International Journal of Medical and Pharmaceutical Research
Website: https://ijmpr.in/ | Print ISSN: 2958-3675 | Online ISSN: 2958-3683
NLM ID: 9918523075206676
Volume: 4 Issue:6 (Nov-Dec 2023); Page No: 153-159

Research Article

The Effect of Docosahexaenoic Acid (DHA) Supplementation On Serum Folate Levels In Underweight Pregnant Women

Leora Esther Xena[1], Salmon Charles P. T. Siahaan[2*], Hendera Henderi[2]

[1] Medical Student, Faculty of Ciputra University, Citraland CBD Boulevard, Surabaya, Indonesia
[2] Medical Faculty of Ciputra University, Citraland CBD Boulevard, Surabaya, Indonesia

ABSTRACT

Background: According to RISKESDAS in 2018, the prevalence of pregnant women at risk of Chronic Energy Deficiency (CED) in Indonesia was 17.3%. CED is a part of the underweight that needs to be addressed efficiently to prevent nutritional disorders. During pregnancy, one crucial nutrient is folate, which plays a role in preventing congenital defects and contributes to neurocognitive function. This study identifies the influence of DHA supplementation on serum folate levels in underweight pregnant women at the Made Surabaya Community Health Center.
Methods: The research follows a pre-experimental design with a one-group pre-and-post-test using 21 samples of underweight pregnant women. Physical examinations, obstetric assessments, ultrasonography, and venous blood collection for analysis were conducted before and after DHA supplementation.
Results: In this study, significant differences were found in underweight pregnant women before and after DHA supplementation in various parameters, namely body weight 51.76 ± 7.635 vs. 53.25 ± 7.310 (p = 0.018), BMI 22.171 ± 2.8173 vs. 22.814 ± 2.5908 (p = 0.034), UAC 24.238 ± 1.4545 vs. 25.243 ± 2.2288 (p = 0.003), folic acid 14.381 ± 4.8078 vs. 18.176 ± 5.8085 (p = 0.000), and fundal height 17.38 ± 7.606 vs. 19.14 ± 7.323 (p = 0.007).
Conclusions: The study found a significant influence on body weight, BMI, UAC, folic acid, and fundal height before and after DHA supplementation

Key Words: *DHA, serum folate, pregnant women, underweight*

***Corresponding Author**
Salmon Charles P. T. Siahaan
Medical Faculty of Ciputra University, Citraland CBD Boulevard, Surabaya, Indonesia

INTRODUCTION

Pregnancy is the result of a conceived implantation located in the uterus or elsewhere in the body. It ultimately ends through abortion or spontaneous or elective delivery[1]. In Indonesia, the incidence of pregnancies from 2015 to 2019 was 7,910,000 while East Java reported 627,901 pregnancy cases in 2021 [2;3]. Pregnancy brings about numerous changes both physical and psychological. Generally, pregnant women undergo anatomical and physiological changes in the reproductive system, such as hypervascularization of the vulva and vagina, an enlarged uterus, changes in cervical color, and the production of colostrum in the respiratory (heart and lung), digestive, urinary, hematological, endocrine, musculoskeletal, dermatological, nutritional, and metabolic system [4;5]. Psychologically, pregnant women experience changes in each stage of pregnancy, ranging from anxiety and excessive protectiveness to happiness [6].

During pregnancy, pregnant women may face conditions such as anemia, energy deficiency, nutritional deficiencies, and metabolic changes that can affect the health of both the mother and the fetus. In 2018, according to Badan Penelitian dan Pengembangan Kesehatan [7] the prevalence of pregnant women at risk of Chronic Energy Deficiency (CED) in Indonesia was 17.3%. In 2020, out of 4,656,382 pregnant women nationwide, 452,350 were at risk of CED, resulting in a 9.7% prevalence [8].

