Path Analysis on the Effect of Hormonal Contraceptive Use on the Risk of Depression in Women of Reproductive Age in Gunungkidul, Yogyakarta

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ABSTRACT

Background: The choice of contraceptive use is based on regulating birth spacing or those who no longer want offspring. Although hormonal contraceptives have been available for more than 50 years, many do not know that hormonal contraceptives also have psychological effects on hormonal contraceptives and their biological mechanisms. This study aims to analyze the effect of hormonal family planning on symptoms of depression in women of reproductive age in Gunungkidul, Yogyakarta.

Subjects and Method: This cross-sectional study was conducted in Gunungkidul, Yogyakarta, from December 2019 to January 2020. A sample of 200 women of reproductive age was selected by purposive sampling. The dependent variable was depression symptoms in women of reproductive age. In contrast, the independent variables were education, age, duration of use, employment status, family income, and hormonal contraceptives. Data were collected using the Beck Depression Inventor II (BDI II) questionnaire and analyzed with path analysis using the Stata 1.3 application.

Results: The incidence of depression symptoms in women of reproductive age increased with duration of use ≥36 months (b= 1.84; 95% CI= 0.86 to 2.83; p <0.001) and contraceptives use (b= 1.31; 95% CI= 0.47 to 2.15; p= 0.001). The incidence of depression symptoms in women of reproductive age decreased with age ≥29 years (b= -2.05; 95% CI= -3.04 to -1.07; p= <0.001), family income ≥ IDR 1,571,000 (b= -3.06; 95% CI= - 3.06 to -1.41; p<0.001), ≥high school education (b= -1.67; CI 95%= -2.54 to -0.18; p= <0.001), and employment status (work outside the home) (b= -0.98; CI95 %= -1.78 to -0.18; p= 0.016).

Conclusion: Duration of use, contraceptive use, age, family income, education, employment status affect depression symptoms in women of reproductive age.

Keywords: hormonal contraceptives, depression symptoms, path analysis

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BACKGROUND

Uncontrolled population growth negatively impacts the economic sector, the environment, and development efforts both nationally and regionally. Therefore, the key to slowing down population growth is participating in family planning (WHO, 2018). For this reason, the government recommends contraceptives as a method of preventing pregnancy (Herowati and Sugiharto, 2019).

Hormonal contraceptives are the most widely used method of contraception. Although hormonal contraceptives have been

available for more than 50 years, little is known about the prevalence of mood changes associated with hormonal contraceptives and the underlying biological mechanisms responsible for the changes that occur and their effects on mood (Poromaa and Segebladh, 2012).

The current literature shows the effects of hormonal contraceptives on emotional functions such as fear and stress, relationships between partners, and social acceptance. Neuroimaging research on the hormones estrogen and progesterone predicts that hormonal contraceptives impact emotional reactivity and fear control (Montoya and Bos, 2017). Women themselves have twice the risk of experiencing depression disorders than men (Mcketta and Keyes, 2019)

Low levels of serotonin in the body caused by the hormone progesterone are the cause of depression. Psychological disorders that occur in users of hormonal contraceptives as a psychological side effect. Complaints that arise are somatic complaints, anxiety and the emergence of stressors from the environment (Toffol et al., 2011)

64% of women who are married between the ages of 15 and 49 in Indonesia use a contraceptive method, 57% use a modern contraceptive method and 6% use a traditional contraceptive method. The trends in the use of family planning that are most widely used by married women are injection (29%), pills (12%), implants and IUDs (5% each) and MOW (4%) (IDHS, 2017). The data recorded in the Yogyakarta Health Office in 2017 that active contraceptives users of Long-term contraceptive methods/MJKP (IUD, MOP, MOW, Implant) were 36.2% (149,708 participants) while non-long-term contraceptive methods were 63.8% (263,492 participants). The most used of family planning was an injection, amounting to 46.8% (193,482 participants).

