

The correlation between the amount of weight gain and physical activity levels in Depot Medroxyprogesterone Acetate (DMPA) users

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ABSTRACT

Background: DMPA is a widely used contraceptive in Indonesia due to its accessibility and effectiveness. However, side effects such as weight gain are a concern, with more than 90% of the 600 users in 2022-2023 experiencing them. Objective: This study aimed to examine the correlation between the amount of weight gain and physical activity levels in DMPA users. Methods: This study used a cross-sectional design with consecutive sampling, involving 82 women (aged 19-51 years, average weight 58 kg) selected using the Slovin formula. Data were collected through structured interviews and questionnaires covering demographics, medical history, and physical activity level based on IPAQ. Body weight was measured with a calibrated digital scale, and association analysis was performed using the Chi-Square test ($p < 0.05$ was considered significant). Result: Analysis showed no statistically significant association between physical activity level and the amount of weight gain in DMPA users ($p > 0.05$). Conclusion: Other factors beyond physical activity, such as diet and metabolism, may play a more significant role in weight gain in DMPA users, so further research is needed. Future research should clarify these relationships by considering a broader range of influencing factors, including demographic variables, metabolic health, lifestyle behaviors, etc., to develop a more comprehensive understanding of how DMPA use affects weight management.

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Introduction

The prevalence of contraceptive use in Indonesia has increased by 0.3% from 2021-2022. In 2021, contraceptive use was 55.06% and increased to 55.36% in 2022. 59.9% of family planning participants use contraceptives through injections. The prevalence of active family planning users in East Java in 2021 was 5,080,633 (75.1%) and in Malang District, 357,804 (79.8%). The most widely chosen modern contraceptive method in East Java is injectable contraception, which amounted to 2,958,271 (58.2%). The number of injectable family planning participants in Malang district is 197,061 (55.1%) out of 448,317 total women of reproductive age ([Dinkes Jatim, 2021](#); [Kemenkes RI, 2021](#)).

In Indonesia, two types of birth control injections are most commonly used, namely 1-month injections and 3-month injections. The 3-month injections contain progestin (Depot Medroxyprogesterone Acetate/DMPA), while the 1-month injections contain a combination of progestin and estrogen hormones. DMPA, as one of the many contraceptive methods, has been widely accepted in Indonesia due to the persistence of its method and easy access. Family planning programs supported by the Indonesian government have incorporated DMPA as a significant component. DMPA has proven advantages, such as menses management and preventing unintended pregnancies ([Dianat et al., 2019](#)). However, the side effects, particularly weight gain, have raised user concerns.

The association between DMPA (Depot Medroxyprogesterone Acetate) and weight gain has been studied in depth, indicating a strong relationship as time passes. Evidence suggests that any weight gain in the first few months of DMPA use positively correlates with overall body weight gain later in use. For example, Le et al. observed that female participants who gained weight early were more likely to keep gaining it — with a significant increase in body mass index (BMI) over 18 months (Lee et al., 2010). Bonny et al. (2011) found that adolescents gaining more significant than 5% excess weight from baseline weight at six months of DMPA use were more likely to gain additional excess weight in the subsequent year.

Multiple mechanisms exist by which DMPA users gain weight. A systematic review by a study emphasized food consumption and eating patterns as vital, suggesting that dietary factors are the main contributors to weight excess among DMPA users (Silva et al., 2018). Furthermore, Batista et al. (2017), A 12-month follow-up study of DMPA users, revealed a significant weight increase (3.01 kg) and changes in body fat mass, suggesting that hormonal fluctuations may modulate metabolic functions with downstream clinical consequences. The findings of Vickery et al. (2013) also support this or similar works. DMPA users had a higher weight gain than other methods of contraception, thus reinforcing the specific effect of DMPA on body weight.