Underweight pregnancies involve low body weight or a Body Mass Index (BMI) < 18.5 kg/m at the beginning of pregnancy, characterized by an Mid-Upper Arm Circumference (MUAC) < 23.5 cm in pregnant women [9;10]. Underweight can result from various factors such as socio-economic conditions, age, environment, and nutritional status. These factors can lead to weakness, decreased physical activity, and reduced fat reserves in the mother, hindering the fetus's growth and development [11].

The nutrients needed by pregnant women can be met through dietary intake or supplementation. Macronutrient and micronutrient supplements play a crucial role in fetal growth during pregnancy. One essential nutrient for fetal development is Docosahexaenoic acid (DHA), an Omega-3 fatty acid critical for brain and retina development in the fetus. DHA can be found in seafood or fish oil supplements. Besides its role in fetal brain and retina development, DHA also helps reduce the risk of preterm birth, cardiovascular disease, brain function, and allergy [12].

Another vital nutrient for fetal development is folic acid. Folic acid is a water-soluble vitamin that can be found in foods like fruits, green leafy vegetables, and liver. Folic acid is crucial for brain function, mental health, and emotional well-being, especially during infancy, adolescence, and pregnancy [13]. Deficiency in folic acid can lead to neural tube defects (NTD), megaloblastic anemia, congenital abnormalities, preterm birth, cardiovascular diseases, hypertension, and neurological disorders [14]. Therefore, the requirement of folic acid supplementation in pregnant women is up to 600 ug/day to meet the nutritional needs of pregnant women and their fetuses [15]. However, excessive folic acid intake can also lead to health issues. Accordingly, optimal folic acid supplementation is crucial. In pregnancy, folic acid plays an important role in preventing congenital defects and neurocognitive dysfunction.

Based on the presented background, there is still a significant incidence of pregnant women with nutritional problems in Indonesia. Many pregnant women do not fully understand the benefits of DHA and folic acid for fetal growth and the health of pregnant women themselves. Therefore, the author aims to investigate the effect of DHA supplementation on folate levels in the serum of pregnant women experiencing underweight.

METHODS

This study is quantitative research with a pre-experimental design and a retrospective cohort test, conducted from July to August to look the effect of Docosahexaenoic Acid (DHA) supplementation on serum folate levels in underweight pregnant women at Puskesmas Made Surabaya. A per-experimental design with a one-group pretest-post test design involves only one group without a comparative or control group. Non-probability sampling with purposive sampling was used in this research. The sample size for this study is 19, with an estimated 10% dropout rate. Therefore, the required sample size is 21, calculated using the minimal sample formula by Lwanga and Lemeshow.

This study was conducted with ethical committee approval and permission from Puskesmas Made. The study sample consisted of pregnant women from the Puskesmas Made who met the following inclusion criteria: research participants were pregnant women underweight, having BMI < 18.5 kg/m. Additionally, the exclusion criteria for the sample were as follows: 1. Participants who were not pregnant women with BMI < 18.5 kg/m during the study period. 2. Participants who did not consume the provided DHA supplementation for consecutive days, and participants who withdrew from the study.

Data collection began by obtaining consent from pregnant women to participate in the study, using an informed consent form that explained the activities, benefits, and potential risks of the research. Once the consent was signed, the data were collected from pregnant women. The data used in the study were obtained through medical records and physical examination, including the name, age, gestational age, body weight, body height, uterine fundal height, MUAC, BMI, and blood pressure of pregnant women. Venous blood samples, the primary focus of this research, were taken initially. Subsequently, pregnant women were given DHA supplements for 30 days, after 30 days passed another blood sample was collected upon their return. The sampel are taken to the laboratory facility for examination. The examination of body serum folate levels in this study utilizes the ECLIA (Electrochemiluminescence Immunoassay) method.

This study conducted a univariate analysis of variables influencing changes in folic acid levels and the occurrence of underweight. In this study, a paired T-test was used for normally distributed data, while the Wilcoxon Signed Rank Test was used for non-normally distributed data. Statistical Package for The Social Science (SPSS) program, providing quantitative results through statistical calculation. Both tests generated results at a significance level of 5%, where a $\alpha < 0.05$ indicated a significant difference.