The number of fertile age couples (PUS) in Gunungkidul is 118,767 people. The new family planning participants were 4.5% (5,336 people) and active family planning was 77.7% (92,324 people). The most used contraceptive devices were injections of 58.8% (54,308 people), IUD 14.1% (12,992 people), pills 11.9% (10,979 people), implants 7.9% (7,320 people, while MOP, MOW and condoms were 7.3% (6,725 people) (Gunung kidul Health Office, 2017).

Based on Basic Health Research (2018), the prevalence of depression was 706,689 people (6.1% of the total population) in the age range> 15 years to 75+ years. The prevalence of women experiencing depression was 354,420 people (7.4%).

SUBJECTS AND METHOD

1. Study Design
This was an analytic observational study with a cross-sectional design. The study was conducted in 5 Independent Practice Midwives (BPM) Gunungkidul, Yogyakarta, from December 2019 to January 2020.

2. Population and Sample
This study's population was women of reproductive age aged 20 to 35 years in Gunungkidul, Yogyakarta. A total of 200 subjects were selected by purposive sampling.

3. Study Variables
The endogenous variables were family income and age. The exogenous variables were duration of use, hormonal contraceptives, education and occupation.

4. Operational Definition of Variables
Age was the age of the study subject at the time of the study. Data were collected using a questionnaire. The continous data was transformed into dichotomous, code 0<29 years and 1 ≥29 years.

Education was the level of formal education that a mother takes to get a diploma. Data were collected using a questionnaire. The measurement scale was categorical, code 0

<Senior High School and 1 ≥ Senior High School.

Employment status was a statement of the study subject regarding the status of work or not working at the study time. Data were collected by questionnaire. Categorical data scale, code 0= working at home and 1= working outside the home.

The duration of use was the length of time the subject used the contraceptives. Data were collected using a questionnaire. Continous data scale, code 0 <36 months and 1 ≥ 36 months.

Type of contraceptives was the method chosen by the subject, both hormonal contraceptives (pills, injections, and implants) and non-hormonal contraceptives (IUD, condoms, and non-device methods). Data were collected using a questionnaire. The measurement scale was categorical, code 0= non-hormonal and 1= hormonal.

Depression symptom was a feeling disorder in which the subject feels deep and continuous sadness, causing behavioral disorders. Data were collected using a questionnaire. Continuous data scale, code 0 ≤Score 19 and 1 >score 19.

During the last six months, family income was income as the cumulative economic source of the nuclear family (husband and wife). Data were collected using a questionnaire. Categorical data scale, code 0= <UMR (Rp 1,571,000) and 1= ≥UMR (Rp 1,571,000).

5. Data Analysis
Univariate analysis was performed on each study variable. Categorical data were described with a frequency distribution table described in terms of number (n) and percent (%) parameters. The characteristics of a continous sample of data were described in terms of the parameter number (n), mean, SD, minimum, and maximum. The bivariate analysis used the chi-square test. The multivariate analysis used was Path Analysis using the Stata 1.3 application.

6. Research Ethic
This study was conducted based on research ethics, namely, confidentiality, anonymity, informed consent and ethical research. Research ethics was obtained from the Health Research Ethics Committee at Dr. Moewardi, Surakarta, Indonesia, No: 036/I/HREC/2020.

RESULTS
1. Sample Characteristics
Table 1 shows the sample characteristics (continuous data) and categorical data as described in Table 2.

Table 1. Sample Characteristics (continuous data)

Variable	N	Mean	SD	Min.	Max.
Age	200	28.77	4.10	20	35
Duration of contraceptives use	200	36.28	21.79	6	120
Depression Symptom (BDI)	200	16.51	5.74	0	27

Table 2. Sample characteristics (categorical data)

Characteristics		N	%
Education	<Senior High School	68	34
	≥ Senior High School	132	66
Family income	< Regional Minimum Wage (Rp.1,571,000)	102	51
	≥ Regional Minimum Wage (Rp.1,571,000)	98	49
Maternal Occupation	Working at home	110	55
	Working outside the home	90	45
Types of contraception	Hormonal	100	50
	Non-hormonal	100	50

Table 2 shows that the subjects' level of education was mostly more or equal to Senior High School as many as 132 people (66%). Income ≥Regional Minimum Wage (Rp. 1,571,000) as many as 98 people (49%).

