

## ORIGINAL ARTICLE

# Weight Change at 12 Months among Hormonal Contraceptive Users at Nur Sejahtera Clinics of National Population and Family Development Board (LPPKN): A Retrospective Study

Hanis Harlida Zaini<sup>1</sup>, Cheong Ai Theng<sup>2</sup>, Abdul Hadi Abdul Manaf<sup>2</sup>

<sup>1</sup> Jelai Health Clinic, Ministry of Health

<sup>2</sup> Department of Family Medicine, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia

## ABSTRACT

**Introduction:** Weight gain was among the most common side effects that caused women to discontinue using hormonal contraception. However, previous literature had reported inconsistent findings of the association between hormonal contraception and weight change. This study aimed to determine the impact of hormonal contraceptive use on weight gain and factors associated with weight gain among the hormonal contraceptive users. **Methods:** A retrospective cohort study was conducted in four Nur Sejahtera Clinics using universal sampling method between September to November 2021. This study recruited women that had been using the hormonal contraception continuously for at least 12 months and had their weight measure at baseline and 12 months. Sociodemographic and clinical characteristic of the participant, weight measurement at baseline and 12 months and the type of hormonal contraception used were retrieved from the records. Multiple logistic regression was used to examine the factors associated with >5% weight gain. **Results:** A total of 366 samples were recruited. About one-third (33.6%) of hormonal contraceptive users had their weight gain more than 5% from their baseline weight. The risk factor for weight gain more than 5% were women with aged less than 40 years (AOR=2.09; 95% CI:1.26,3.45) and Etonogestrel (ENG) implant user (AOR = 7.91; 95% CI:2.69,23.24). **Conclusion:** One third of the hormonal contraception users had their weight gain greater than 5%. Lifestyle intervention to prevent weight gain could be targeted at high-risk users who are less than 40 years old and those on ENG implant.

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## Corresponding Author:

Cheong Ai Theng, PhD

Email: cheaitheng@upm.edu.my

Tel: +603-97692538

## INTRODUCTION

Family planning serves several critical important needs for reducing unintended pregnancies and allowing longer birth spacing, which can improve children's health and nutritional status and reduce maternal mortality. However, Malaysia's contraceptive prevalence rate (CPR) is still low, only 33.1% compared to the global rate of 48.5% and lesser than the neighbouring countries, for example, Vietnam (56.8%), Thailand (47.9%), Indonesia (44%), and Singapore (39.2%) (1).

Among the available methods of modern contraception, hormonal type contraception such as contraceptive pills (41.9%) and injectable contraception (20.9%) was preferred compared to non-hormonal contraception

such as condoms (20.4%) and intrauterine copper devices (14.5%) (2). These hormonal type contraceptives were preferred (contraceptive pills and injectable contraception) in view of its effectiveness, easy to use and inexpensive (2). However, perception of weight gain from using hormonal contraception had become a barrier for women to initiate and a factor in discontinuing hormonal contraception (3,4) though evidence from systematic review was inconclusive about the impact of hormonal contraception and weight gain (4,5).

Several mechanisms for weight gain of the use of hormonal contraception were postulated which are either increase in one or more factors of fluid retention, muscle mass and fat deposition, however there was no direct causal link between weight gain and hormonal contraception (5). It is also postulated that combined hormonal contraceptives could result in increased in food intake due to physiological effect on satiety and appetite (5). Estrogen was thought to cause fluid retention, which can lead to increased body weight,

breast tension and swelling of the extremities (6). Whereas progesterone has been shown to stimulate hunger and promote binge or emotional eating (7).