RESULTS

Based on the result of the conducted research, descriptive data analysis is intended to provide a general overview of data, including the mean, median, standard deviation, maximum data, minimum data, normality test result and frequency table (Table 1).

The normality test is a mandatory procedure before conducting statistical tests to determine whether the obtained data is normally distributed or not. The normality test used in this study is the Shapiro-Wilk test because the sample size is small, i.e., < 50 samples. The data is considered normally distributed if the significance value is > 0.05, and vice versa. Based on Tables 1, it is found that BMI, uterine fundal height, systolic blood pressure, and the mean diastolic blood pressure, both pre-intervention and post-intervention, are not normally distributed, where the p-value < 0.05, so the test performed is the Wilcoxon Signed Ranks Test. Meanwhile, body weight, body height, MUAC, and folate are normally distributed with a p-value > 0.05, so the test performed is the paired T-test. The data analysis results at a significance level of 5%, if $\alpha < 0.05$, meaning there is a significant or meaningful difference.

Analysis data shows that the mean initial weight of pregnant women is 42.62 ± 3.106, while the final weight after receiving DHA supplements is 44.76 ± 3.032, with p-value < 0.001. The mean initial height of pregnant women in the study is 152.595 ± 4.8647, and the final height has a mean of 152.595 ± 4.8647, with p-value of 0.693. The initial mean BMI of pregnant women is 18.257 ± 0.3102, and the final BMI mean is 19.262 ± 0.8663, with a p-value < 0.001. The initial MUAC in pregnant women has a mean value of 24.238 ± 1.4545, while the final MUAC has a mean of 25.243 ± 2.2288, with a p-value of 0.003. The mean initial fundal height is 17.38 ± 7.606, and for the final fundal height, it is 18.52 ± 7.366, with a p - value of 0.007. The initial mean systolic blood pressure is 104.48 ± 10.638, while the final mean systolic blood pressure is 107.95 ± 14.312, with a p - value of 0.090. The initial mean diastolic blood pressure in pregnant women is 66.00 ± 6.611, and for the final diastolic blood pressure, it is 67.95 ± 11.651, with a p - value of 0.393. The initial mean folate level in pregnant women is 14.381 ± 4.8078, while the mean final folate level is 18.176 ± 5.8085, resulting in a paired T-test probability value of < 0.001. (Table 2)

DISCUSSION

The results showed that there was a significant difference between body weight before and after DHA supplementation, with an initial body weight value of 42.62 ± 3.106. Where there was an increase in the weight of pregnant women after consuming DHA supplements with a value of 44.76 ± 3.032 (p < 0.001). The results of this study were proven to be in line with research conducted on young mice given healthy food where fish oil and DHA supplementation caused changes in body weight (p = 0.036 < 0.05), namely an increase in body weight [16]. Then other research is also in line with this research where there is a significant difference between before and after DHA supplementation on the weight of pregnant women (p < 0.001) [17].

In the BMI results of pregnant women, significant changes were found, where there was an increase in BMI after being given DHA compared to before being given DHA. Where the initial BMI of pregnant women is 18.257 ± 0.3102 and the final average BMI is 19.262 ± 0.8663 with a p value < 0.001. This research is in line with research conducted on obese adolescents aged 16 -18 years, there is a relationship where the p value = 0.001 < 0.05 between the ratio of omega-6 or omega-3 intake and BMI [18]. Meanwhile, another study conducted on the obese group before and after being given EPA and DHA found that there was no significant effect between before and after EPA and DHA supplementation with a value of p = 0.91 > 0.05 [19].