However, regular physical activity can mitigate these effects and help maintain a healthy weight. Physical activity is essential in weight management, especially for those who use DMPA. According to a study, proper food and activity monitoring is crucial for women who gain weight while using DMPA. They advocate a balanced diet and at least 60 minutes of daily physical activity to achieve optimal body weight (Silva et al., 2018). This aligns with findings from Fogelholm, who notes that increased physical activity can significantly reduce obesity-related health risks, even if substantial weight loss is challenging for many individuals (Fogelholm, 2010). Thus, incorporating regular physical activity can be a practical strategy for DMPA users to counteract potential weight gain.

Moreover, the relationship between physical activity and weight gain prevention is further supported by evidence indicating that higher levels of physical activity are inversely associated with weight gain in women, particularly those with a body mass index (BMI) under 25 (Stommel, 2010). Lee et al. (2020) also highlight that the amount of physical activity needed to prevent long-term weight gain is substantial, suggesting that women should aim for more than the minimum recommended physical activity levels to see significant benefits. This is particularly relevant for DMPA users, as they may be predisposed to weight gain due to the hormonal effects of the contraceptive.

Physical activity plays a vital role in most of the energy the body expends from physical activity, so physical activity itself plays a crucial role in weight loss, especially in strenuous physical activities that require much energy, which is obtained from body fat converted into power. Physical activity is any body movement that requires energy expenditure, such as walking, running, swimming, cycling, and other forms of exercise. Regular physical activity has many benefits, such as improving heart and lung health, increasing muscle and bone capabilities, lowering the risk of obesity, diabetes, and heart disease, and improving mental and emotional health. Engaging in physical activity helps increase muscle mass and reduce body fat. Fat burns far fewer calories compared to muscles. So, they can enhance the metabolic process and help keep the proper body weight (Rafiq et al., 2021). Studies show that some negative impacts of DMPA, such as weight gain and loss of bone density, can be mitigated by exercise. The study carried out by Babatunde and Forsyth found that the higher the level of physical activity, the better the bone health outcome among DMPA users, which indicates that physical activity may offset adverse side effects attributed to hormonal contraceptive use (Babatunde & Forsyth, 2013).

The International Physical Activity Questionnaire (IPAQ) is a well-known tool that assesses physical activity in heterogeneous population cohorts, including those with special healthcare needs. The IPAQ has been validated in various settings and populations, including among DMPA users, making it a valid tool for assessing physical activity levels. For example, Benítez-Porres et al. indicate the reliability of

IPAQ across health conditions (Benítez-Porres et al., 2013). However, this indicates that the IPAQ could be used similarly to assess physical activity for women who use DMPA and provides a standardized measure of their activity levels. IPAQ defined three classes of physical activity: light, moderate, and vigorous (IPAQ, 2005).

A preliminary study for the Viandika Midwife Independent Practice in Malang Regency, known as the "Malang Service Program," found that over 90% of DMPA users gained weight by screening 150 users in January 2023 and 450 in 2022. It is essential to analyze the relationship between physical activity levels and weight gain among DMPA users in this practice. A previous study conducted in Probolinggo, Indonesia, also found a correlation between physical activity and weight gain among DMPA users, highlighting the importance of this analysis (Anggraeni et al, 2023). This research utilized a case-control study design, contrasting with prior research that employed a cross-sectional study approach. It specifically investigated weight gain among users of DMPA (Depot Medroxyprogesterone Acetate). Notably, there has been a lack of similar studies conducted in Indonesia, particularly in Malang Regency. This study has the potential to serve as a pilot project in Indonesia. It could provide a foundation for policy initiatives to mitigate the adverse effects of weight gain in DMPA users. The primary objective of this study was to examine the relationship between the amount of weight gained and the levels of physical activity among DMPA users.