Subjects who worked outside the home were 90 people (45%), Subjects who used hormonal birth control were 100 people (50%).

2. The result of bivariate analysis

Table 3. Bivariate analysis of the effect of age, duration of use, family income, education, employment status and type of contraceptives using the chi-square

Independent Variable	Depression Symptom				OR	p
	Mild		Severe			
	N	%	N	%		
Age						
<29 years	39	37.14	66	62.86	0.32	< 0.001
≥29 years	61	64%	34	35.79		
Duration of Use						
< 36 months	53	61.63	33	38.37	2.28	0.004
≥ 36 months	47	41.23	67	58.77		
Family Income						
< Rp. 1,571,000	26	25.49	76	74.51	0.11	< 0.001
≥ Rp. 1,571,000	74	12.8	24	12.8		
Education						
< Senior High School	14	20.8	54	11.8	0.13	< 0.001
≥ Senior High School	86	65.15	46	34.85		
Employment Status						
Working at home	43	39.09	67	60.91	0.37	< 0.001
Working outside the home	57	63.33	33	36.67		
Type of Contraceptives						
Non-hormonal	63	63	37	37	2.89	< 0.001
Hormonal	37	37	63	63		

Table 3 shows the results of the bivariate analysis, age ≥29 years (OR= 0.32; p <0.001), duration of use ≥36 months (OR= 2.28; p= 0.004), family income ≥Rp. 1,571,0-00 (OR= 0.11; p= <0.001), education level ≥Senior High School (OR= 0.13; p <0.001), working outside the home (OR= 0.37; p <0.001), hormonal contraceptives (OR= 2.89; p <0.001).

3. Path Analysis
The results of the path analysis model were described in Figure 1. Figure 1 shows the direct and indirect correlation between variables. Table 4 shows the path analysis results on the effects between age, duration of use, family income, education, employment status and type of contraceptives.

Table 4 shows the incidence of depression symptoms in women of reproductive age was directly affected by the duration of use ≥36 months (b= 1.84; 95% CI= 0.86 to 2.83; p<0.001), hormonal contraceptives increased the incidence of depression symptoms (b= 1.31; 95 % CI= 0.47 to 2.15; p= 0.001).

Table 4 shows that the incidence of depression symptoms in women of reproductive age was directly affected by age ≥29 years (b= -2.05; 95% CI= -3.04 to -1.07; p= <0.001), family income ≥ IDR 1,571,000 (b= -3.06; 95% CI= -3.06 to -1.41; p= <0.001), education level ≥Senior High School (b= -1.67; 95% CI= -2.54 to -0.18; p= <0.001), and mothers who work outside house (b= -0.98; 95% CI= -1.78 to -0.18; p= 0.016).

Figure 1 shows that employment status, education, and duration of use indirectly affected depression symptoms in women of reproductive age.
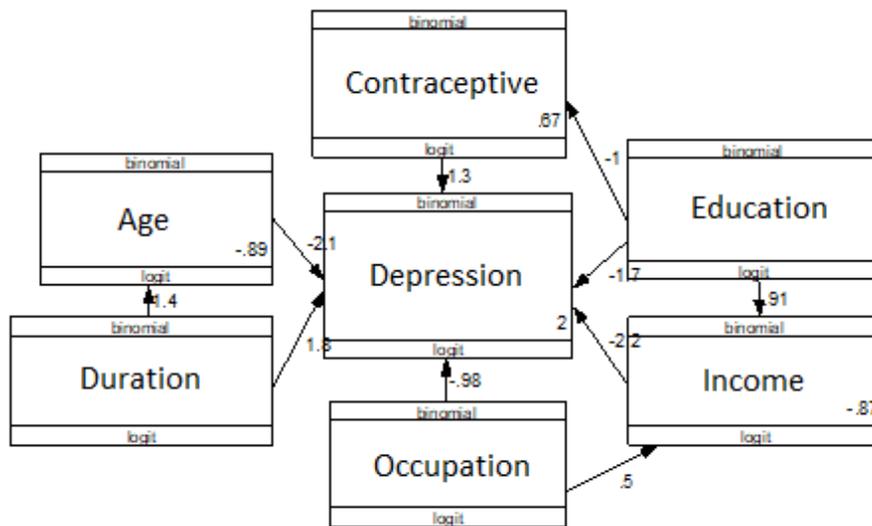