The research results showed that there was an influence on MUAC of pregnant women before it was 24.238 ± 1.4545, and after consuming DHA it was 25.243 ± 2.2288 with the results of data analysis having a p value = 0.003. According to research conducted in 2019 in Surabaya, a significant difference in MUAC between normal pregnant women and CED pregnant women before being given DHA was 27.4+2.22 vs 20.6+1.298 (p < 0.005) so it is in accordance with this research [10]. Then other research also stated that there was a significant difference in the MUAC size before and after treatment, 22.26 + 0.28 vs 22.88 + 0.28 (p < 0.0001) [17].

In TFU, changes were found before and after DHA supplementation. Where the initial TFU value was 17.38 ± 7.606 and for the final TFU was 19.14 ± 7.323 (p = 0.007). This research is not in accordance with research conducted in 2019 in Surabaya where the TFU of pregnant women with CED who were given micronutrient supplementation was 29.6+1.121 and calorie adequacy compared with normal pregnant women was 28.9+1.032, there was no significant difference (p = 0101) [10]. Meanwhile, other research states that accompanying activities for KEK pregnant women who have a high risk of having stunted babies by providing additional food high in energy, high in protein, giving Fe, folic acid, calcium and multivitamins has been proven to increase TFU with an average increase of 14. 06 cm [20].

For blood pressure, it showed that there was no effect on systolic & diastolic blood pressure either before or after consuming DHA where the initial systolic blood pressure was 104.48 ± 10.638 and the final was ± 14.312 (p = 0.090). Meanwhile, the initial diastolic blood pressure was 66.00 ± 6.611 and at the end it was 67.95 ± 11.651 (p = 0.393). In research on giving DHA or Olive Oil 3 g/day for 12 weeks there was a reduction in resting systolic and diastolic blood pressure compared to EPA treatment in healthy young men and women (cytosolic p = 0.008 and diastolic p = 0.002) so it does not match the research this [21]. In contrast to research on blood pressure before and after in the omega-3 PUFA group and the placebo group (systolic p = 0.082 and diastolic p = 0.235), it was found that there was no significant difference so it is in accordance with this study [22].

Finally, folic acid showed that there was an effect of DHA administration on serum folate levels in underweight pregnant women between 14.381 ± 4.8078 and after DHA supplementation 18.176 ± 5.8085 (p < 0.001). Research conducted at the Patumbak Community Health Center in 2021 concluded that the research had a relationship between folic acid and fetal brain growth as seen through the size of the fetal head circumference (P = 0.022) [23]. Then other research stated that there was a significant relationship (P < 0.001) between folic acid supplementation and a reduced risk of congenital heart disease [24]. Then in other research it was found that giving folic acid during pregnancy had a significant effect on children's cognitive development and prevention of NTDs, where it was stated that children aged 7 years whose mothers were given folic acid had a much higher score than the placebo group (p = 0.027) and also in children 3 years old (p = 0.040) [25]. Apart from that, there is another study that mentions the consumption of folic acid in pregnant women who have gestational diabetes, and found a significant correlation (p = 0.009) so that consumption of folic acid can reduce the risk of developing gestational diabetes [26].

CONCLUSION

Based on the results of research and discussions that have been carried out regarding the effect of Docosahexaenoic Acid (DHA) supplementation on serum folate levels in underweight pregnant women, the following conclusions were obtained: There is an influence on body weight, BMI, LILA, and TFU in underweight pregnant women between before and after DHA supplementation; There is an effect of serum folate in underweight pregnant women between before and after DHA supplementation, where there is an increase in serum folate levels with the significance value requirements being met between before and after DHA supplementation for 30 days.

ACKNOWLEDGEMENTS

The author would like to thank the professors, staff, colleges, and respondents for their invaluable contributions to this research project.

DECLARATIONS

Funding: Self-funded

Conflict of interest: No conflict of interest to be disclosed

Ethical approval: This research has obtained a permit from the National Unity and Politics Agency (Badan KesatuanBangsa dan Politik) with approval number 070/7145/209/2023. All procedures involving research subjects were conducted following the guidelines specified in the ethical clearance from the Health Research Ethics Committee of the Faculty of Medicine Ciputra University (KomisiEtikPenelitian Kesehatan FakultasKedokteran Universitas Ciputra), approval number 050/EC/KEPK-FKUC/VII/2023. All participants provided written consent before participating in this study.