Based on this, this study aims to determine the relationship between the amount of weight gain and the level of physical activity on Depo Medroxyprogesterone Acetate (DMPA) users. The novelty of this study lies in its specific focus on analyzing the relationship between physical activity levels and the amount of weight gain in DMPA users, which has not been extensively studied in Indonesia, particularly in Malang Regency. Unlike previous studies that generally only highlighted the effects of DMPA-induced weight gain, this study used a physical activity-based approach as the primary variable that can influence weight change. In addition, this study adopted the case-control method, which can better identify causal relationships than cross-sectional studies often used in previous similar studies.

Another unique feature of this study was using the International Physical Activity Questionnaire (IPAQ) to measure the physical activity levels of DMPA users in a more objective and standardized manner. By using the IPAQ, this study provides quantitative data on physical activity levels and allows comparison with other populations that have been analyzed using the same instrument. In addition, this study highlights a population at the primary healthcare level, namely in the independent practice of midwives, which provides a new perspective in understanding how physical activity factors contribute to weight management in community-based family planning programs. Thus, this study is expected to fill existing research gaps and provide a basis for physical activity-based policies and interventions to reduce the impact of weight gain on DMPA users.

The results of this study contribute to public health science, policy, and practice related to DMPA use. In terms of science, this study enriches understanding of the relationship between physical activity and weight gain in DMPA users. If no significant correlation was found, other factors such as diet or metabolism may play a role, opening up further research opportunities. From a policy perspective, these findings help guide family planning programs through early screening or nutrition education for DMPA users. If physical activity is ineffective enough to prevent weight gain, then policy could focus on alternative strategies, such as metabolic monitoring or nutrition-based interventions. In public health practice, the results of this study can be used by medical personnel to better educate DMPA users on managing weight change. More effective intervention strategies, such as integrating nutrition management with routine monitoring, could be developed to help DMPA users maintain weight balance. Thus, this study not only adds scientific insights but can also serve as a basis for policy formulation and better health services for DMPA injectable contraceptive users.

Method

Research Design

This research used a cross-sectional study design.

Participants

The target population was 450 DMPA injection contraceptive acceptors 2022 at the Viandika Midwife Independent Practice. By employing the Slovin formula, 82 participants were identified as the sample size. We selected the participants via consecutive sampling and got their informed consent to participate in our study. The inclusion criteria are women who are gaining weight and have ever accepted DMPA at Viandika Midwife Independent Practice from September to November 2023. Pregnant women and those refusing to participate in the study were excluded from these analyses.

Research Instruments

Data was collected using structured interviews and self-administered questionnaires. The survey collected self-reported data on physical activity levels, medical history, and demographic characteristics. This assessment was made through the International Physical Activity Questionnaire (IPAQ), classifying activity into two categories: vigorous exercise and light to moderate. Participants' weights were measured in light clothing (using a calibrated digital scale; sx50, China). Individual median weight changes assessed weight gain; subjects were categorized as gainers or non-gainers (an increase of either >1 kg or ≤ 1 kg from baseline weight). The weight change was calculated by comparing the weights at the first and second visits for Study-1 subjects during the study months.

Data Analysis

Descriptive statistics were used to examine demographic and physical activity levels. The chi-square test was used to evaluate the relation between weight gain and activity levels, with p value < 0.05 considered significant. We have performed all the data analysis using SPSS version 26.

Results and Discussion

Results

The study included 82 female participants (aged 19–51 years, with an average weight of 58kg) with diverse demographics (Table 1). Participants were evenly split by age, with 50% aged ≥ 27.5 years and 50% younger. Most were multiparous (52.4%), while 47.6% were primiparous. Additionally, 56.1% were unemployed, and 43.9% were employed. These demographic characteristics provide a foundation for analyzing the correlation between weight gain and physical activity levels among DMPA users. Bivariate analyses of weight gain categories and physical activity levels are presented in Table 2.