There is inconclusive evidence regarding weight change resulting from hormonal contraceptive methods. Two Cochrane systematic reviewed had been conducted to examine the effect of combination hormonal contraceptives and progestin-only contraceptive on weight respectively (4,5). The Cochrane systematic review by Gallo et al on 49 trials has reported that the available evidence was insufficient to determine the effect of combination hormonal contraceptives on weight due to the limited number of placebo-controlled trials (5). Another Cochrane systematic review by Lopez et al consisting of 16 studies that assessed progestin-only contraceptives (POC) on weight change revealed the majority of the studies (12 studies) compared with another contraceptive group (non-hormonal methods or combined oestrogen progestin pill) showed no significant changes (4). Studies that were included in the systematic review were mainly conducted in the USA, South America, Europe, Africa, and Asia (Thailand and Filipina)(4).

In Malaysia, there is limited study available in studying the effect of hormonal contraception on users' weight. There was only one study found and it was conducted at government health clinics in Kelantan (8). The result showed mean weight gain among hormonal users was significantly higher than non-hormonal methods (adjusted mean weight change 2.85 kg vs. 0.46 kg,  $p$ -value  $<0.001$ ) (8). The majority of the participants was Malay (96.3 %), and this could not represent the multiracial population in Malaysia (8). The hormonal contraception used in that study were combined oral contraceptive pills (COCP), progestogen pills, and depot-medroxyprogesterone acetate (DMPA), which were available in government health clinics (8). It did not include Etonogestrel Implant which is also a common hormonal method available in private health settings and family planning services under the National Population and Family Development Board (LPPKN).

To address the knowledge gaps, this study aimed to examine the profile of weight change among different types of hormonal contraception in Nur Sejahtera Clinics which provide family planning services under the National Population and Family Development Board (LPPKN) at the state of Federal Territory of Kuala Lumpur and factors associated with weight gain among the hormonal contraceptive users. The findings of this study could help in patient management when counsel women on choices of contraception. In addition, by knowing the factors associated with weight gain among hormonal contraceptive users, health care providers could identify those women who are at risk of weight gain early and timely intervention could be initiated to mitigate their risk of weight gain.

## MATERIALS AND METHODS

### Study design and participants

This was a retrospective cohort study using a secondary data of women registered with the family planning services in four Nur Sejahtera Clinics under the National Population and Family Development Board (LPPKN) at the state of Federal Territory of Kuala Lumpur. LPPKN is a government statutory body providing family planning services and has additional hormonal contraception which is Etonogestrel (ENG) Implant that was not widely available in government health clinics. Other hormonal types of contraception available in LPPKN included combined oral contraceptive pill (COCP) with Ethinyl Estradiol (EE) 20 µg, COCP EE 30 µg and DMPA injections. However, hormone-releasing intrauterine device was not provided in LPPKN. The non-hormonal types of contraception provided by LPPKN included copper intrauterine device and condom.

Data was collected between 1 September 2021 until 31 November 2021. The population consisted of women continuously using hormonal contraceptive methods for at least 12 months and had their weight measured at baseline and at 12 months after the initiation of hormonal contraception during the year of 2017-2019. Records of women who did not fulfill the above mentioned criteria, switch to another type of contraception within 12 months used and women with metabolic disease such as hypothyroid and diabetes were excluded.

### Sample size

Sample size was calculated according to the sample size formula for hypothesis of single proportion based on a study done by Yen Chi et al. (2009)(9). The study showed 26.1% of depot-medroxyprogesterone acetate (DMPA) user had their weight increase  $>5\%$  at 6 months of duration (9). The estimated sample size was 296 and the minimum sample size was 370 with account for 20% non-responders.

### Sampling method

Universal sampling was used in this study. The sample size needed was 370 participants. The estimated total number of patients registered in four LPPKN clinics at the state of Federal Territory of Kuala Lumpur were around 900 per year. Out of the number of patients registered, it was estimated 60% of the patients chose hormonal contraception. From the literature report, it was estimated only about 24% of women would continue using the same contraception for a year (8). Thus, the expected respondents using the same type of hormonal contraception at least for twelve months was 130. To meet the minimum sample size of 370, total duration of three years' records was included in this study.