REFERENCES

1. Pascual, Z. N., &Langaker, M. D. (2023). Physiology, pregnancy - statpearls - NCBI bookshelf. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK559304/
2. Moore , A. M., Owolabi, O., Barot, S., &Sedgh, G. (2023). Retrieved from https://www.guttmacher.org/regions/asia/indonesia
3. Dinas Kesehatan Provinsi Jawa Timur. (2021). Jumlah Ibu Hamil, MelakukanKunjungan K1, MelakukanKunjungan K4, Kurang EnergiKronis (KEK), dan Mendapat Tablet ZatBesi (Fe) di Provinsi Jawa Timur, 2017-2020. . Retrieved from https://jatim.bps.go.id/statictable/2021/09/14/2283/jumlah-ibu-hamil-melakukan-kunjungan-k1-melakukan-kunjungan-k4-kurang-energi-kronis-kek-dan-mendapat-tablet-zat-besi-fe-di-provinsi-jawa-timur-2017-2020-.html.
4. Konar, H. (2020). *DC Dutta's textbook of gynecology*. Delhi, India: Jaypee Brothers Medical P.
5. Callahan, T. L., & Caughey, A. B. (2018). *Blueprints Obstetrics &Gynecology*. Philadelphia, US: Wolters Kluwer Health.
6. Hatijar, Saleh, I. S., & Yanti, L. C. (2020). *Buku Ajar AsuhanKebidanan pada Kehamilan*. 10Sungguminasa, Indonesia: Cv. Cahaya Bintang Cemerlang.
7. Badan Penelitian dan Pengembangan Kesehatan. (2018). Laporan Nasional riskesdas 2018. Retrieved from https://repository.badankebijakan.kemkes.go.id/id/eprint/3514/
8. Sadikin, B. G. (2021). Kemkes.go.id. Retrieved from https://e-renggar.kemkes.go.id/file_performance/1-131313-1tahunan-211.pdf
9. Burnie, R., Golob, E., & Clarke, S. (2022). Pregnancy in underweight women: Implications, management and outcomes. *The Obstetrician & Gynaecologist*, *24*(1), 50–57. doi:10.1111/tog.12792
10. Siahaan, S. C., Henderi, H., & Sudibyo. (2021). Intervensi Ibu Hamil dengan Kurang Energi Kalori pada Trimester KetigaMelaluiSuplementasiMikronutrien di Surabaya Tahun2019 . *MajalahKedokteranAndalas*, *44*(1). doi:https://doi.org/10.25077/mka.v44.i1.p17-27.2021
11. Rana, K., Chimoriya, R., Haque, N. B., Piya, M. K., Chimoriya, R., Ekholuenetale, M., & Arora, A. (2022). Prevalence and correlates of underweight among women of reproductive age in Nepal: A cross-sectional study. *International Journal of Environmental Research and Public Health*, *19*(18), 11737. doi:10.3390/ijerph191811737
12. Li, J., Pora, B. L., Dong, K., &Hasjim, J. (2021). Health benefits of docosahexaenoic acid and its bioavailability: A Review. *Food Science & Nutrition*, *9*(9), 5229–5243. doi:10.1002/fsn3.2299
13. Subandrate, Athiah, M., Safyudin, Amalia, E., Saleh, I., Hermansyah, &Gunarti, D. R. (2022). Asam Folat: Peran dalamMetabolisme dan Metode Pemeriksaan . *MajalahKedokteranAndalas*, *45*(1). doi:https://doi.org/10.25077/mka.v45.i1.p51-62.2022
14. Khan, K. M., &Jialal, I. (2022). Folic acid deficiency - statpearls - NCBI bookshelf. Retrieved from https://www.ncbi.nlm.nih.gov/books/NBK535377/
15. Akbar, M. I. A., Febryanna, C., &Sulistyono, A. (2018). Peran asamFolat Dalam Kehamilan. Retrieved from https://www.researchgate.net/publication/326961115_Peran_Asam_Folat_Dalam_Kehamilan
16. Veronica, F., Fitri, L. L., Rizal, A., Gunawan, H., Lesmana, R., Supratman, U., … Wirata, G. (2020). Effects of DHA-Enriched Fish Oil Supplements on Dopamine Receptor Gene Expression in the Cerebral Cortex and Hippocampus Related to the Male Rats Weight Gain. *Journal of Global Pharma Technology*, *12*(6).
17. Siahaan, S. C. (2023). KorelasiSuplementasiNutrisiTerhadap Ibu Hamil Kurang EnergiKronisuntukPencegahanKejadian Stunting. *JurnalKedokteran Syiah Kuala*, *23*(1).