Figure 1. Path analysis the effect of depression symptoms on age, duration of use, family income, education, maternal occupation, and hormonal types

Table 4. The results of the path analysis of the effect between age, duration of use, family income, education, employment status and type of contraceptives

Dependent Variable	Independent Variable	b	95% CI Lower limit	Upper limit	p
Direct effect					
Depression Symptom (Severe)	← Employment status (working outside the home)	-0.98	-1.78	-0.18	0.016
	← Years (≥ 29 years)	-2.05	-3.04	-1.07	<0.001
	← Education (≥Senior High School)	-1.67	-2.54	-0.79	<0.001
	← Hormonal contraceptives	1.31	0.47	2.15	0.002
	← Family Income (≥ Rp 1,571,000)	-2.23	-3.06	-1.41	<0.001
	← Duration of use (≥36 months)	1.84	0.86	2.83	<0.001
Indirect effect					
Family income ≥ Rp 1,571,000	← Employment status (working outside the home)	0.50	-0.07	1.07	0.088
	← Education (≥Senior High School)	0.90	0.29	1.52	0.004
Hormonal contraceptives	← Education (≥Senior High School)	-1.00	-1.61	-0.39	0.001
Age (≥ 29 years)	← Duration of use (≥36 month)	1.35	0.75	1.9	<0.001

N observation = 200
Log likehood= -472.41

DISCUSSION

1. The Effect of Age on Depression Symptoms

The results showed a direct effect between maternal age and depression symptoms in users of hormonal contraceptives and it was statistically significant. Mothers aged ≥ 29 years were more likely to experience symptoms of major depression when using hormonal contraceptives than mothers aged <29 years (b= -2.05; 95% CI= -3.04 to -1.07; p= <0.001).

This is in accordance with the results of a study conducted by Skovuland et al. (2016), which stated a decrease in the risk of depression symptoms in users of hormonal contraceptives as they age. Women in the age range of 20 to 30 years are three times more likely to experience symptoms of depression (Maina et al., 2016). In other studies, it is known that women under 30 years of age are more prone to experience the negative impacts of using hormonal contraceptives than women who are over 30 years of age. The negative psychological effect of contraceptive use has even started for 3 months of use (Lisofsky et al., 2016). So that younger women have a greater chance of experiencing stress, which will lead to depression (Tunurrohmin et al., 2019).

2. The Effect of Duration of Hormonal Contraceptive Use on Depression Symptoms

The results showed a direct effect between duration of use and depression symptoms in users of hormonal contraceptives and it was statistically significant. Mothers with a duration of use ≥ 36 months were more likely to experience severe depression symptoms using hormonal contraceptives than mothers with a duration of use <36 months (b= 1.84; 95% CI= 0.86 to 2.83; p <0.001)

This is in line with the results of a study conducted by Aulia (2019), which stated that the length of use was related to depression symptoms with p= 0.018 and OR= 2.192. This means that women who use hormonal contraceptives than two years had the potential to be 2.192 times more likely to experience depression symptoms than non-hormonal. Another study conducted by Fatmawati and Fatmawati (2019) also stated that the longer the use of hormonal contraceptives, the higher the risk of depression symptoms with an r value of 0.55.