### Data collection

Data was retrieved from the family planning record card that used for documentation of family planning

consultation and management. Data collection form consisted of four sections. Section A examined the participant's sociodemographic details, section B examined the maternal obstetric history, section C examined the clinical profile which were the weight (at baseline and 12th month) and body mass index (BMI) and section D examined the types of hormonal contraception used i.e. combined oral contraceptive pill (COCP) with Ethinyl Estradiol (EE) 20 µg, COCP EE 30 µg, DMPA injections and Etonogestrel (ENG) Implant.

### Data analysis

Data were analysed using IBM SPSS version 26. Descriptive statistics was used to summarise the participants' socio-demographic characteristic. Categorical variables were described as frequency and percentage. Numerical variables were described as mean and standard deviation for normally distributed data or median and interquartile range for data that was not normally distributed. The dependent variable for this study was the percentage of weight changes of contraceptive users. Body weight change was calculated as the difference in weight at twelfth month with the weight at baseline when hormonal contraception was initiated. Weight change then was categorised into 2 groups which is ">5% weight gain" and "≤ 5% weight gain" (9). Percentage of weight change was chosen instead of mean weight change as our participants started at differing weights and body mass index. 5% of weight change was chosen as the cut-off point as it was the value defined as excessive weight change in previous literature (9) and weight change of 5% had shown to have an impact on cardiometabolic outcomes for weight reduction intervention (10,11). In the ≤ 5% weight gain group it included those that had gaining weight less than 5%, no change in weight and those who had lost weight. The independent variables were age, parity, race, education level, monthly household income, employment status, and baseline BMI.

For sociodemographic, monthly household income was classified into 3 groups based on Household Income And Basic Amenities Survey Report 2019, namely high income (T20), middle income (M40), and low income (B40) (12). While BMI was categorised into underweight (BMI < 18.5 kg/m<sup>2</sup>), normal (BMI 18.5 to 22.9 kg/m<sup>2</sup>), overweight (BMI 23.0 to 27.4 kg/m<sup>2</sup>) and obese (BMI ≥ 27.5 kg/m<sup>2</sup>) (10).

The association between the study factor and weight changes was assessed using Chi-square test, simple logistic regression followed by multiple logistic regression. Factors with p-values less than 0.25 (age, race, parity and type of contraception) in simple logistic regression analysis were included in the multiple logistic regression. Multicollinearity of the independent variables was tested by examining the Variance Inflation Factor (VIF) and Tolerance statistics. The VIF value was

all below 10 (ranged 1 to 1.5) and the tolerance was all above 0.2; therefore, there is no collinearity between the independent variables (13). The model fitness was assessed using the Hosmer-Lemeshow goodness of fit test. The outliers were checked using the Cook's distance, leverage value, studentized and standardized residual and the values were within the acceptable limit.

### Ethical issues

This study had obtained the ethical approval from Ethics Committee for Research involving Human Subjects, Universiti Putra Malaysia (JKEUPM-2021-191).

### RESULTS

A total of 1478 records registered from January 2017 until December 2019 were selected and screened according to inclusion and exclusion criteria. Out of this, 366 records (24.7%) fulfilled the criteria of the use of same hormonal contraceptive measure for a year, all of which were included in the study.

The mean age of the participants was 39.17 (SD 6.30) and the age ranged from 23 to 55 years old. The majority of the participants were of Malay ethnicity (79.8%, n=292), received education up to tertiary level (54.1%, n= 198), and were employed (80.1%, n =293). Almost half of the participants were from the low-income group (48.1%, n = 176). 61.7% of the participants were from the high BMI group (overweight and obese) and 54.9% of the participants were ENG implant users (Table I).

There was 66.4% (243/366) of the hormonal contraceptive users had ≤ 5% weight gain (included those that had gaining weight less than 5%, no change in weight and those who had lost weight) at one year (Table II). Out of this, 2.8% (7/243) had no change in weight, 56.8% (138/243) had weight gain which ranged from 0.5 kg to 2.7 kg, and 41.2% (100/243) lost their weight ranging from 0.1kg to 13.7 kg. One third (33.6%, 123/366) of the hormonal users (included those on COCP, DMPA, ENG implant) had >5% weight gain at one year and 16.4% (60/366) of the users had >10% weight gain. Only 0.5% of the participants (2/366) had >20% weight gain.

