440
Non hormonal <sup>=</sup>	38 (37,25)	57 (55,88)	1,00		

<sup>=</sup> reference

Table 4. Risk of obesity related to the duration of using hormonal contraception

Duration	Types contraception	Odds Ratio	95% CI	p
> 7 years	Hormonal	8.00	1.33 – 61.73	0.007
	Non Hormonal <sup>=</sup>	1.00 <sup>=</sup>		
> 6 years	Hormonal	3,60	0.95 – 14.33	0.030
	Non Hormonal <sup>=</sup>	1.00 <sup>=</sup>		
> 5 years	Hormonal	3,90	1.20 – 13.22	0.010
	Non Hormonal <sup>=</sup>	1.00 <sup>=</sup>		
> 4 years	Hormonal	2,30	0.90 – 5.92	0.050
	Non Hormonal <sup>=</sup>	1.00 <sup>=</sup>		
> 3 years	Hormonal	2,40	1.09 – 5.23	0.180
	Non Hormonal <sup>=</sup>	1.00 <sup>=</sup>		
> 2 years	Hormonal	2,10	1.05 – 4.08	0.220
	Non Hormonal <sup>=</sup>	1.00 <sup>=</sup>		
> 1 years	Hormonal	1,90	1.01 – 3.57	0.030
	Non Hormonal <sup>=</sup>	1.00 <sup>=</sup>		

<sup>=</sup> reference

Table 4. Risk of obesity related to the duration of using hormonal contraception

Duration	Types of contraception	Non obese	Obese	Odds Ratio	95% CI	p
> 1 year to 4 years	Hormonal	17	33	2.04	0.77 – 5.38	0.150
	Non Hormonal <sup>=</sup>	15	9	1.00 <sup>=</sup>		
> 4 years to 7 years	Hormonal	12	12	1.20	0.38 – 3.83	0.760
	Non Hormonal <sup>=</sup>	12	10	1.00 <sup>=</sup>		
> 7 years	Hormonal	3	13	8.31	1.98 – 34.93	0.002
	Non Hormonal <sup>=</sup>	23	12	1.00 <sup>=</sup>		

<sup>=</sup> reference

Table 4. Risk of obesity related to the duration of using hormonal contraception

Duration	Types of contraception	Non obese	Obese	Odds Ratio	95% CI	p
> 1 year to 3 years	Hormonal	21	19	1.36	0.41 – 4.53	0.620
	Non Hormonal <sup>=</sup>	9	6	1.00 <sup>=</sup>		
> 3 years to 5 years	Hormonal	13	17	2.83	0.85 – 9.47	0.090
	Non Hormonal <sup>=</sup>	13	6	1.00 <sup>=</sup>		
> 5 years to 7 years	Hormonal	5	9	1.29	0.26 – 6.27	1.000
	Non Hormonal <sup>=</sup>	5	7	1.00 <sup>=</sup>		
> 7 years	Hormonal	3	13	8.31	1.98 – 34.93	0.002
	Non Hormonal <sup>=</sup>	23	12	1.00 <sup>=</sup>		

<sup>=</sup> referenceTable 5. Odds ratio of obesity in users of contraception<sup>=</sup>

Covariates	Multivariate Odds Ratio	95% CI	p
<b>Types of contraception used</b>			
Hormonal	9.40	1.09 – 81.5	0.040
Non hormonal	1.00 (reference)		
Duration of using hormonal Contraception (month)	1.03	1.002 – 1.06	0.040
<b>Obese parents</b>			
No	1.00	0.002 – 0.64	0.020
Yes	25.00 (reference)		

Table 6. Food intake and energy expenditure of hormonal and non-hormonal contraceptive users

Variables	Hormonal Mean $\pm$ SD <sup>=</sup>	Hormonal Mean $\pm$ SD <sup>=</sup>	p
Energy (Kcal)	1871.9 $\pm$ 140.3	1831.2 124.0	0.030
Energy (in % RDA <sup>‡</sup> )	92.5 $\pm$ 5.47	93.3 4.9	0.290
% Intake of Fat <sup>§</sup>	23.4 $\pm$ 9.0	25.1 9.9	0.180
% Intake of Carbohydrate <sup>§</sup>	63.8 $\pm$ 9.3	61.4 11.2	0.100
% Intake of Protein <sup>§</sup>	12.3 $\pm$ 3.6	12.5 3.6	0.730
Energy expenditure (Kcal)	1843.7 $\pm$ 148.9	1803.0 124.7	0.040

<sup>=</sup>SD, standard deviation, <sup>‡</sup>RDA, recommended dietary allowance, <sup>§</sup> of total energy

## DISCUSSION

Our data shows that users of hormonal contraception, face over all about 9 times risk of obesity compared to users of non-hormonal contraception. The risk is highest when the method of contraception has been used for more than seven years. Kasseru in 1994 reported that injected depot medroxyprogesterone acetate increased weight approximately 2 kg in the first year, while kaushik in 1998 reported a weight gain of 4-6 pounds in the first year.<sup>5,7,13,14</sup> Cushman et al (1996), also reported that more than 50% of hormonal contraceptive users believed that injected Depo-Provera led to weight gain.<sup>15</sup>

Our study also showed increased risk of obesity in users of injected progesterone depot, OR: 2.53 (95% CI: 1.1-5.7), but the risk is higher in users of combination pills, OR: 3.17 (95% CI: 1.2-8.5).

Duration in utilization of hormonal contraception is related to higher risk of obesity. Our data showed a steadily increasing risk of obesity the longer the contraception is used. After seven years of using hormonal contraception the risk of obesity is 8.3 folds higher intramuscularly injected depot of progesterone or subcutaneous implantation of low-dose levonorgestrel or etonorgestrel (implant). Longer use of hormonal contraception related to higher risk of obesity. The risk is also higher in offsprings of obese parents.

## Recommendations

Offspring of obese parents should be advised to avoid using hormonal contraception, especially combination pills and injected progesterone depot. To avoid obesity, after seven years, continuous utilization of hormonal contraception should be reconsidered.

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