The length of time using hormonal contraceptives affects the incidence of dep-

ression caused by a lack of serotonin levels in the brain. Serotonin functions as a mood regulator or a person's feelings. Several studies have found that a lack of serotonin is responsible for the symptoms of depression (Martini and Fairus, 2017; Natalia, 2014).

A study conducted by Skovlund et al. (2016) stated a correlation between the duration of use and the risk of depression and the use of antidepressants and then a decrease in the incidence of depression after 7 years of use to less than 10 years. Merki-Feld et al. (2017) stated that although hormonal contraceptives allow the improvement of depression symptoms, it can subside after several months of stopping hormonal contraceptives.

3. The Effect of Education on Depression Symptoms

The results showed a direct effect between maternal education and depression symptoms in hormonal family planning users and was statistically significant. Mothers with education level ≥Senior High School were less likely to experience severe depression symptoms using hormonal contraceptives than mothers with education <Senior High School (b= -1.67; 95% CI= -2.54 to 2.15; p <0.0001)

There is an inverse correlation between education and depression symptoms. This is in line with a study conducted by Faith and Ross in Kranjac (2016), which stated that women who had higher education were at lower risk of experiencing depression symptoms. On the other hand, there is evidence that people with low education have less economic and social resources to successfully cope with mental health problems. Therefore they are more likely to experience depression symptoms (Kranjac, 2016).

Women with lower secondary education are more likely to experience symptoms of depression (Pulgar et al., 2015). A study conducted by Ardoino et al. (2013) stated that a higher level of education has a risk of

experiencing depression symptoms by 0.8 times lower than that of women with low education. According to Beck in Hall et al. (2015), women with low levels of education also influence risk assessment, planning, social learning, motivation, taking care of themselves, excessive worry, and a lack of perception of pregnancy opportunities, which have an impact on the decision-making process in choosing a contraceptive method.

4. The Effect of Family Income on Symptoms of Depression

The results showed a direct effect between family income and symptoms of depression in users of hormonal contraceptives and it was statistically significant. Mothers with family income ≥ Rp. 1,571,000 have a lower likelihood of experiencing depression symptoms when using hormonal contraceptives than mothers with family income <Rp 1,571,000 (b= -2.23; 95% CI= -3.06 to -1.41; p= <0.001)

Some literature suggests that families with low income and socioeconomic status have become evidence of risk factors for distress (Drapeau, 2012). Economic limitations, economic dependence, household responsibilities, and the lack of access outside the household cause an increased risk of emotional distress for women (Isfandari, 2015). Therefore, it can be presumed that women with prior mood disturbances and distress may be at a higher risk of developing adverse depression symptoms from the use of hormonal contraceptives because women are particularly sensitive to estrogen and progesterone in the brain pathways involved well connected (Bengtsdotter, 2018). Hormonal contraceptives validate the stress response to reduce cortisol levels, which tend to experience depression symptoms more easily than non-hormonal ones (Lewis, 2019).

A study conducted by Farr et al. (2011) states that income influences the relationship between mental stress and contraception.

Women with low family income are more likely to choose to use short-term contraceptives than women with high family income who choose to use long-term contraception. According to Liwang (2018), contraceptives were practical, cheap, easy to reach, and efficient, which was why women prefer to use hormonal contraceptives (injections) rather than IUDs.

5. The Effect of Employment Status on Depression Symptoms

The results showed a direct effect between maternal occupation and depression symptoms in hormonal contraceptives users and was statistically significant. Mothers who work outside the home were less likely to experience depression symptoms using hormonal contraceptives than mothers who work at home (b= -0.98; 95% CI= -1.78 to -0.18; p= 0.016)

This is in line with a study conducted by Hoshino et al. (2016), which stated that women who only work at home had a greater chance of experiencing depression symptoms than women who work outside the home. In domestic work, the variance in workload and a lack of self-utilization are associated with the occurrence of depression symptoms and unpredictable circumstances in household work.