Bivariate analysis using Chi-square and Fisher's Exact Test showed that age group and type of hormonal contraception were significantly associated with weight gain (Table III).

Variables with P value < 0.25 in simple logistic regression were age, race, parity and type of contraception. These variables were included in the multiple logistic regression model. Results of multiple logistic regression showed that women with age < 40 years old was 2.09 times likelihood to gain weight (AOR = 2.09; 95% CI 1.26, 3.45, p = 0.004). The odds for ENG implant users to gain weight was 7.91 times more compared to COCP

**Table I: Participants' characteristics**

Characteristics (n=366)	Mean (SD)	Median (IQR)	n (%)
<b>Weight</b>			
Baseline weight (kg)	62.54 (12.33)		
Weight at 12 months (kg)	64.59 (12.94)		
<b>Parity</b>		3.00 (2.00)	
<b>Age group</b>			
<40 years old			192 (52.5)
≥ 40 years old			174 (47.5)
<b>Race</b>			
Malay			292 (79.8)
Chinese			39 (10.6)
Indian			5 (1.4)
Others			30 (8.2)
<b>Educational level</b>			
Primary education			5 (1.4)
Secondary education			163 (44.5)
Tertiary education			198 (54.1)
<b>Monthly household income</b>			
B40 (<RM4850)			176 (48.1)
M40 (RM4,851 - RM10,970)			146 (39.9)
T20 (>RM10,970)			44 (12.0)
<b>Employment status</b>			
Unemployed			73 (19.9)
Employed			293 (80.1)
<b>Baseline BMI (kg/m<sup>2</sup>)</b>			
Underweight			20 (5.5)
Normal			120 (32.8)
Overweight			127 (34.7)
Obese			99 (27.0)
<b>Types of contraception</b>			
COCP EE 20mg			45 (12.3)
COCP EE 30mg			33 (9.0)
DMPA			87 (23.8)
ENG Implant			201 (54.9)

EE 20mg users (AOR = 7.91; 95% CI 2.69,23.24, p = <0.001). While the odds of gaining weight were not significantly different between DMPA and COCP EE 20mg users (p = 0.937), and between COCP EE 30mg and COCP EE 20mg users (p = 0.509) (Table IV).

**Table II: Body weight change based on types of contraception**

Types of contraception	Body weight change (kg)		Body weight change (% of baseline body weight)			
	n (%)	Mean (SD)	≤ 5% weight gain		>5% weight gain	
			Weight loss n (%)	No weight change n (%)	Weight gain up to 5% n (%)	Weight gain more than 5% n (%)
COCP EE 20mg	45 (12.3)	-0.11 (3.36)	21 (46.7)	0 (0)	20 (44.4)	4 (8.9)
COCP EE 30mg	33 (9.0)	0.98 (2.18)	10 (30.3)	1 (3.0)	17 (51.5)	5 (15.2)
DMPA	87 (23.8)	1.84 (2.90)	16 (18.4)	5 (5.7)	43 (49.4)	23 (26.5)
ENG Implant	201 (54.9)	2.86 (4.50)	53 (26.4)	1 (0.5)	56 (27.9)	91 (45.3)

**Table III: Association of sociodemographic characteristics and types of hormonal contraception with the status of weight change**