Table 1. Frequency distribution of the respondents

| Characteristic | Frequency | |
|-------------------|-----------|------|
| | n | % |
| Age | | |
| ≥ 27.5 y.o. | 41 | 50 |
| < 27.5 y.o. | 41 | 50 |
| Parity | | |
| Multiparous | 43 | 52.4 |
| Primiparous | 39 | 47.6 |
| Employment Status | | |
| Not employed | 46 | 56.1 |
| Employed | 36 | 43.9 |

Table 2. The results of univariate and bivariate analysis

| Physical Activity Levels | The Amount Weight Gain | | | | p-value | OR | 95% CI |
|--------------------------|------------------------|------|-------------|------|---------|-------|-------------|
| | >1kg (n=82) | | ≤1kg (n=82) | | | | |
| | n | % | n | % | | | |
| Light to moderate | 25 | 30.5 | 25 | 30.5 | 0.406 | 1.462 | 0.596-3.585 |
| Vigorous | 13 | 15.9 | 19 | 23.2 | | | |

The results of this study revealed no statistically significant correlation between the amount of weight gain and physical activity levels among DMPA users (Table 2). The Chi-Square test produced a p-value of 0.406, indicating that the relationship between these two variables was not statistically significant. The odds ratio (OR) for weight gain in participants with low to moderate physical activity was 1.462 (95% CI: 0.596–3.585), suggesting a possible trend toward an increased likelihood of weight gain in this group. However, the pCI is vast and contains one, so this result was not definitive.

Discussion

This finding shows a potential increased risk of being overweight among people with lower physical activity levels; however, the confidence interval is so vast, and the p-value is close to statistically significant that we take these results cautiously. 1 in the confidence interval indicates that any identified pattern may be due to random noise rather than an actual association.

Numerous studies have examined the correlation between weight gain and physical activity among users of depot medroxyprogesterone acetate (DMPA). However, the results have been mixed and inconsistent. A review by Silva et al. (2018) found that food intake increased among DMPA users, but this did not lead to significant weight gain. This indicates that physical activity might play a significant role in weight management for these people outside of the genetic component (Silva et al., 2018). Jirakittidul et al. (2019) highlight the difficulty in identifying risk factors for substantial weight gain among DMPA (Depo-Provera)-users. Differential weight gain according to race and ethnicity may be confounding the effect of physical activity on fatness (Jirakittidul et al., 2019).

Although some studies show that users of DMPA gain more than 5% in weight, the relationship with physical activity remains ambiguous (Lopez et al., 2016; Lopez et al., 2016). The findings of Mehta et al. suggest that only a minority of DMPA users gained substantial weight. It suggests that the association between exercise and gaining weight is more complicated than once thought (Mehta et al., 2021).

Prior work by Vickery et al. suggested that DMPA users had an increase in total body fat. However, the research did not consider race to see whether that affected weight gain, suggesting such connections still require more clarity (Vickery et al., 2013). Notably, the comparative research of Beksinska et al. found that although numerous women claimed weight gain, all users did not comply with a suit, and some even recognized a weight reduction to show the variation in actions towards DMPA (Beksinska et al., 2021). That variation may depend on the starting weight and exercise level. Bonny et al. explained that weight gain with DMPA in adolescents predicted future weight gain. However, this study did not find a direct correlation between physical activity levels (Bonny et al., 2011). Furthermore, Oshodi et al. reported a significant increase in mean weight at 12 months among DMPA users but did not directly examine physical activity and body weight changes; there is, therefore, a paucity of data regarding this (Oshodi et al., 2019).

A study by Yoshimura and colleagues provides a broader context suggesting that seasonal changes in physical activity may influence weight gain. However, their research showed no meaningful differences in physical activity between people who put on weight and those who kept it off (Yoshimura et al., 2020). This implies that merely engaging in physical exercise may not be sufficient as a predictor

of changes in weight among DMPA users. In addition, complicating the interaction among these determinants, Le et al. examined the association between physical activity and self-reported weight gain among women. They also discovered that the perceived weight gain was not associated with longer times of physical activity (Le et al., 2010).