18. Mahesty , I. R., Sulchan , M., & Kartini, A. (2022). RasioAsupan Omega-6/omega-3 Dan Imt (indeks Massa Tubuh) Pada RemajaObesitasUsia 16-18 Tahun. *Sport and Nutrition Journal*, *4*(2). doi:https://doi.org/10.15294/spnj.v4i2.60903
19. Borja-Magno, A. I., Furuzawa-Carballeda, J., Guevara-Cruz, M., Arias, C., Granados, J., Bourges, H., … Gómez, F. E. (2023). Supplementation with EPA and Dha omega-3 fatty acids improves peripheral immune cell mitochondrial dysfunction and inflammation in subjects with obesity. *The Journal of Nutritional Biochemistry*, *120*(109415), 109415. doi:10.1016/j.jnutbio.2023.109415
20. Setyowati, A., Ratnawati, L., &Sholichah, R. M. (2022). PendampinganPengelolaan Ibu Hamil dengankekuranganenergikronik Dan Bayi Berisiko stunting. *Poltekita: JurnalPengabdian Masyarakat*, *3*(2), 157–165. doi:10.33860/pjpm.v3i2.891
21. Lee, J. B., Notay, K., Klingel, S. L., Chabowski, A., Mutch, D. M., & Millar, P. J. (2019). Docosahexaenoic acid reduces resting blood pressure but increases muscle sympathetic outflow compared with eicosapentaenoic acid in healthy men and women. *American Journal of Physiology-Heart and Circulatory Physiology*, *316*(4). doi:10.1152/ajpheart.00677.2018
22. Pipingas, A., Reddan, J. M., Gauci, S., Young, L. M., Kennedy, G., Rowsell, R., … Scholey, A. (2023). Post-prandial cognitive and blood pressure effects of a dha-rich omega-3 powder in middle-aged males: A pilot study. *Nutrients*, *15*(9), 2198. doi:10.3390/nu15092198
23. Khairani, K. (2021). Kontribusi Asam Folat Dan Kadar haemoglobin Pada Ibu Hamil terhadappertumbuhanOtak Janin di puskesmaspatumbak tahun 2021. *JIDAN (JURNAL ILMIAH KEBIDANAN)*, *1*(2), 110–117. doi:10.51771/jdn.v1i2.117
24. Cheng, Z., Gu, R., Lian, Z., & Gu, H. F. (2022). Evaluation of the association between maternal folic acid supplementation and the risk of congenital heart disease: A systematic review and meta-analysis. *Nutrition Journal*, *21*(1). doi:10.1186/s12937-022-00772-2
25. McNulty, H., Rollins, M., Cassidy, T., Caffrey, A., Marshall, B., Dornan, J., … Pentieva, K. (2019). Effect of continued folic acid supplementation beyond the first trimester of pregnancy on cognitive performance in the child: A follow-up study from a randomized controlled trial (FASSTT offspring trial). *BMC Medicine*, *17*(1). doi:10.1186/s12916-019-1432-4
26. Chen, H., Hu, Y., Li, Y., Zhou, W., Zhou, N., Yang, H., … Chen, Z. (2022). Association of Folic acid supplementation in early pregnancy with risk of gestational diabetes mellitus: A longitudinal study. *Nutrients*, *14*(19), 4061. doi:10.3390/nu14194061