Variables	≤ 5% weight gain n=243 (%)	> 5% weight gain n=123 (%)	X <sup>2</sup>	p-value
<b>Age group</b>				
<40 years old	109 (56.8)	83 (43.2)	13.86	<0.001
≥40 years old	131 (75.3)	43 (24.7)		
<b>Race</b>				
Malay	189 (64.7)	103 (35.3)	1.80	0.180*
Non - malay	54 (73.0)	20 (27.0)		
<b>Employment status</b>				
Employed	192 (65.5)	101 (34.5)	0.49	0.483*
Unemployed	51 (69.9)	22 (30.1)		
<b>Education status</b>				
Tertiary level	124 (62.6)	74 (37.4)	2.74	0.098
Others	119 (70.8)	49 (29.2)		
<b>Monthly income</b>				
B40 (<RM4850)	120 (68.2)	56 (31.8)	0.79	
M40 (RM4,851 - RM10,970)	93 (63.7)	53 (36.3)		0.674
T20 (>RM10,970)	30 (68.2)	14 (31.8)		
<b>Baseline BMI</b>				
Obese	66 (66.7)	33 (33.3)	0.005	0.946*
Non- obese (Normal, underweight,overweight)	177 (66.3)	90 (33.7)		
<b>Type of contraception</b>				
COCP EE20mg	41 (91.1)	4 (8.90)	31.6	<0.001
COCP EE30mg	28 (84.8)	5 (15.2)		
DMPA	64 (73.6)	23 (26.4)		
ENG Implant	110 (54.7)	91 (45.3)		

X<sup>2</sup> =Chi-square test \*Fisher's Exact Test

**DISCUSSION**

This study adds on the new knowledge to previous findings from a local study (8). The previous local study had shown women using hormonal contraceptive methods had significantly higher body weight change compared to non-hormonal users (8). Our study had

Table IV: Factors associated with &gt;5% weight gain

Variables	Simple logistic regression		Multiple logistic regression	
	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
<b>Parity</b>	0.89 (0.77-1.05)	0.161	1.58 (0.78 – 3.21)	0.203
<b>Age</b>				
<40 years	2.42 (1.54-3.80)	<0.001	2.09 (1.26 – 3.45)	<b>0.004</b>
≥40 years	1.00		1.00	
<b>Race</b>				
Malay	1.47 (0.84-2.59)	0.181	1.15 (0.62 – 2.14)	0.651
Non-Malay	1.00		1.00	
<b>Employment status</b>				
Employed	1.22 (0.70-2.12)	0.483	-	
Unemployed	1.00			
<b>Education level</b>				
Tertiary	1.25 (0.83-1.89)	0.287	-	
Others	1.00			
<b>Monthly income</b>				
B40	1.00 (0.49 – 2.03)	1.000	-	
M40	1.22 (0.56 – 2.51)	0.586		
T20	1.00			
<b>Baseline BMI</b>				
Obese	1.02 (0.62-1.66)	0.946	-	
Non-obese	1.00			
<b>Type contraception</b>				
COCP EE20mg	1.00		1.00	
COCP EE30mg	1.83 (0.45-7.42)	0.397	2.13 (0.51 – 8.88)	0.301
DMPA	3.68 (1.12-11.42)	0.024	2.96 (0.94 – 9.34)	0.065
ENG Implant	8.50 (2.93-24.56)	<0.001	7.91 (2.69 – 23.24)	<b>&lt;0.001</b>

CI = Confidence interval, OR = Odds ratio

Enter method was applied for multiple logistic regression analysis.

Hosmer Lemeshow test (p= 0.801) which indicates that the model fitted well.

No multicollinearity (IVF ranged 1-1.5) found among the independent variables.

added on the information by informing that ENG implant users had significantly higher odds of weight gain compared to COCP EE 20mg users. In addition, we also showed that the odds of gaining weight were not significantly different between DMPA, COCP EE 30mg and 20mg users.

In this study, we found one third (33.6%) of the participants gained >5% of their baseline weight after 1-year of hormonal contraception usage. This finding was consistent with a study conducted in Texas that showed that 26.1% of DMPA users had their weight increase by > 5% at 6 months (9). On the other hand, a study conducted in Nigeria reported only 12.9% gained weight >10% from baseline among hormonal contraceptive users of COCP, Norplant subdermal implant, and DMPA (14). Whereas, our study reported 16.4% (60/366) of the users had >10% weight gain, which this were higher than the literature (14).