Furthermore, a prospective analysis by Beksinska et al. Weight gain was higher among individuals with a higher level of obesity before starting DMPA use. However, exercise did not significantly contribute to this association (Beksinska et al., 2021). It is important to note that while physical activity is necessary for controlling weight, the impact of physical activity on hormonal contraceptives such as DMPA may depend upon other factors, including the metabolic rate, genetic predisposition, and lifestyle of individual women (Okunola et al., 2019). Metabolic rate is a central link to how people respond to changes in exercise and diet. Hormonal medications such as DMPA that affect metabolic functions may lead some people to gain weight. The hormonal changes with DMPA could impact energy balance through increased fat deposition and basal metabolic rate (BMR). As noted by Jang et al. Self-efficacy and motivation are determinants of physical activity, which can determine the level of physical activity, which is a factor in controlling body weight (Jang et al., 2020).

Additionally, genetic variables may mediate the association between activity level and weight in DMPA users. Evidence suggests genetics may play a role in metabolism and hormone sensitivity, leading to weight gain or loss. Some genes that are linked to obesity can make you sensitive to gaining weight, perhaps even more so when coupled with hormonal changes brought on by contraceptives. Another example is that the arrangement of food and practice cycles is also important in considering the performance of hormonal contraceptives for weight maintenance. Okumatsu et al. (2021) determined a negative relationship between waist circumference and moderate to vigorous physical activity, inferring that increased activity levels may help prevent weight gain. It indicates the importance of promoting physical exercise among DMPA users to prevent weight gain. Furthermore, Cioffi et al. point out that social and environmental factors providing opportunities to be active delineate a support system for physical activity; hence, lifestyle factors such as accessibility of places to exercise, social incentives, and personal drive can modify the trend of physical activity (Cioffi et al., 2010).

Moreover, the mental side of looking at self-image and perception about weight can also affect DMPA users' behavior toward physical activity. One possible explanation is that overweight women may be embarrassed or unmotivated, which results in a lower willingness to engage in sports activities. This mental block may disrupt their attempts to stay at a healthy weight while on hormonal birth control. Research by Zachary et al. during the COVID-19 pandemic Findings from Zachary et al. (2020) showed that weight gain followed by increases in sedentary behaviors and decreases in physical activity provided evidence of how externalities could influence lifestyle behavior. Apart from psychological factors, another possible explanation for the association between DMPA-related weight gain and physical activity is that dietary habits are also important. Changes in dietary intake may predict weight gain for DMPA users, and thus, an increased caloric intake may also accompany decreased physical activity levels (Silva et al., 2018; Silva et al., 2018).

The study partially met the research objective of examining patterns of weight gain and physical activity throughout the use of DMPA, but not its specific aim. Nevertheless, it was unable to form a statistically significant connection. The appropriate methods were used to evaluate physical activity, namely anthropometric measurements of weight gain and IPAQ. However, the sample size was relatively small (n=82), which may have limited statistical power to detect a significant association between weight gain and physical activity. In addition, the study was poorly designed to answer the research question. It did not control for other important confounders that may affect weight gain (stress levels, diet risk score of participants, and duration of DMPA's use).

Conclusions

There was no statistically significant association between the level of physical activity and weight gain among DMPA users (analytical results). Weight-management strategies targeting DMPA users should not only consider these social and cultural determinants but also avoid reinforcing concurrent underlying biological and psychological concerns by implementing interventions promoting physical activity while acknowledging the capabilities of individuals to thrive despite facing several barriers. The opportunity to clarify these connections may become more feasible if future studies assess potential confounders, including demographics, metabolic health, and lifestyle behaviors, thus enabling an assessment of how DMPA use influences weight regulation.

Authors' contributions

ZH, DM, DA, ACP, RPN, NV, PND were responsible for data collection, analysis, article design, writing, and revision. RMFRA was responsible for the article's conceptualization and conducted a rigorous and critical manuscript revision. All authors have read and approved the final manuscript.

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Competing interests

The authors declare no competing interests.

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