Domestic work that does not have high standards and work intensity can contribute to women's poor mental health through disruption of distorted sleep and eating patterns and disruption of circadian rhythms (Shepherd-Banigan et al., 2015). According to Wulyani and Sudiajeng in Putri and Sudhana (2013), housework was one of the three main stressors of housewives. The monotonous homework that must be done every day and mostly focuses only on the house triggers isolated situations in housewives so that they tend to be stressors for women themselves.

While there is some evidence to suggest that estradiol levels in contraceptive use can

modulate attention to stressor exposure, they are more susceptible to experiencing depression symptoms (Graham and Shin, 2018).

According to Scheuringer et al. (2020), even mild negative mood changes were considered stressful by women rather than users who do not experience anxiety disorders. As a result of the pressure from the homework they face. A study conducted by the National Population and Family Planning Board (BKKBN) (2011) stated that occupation is very influential in choosing the type of contraceptives. Working women prefer to use long-term non-hormonal contraceptives because they realize the benefits and uses of women who work at home.

6. The Effect of Hormonal Contraceptives on Depression Symptoms

The results showed a direct effect between the type of hormonal contraceptives and the depression symptoms in users of hormonal contraceptives, and it was statistically significant. Mothers using hormonal contraceptives were more likely to experience depression symptoms using hormonal contraceptives than mothers who used non-hormonal contraceptives (b= 1.31; 95% CI= 0.47 to 2.15; p= 0.002)

This is in line with a study conducted by Martini and Fairus (2017), which stated that hormonal contraceptives had a 3.15 times risk of experiencing depression symptoms compared to non-hormonal users.

Several research findings shed light on the biological mechanisms linking hormonal changes to depression symptoms, including mood and anxiety. First, the hormones estrogen and progesterone affect neurotransmitters' function, especially serotonin, which is associated with depression. Second, progesterone's effect has an impact on the GABA (Gamma Amino Butiric Acid) receptors that regulate a person's anxiety. Third, ovarian hormones influence the stress response, thereby increasing susceptibility to depres-

sion symptoms, via the hypothalamic-hypnosis-adrenal axis. Besides, estradiol affects the neurological system associated with fear or anxiety (Cheslack-Postava et al., 2014). Ovarian hormone fluctuations are associated with an increased prevalence of depression symptoms in women (Kuehner, 2017).

The disruption of ovarian hormone production naturally is caused by disruption of serotonin, dopamine, and norepinephrine regulation, which mostly causes depression symptoms as ethylogy. The reduced serotonin is responsible for the incidence of depression symptoms (Natalia, 2014). Then, hormonal contraceptives exacerbate mood swings outside the menstrual period and increase the onset of depression symptoms during the pre-menstrual period. Although statistically significant, the average difference in depression symptoms was small between users of hormonal and non-hormonal contraceptives (Roe et al., 2020). The current literature shows that modern low-dose hormonal contraceptives show less effect on the occurrence of depression symptoms (Pagano et al., 2016).

Large cohort studies have shown that progestin-contraceptives have a greater risk of developing depression symptoms. Still, a systematic review found little evidence of an association between progestin contraceptives and depression (Laird et al., 2019).

According to Laely and Fajarsari in Ramadhan et al. (2017), among the three types of contraceptives that contain progestins (mini pills, DMPA, implants), mini pills have the highest synthetic progesterone content, namely 350 mg norethindrone, then DMPA of 150 mg and implants of 36 mg levonorgestrel (norplan), 68 mg 3-ketodesogestrel (implanon) and 75 mg lenovorgestrel (jadena)

The hormonal components of combined contraceptives have little effect on mood swings and depression symptoms. This is due

to the difference in lower doses, so it is lower to experience depression symptoms than a single hormone (Schaffir, 2016).

Some studies suggest that estrogen has a role in increasing serotonin levels which has an antidepressant-like effect on the neurotransmitter depominergic neurons, ergikneuron GABA. Therefore, combined hormonal contraceptives may reduce the exacerbation of depression symptoms compared to those containing only the hormone progetin (Smith, 2018).

AUTHOR CONTRIBUTION

CONFLICT OF INTEREST

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