Literature had showed that overweight and obesity have various implications on one's health in long term which include increasing risks for chronic diseases such as type 2 diabetes mellitus, cardiovascular diseases, chronic back pain, osteoarthritis and cancers (15–18). In addition, overweight and obesity are also affecting the well-being and psychosocial functioning of those

who had these conditions which weight stigma was associated with body image dissatisfaction, reduced self-esteem and increased risk of depression and anxiety (19,20). The weight gain in using hormonal contraception could further increase the risk of women for the above complications especially for women who are already overweight or obese at baseline. Thus, identifying types of hormonal contraception that increase the risk of weight gain is important for helping the women in mitigating the risks of morbidities and mortalities that associated with overweight and obese. This is very relevant in view of overweight and obese is a prevalent condition among women (29.3% and 38.8% respectively) in Malaysia (21) and in our study 61.7% of the women were overweight or obese at baseline.

We identified two significant risk factors for weight gain more than 5% from their baseline weight which were the age and the use of ENG Implant. Our study found that women less than 40 years were more likely to gain weight compared to those women aged 40 years and above. These findings were contradicting with the findings from the literature which showed that there was no relationship between age and weight change (22–25). Pathogenesis of obesity is complex that involves the interplay between genetic, hormonal, environmental and psychosocial factors which mediate food intake and



energy expenditure (26). Though women in younger age group might be more physically active and had higher basal metabolic rate which reduce their risk for weight gain, the older women might be more aware and caution with their health and practice healthy lifestyle that reduce their risk in weight gain. We were unable to explain the causes that contributing to our findings in this study due to limited information captured regarding the lifestyle of the participants. Further study is needed to examine the association between the age and risk of weight gain among women using hormonal contraception.

In our study, ENG implant users were found to significantly gain weight (>5% of their baseline weight) compared to COCP EE 20ug in our study population. However, previous literature did not report the similar findings (27,28). A retrospective study conducted in USA had reported that the long term used of ENG implant did not cause significant weight gain (27). Also another prospective cohort study from USA reported no different in body weight and composition between hormonal and non-hormonal contraception (28). The difference could be due to different genetic susceptibility to hormonal weight gain in different population, which the Asian population in our study might be more susceptible to weight gain with the use of ENG implant compared to the population in USA.

#### Implication of practice

The findings of this study could help in patient management when counsel women on choices of contraception. Women seeking contraception should be informed about the benefits and drawbacks of each hormonal contraception methods to make an informed decision about the best method that can be tailored to their needs. Weight monitoring for hormonal contraceptive users by health care providers is essential in particularly paying attention to those on ENG implant users. Further action plans should be applied to those at risk of gaining weight by providing advice on adopting a healthy lifestyle.

Nevertheless, in view of the limitation of the retrospective study and small sample size of COCP EE 20mg, COCP EE 30 mg and DMPA, future research using prospective cohort study with bigger and similar sample size in each type of hormonal contraception is needed to further examine the association of these hormonal contraception with weight gain.

#### Strength and limitations

This is the first study conducted locally that included the ENG implant as one of the hormonal contraception in examining the possibility of weight change among the users of hormonal contraception.

The study design was a retrospective cross-sectional study with few limitations, including missing data from

those who had loss to follow up which could have introduced bias in our estimates and the data provided was limited to what was documented in the Family Planning Cards. Other factors such as diet intake and physical activity that may contribute to weight change were not able to be examined. Thus, the results need to be interpreted with caution. Further analysis such as two-way Anova repeated measures could be useful in examining the significant of the weight change. However, we did not proceed with this analysis due to large difference of sample size between the types of hormonal contraception.

#### CONCLUSION

About one third (33.6%) of the hormonal contraception users had their weight gain greater than 5% in our study population. Users aged less than 40 years and using ENG implant were more at risk of weight gain more than 5%. Future research is needed to verify these findings.

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