Table 1. Description of Data on Pregnant Women at Puskesmas Made

Characteristic	N	Range (Median)	Mean ± Std. Deviasi	*p-value*
Age	21	16 - 36 (27.00)	26.81 ± 4.332	.541
Gestational Age	21	7 - 38 (20.00)	19.86 ± 9.356	.232
Body Weight Pre	21	38 - 47 (43.00)	42.62 ± 3.106	.065
Body Height Pre	21	144.5 - 161.0 (153.000)	152.762 ± 5.1128	.185
BMI Pre	21	17.3 - 18.8 (18.300)	18.257 ± 0.3102	.040
MUAC Pre	21	21.5 - 28.0 (24.000)	24.238 ± 1.4545	.517
Uterine Fundal Height Pre	21	7 - 33 (15.00)	17.38 ± 7.606	.042
Systolic Blood Pressure Pre	21	90 - 128 (101.00)	104.48 ± 10.638	.027
Diastolic Blood Pressure	21	59 - 79 (64.00)	66.00 ± 6.611	.006
Folic Acid Pre	21	5.3 - 24.3 (14.700)	14.381 ± 4.8078	.994
Body Weight Post	21	38 - 49 (45.00)	44.76 ± 3.032	.277
Body Height Post	21	144.5 - 161.0 (153.00)	152.595 ± 4.8647	.197
BMI Post	21	18.3 - 21.7 (19.100)	19.262 ± 0.8663	.003
MUAC Post	21	20.6 - 29.0 (25.700)	25.243 ± 2.2288	.848
Uterine Fundal Height Post	21	10 - 35 (17.00)	18.52 ± 7.366	.007
Systolic Blood Pressure Post	21	85 - 140 (105.00)	107.95 ± 14.312	.141
Diastolic Blood Pressure Post	21	51 - 94 (63.00)	67.95 ± 11.651	.025
Folic Acid Post	21	7.5 - 28.9 (17.500)	18.176 ± 5.8085	.742

Table 2. Data analysis on Pregnant Women at Puskesmas Made

Characteristic	N	Range (Median)	Mean ± Std. Deviasi	*p-value*
Body Weight Pre	21	38 - 47 (43.00)	42.62 ± 3.106	< 0.001
Body Weight Post		38 - 49 (45.00)	44.76 ± 3.032	
Body Height Pre	21	144.5 - 161.0 (153.00)	152.595 ± 4.8647	0.693
Body Height Post		144.5 - 161.0 (153.00)	152.595 ± 4.8647	
BMI Pre	21	17.3 - 18.8 (18.300)	18.257 ± 0.3102	< 0.001
BMI Post		18.3 - 21.7 (19.100)	19.262 ± 0.8663	
MUAC Pre	21	21.5 - 28.0 (24.000)	24.238 ± 1.4545	0.003
MUAC Post		20.6 - 29.0 (25.700)	25.243 ± 2.2288	
Uterine Fundal Height Pre	21	7 - 33 (15.00)	17.38 ± 7.606	0.007
Uterine Fundal Height Post		10 - 35 (17.00)	18.52 ± 7.366	
Systolic Blood Pressure Pre	21	90 - 128 (101.00)	104.48 ± 10.638	0.090
Systolic Blood Pressure Post		85 - 140 (105.00)	107.95 ± 14.312	
Diastolic Blood Pressure	21	59 - 79 (64.00)	66.00 ± 6.611	0.393
Diastolic Blood Pressure Post		51 - 94 (63.00)	67.95 ± 11.651	
Folic Acid Pre	21	5.3 - 24.3 (14.700)	14.381 ± 4.8078	< 0.001
Folic Acid Post		7.5 - 28.9 (17.500)	18.176 ± 5.8085	