Status of Anthropometry in Depot Medroxyprogesterone Acetate User Subjects

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A study was conducted to evaluate the status of anthropometric parameters in women using depot medroxyprogesterone acetate (DMPA). A total of 90 Bangladeshi married women of age group 15–40 years attending the Model Family Planning Clinic, Mymensingh Medical College Hospital, Mymensingh during July 2010 to June 2011 were included for this study. The selected women were classified into three groups comprising those using the drug for 3 months, 1 year, and 2 years, respectively also compared to a control group (N = 30) of married non-hormonally treated women of similar ages. All the subjects were clinically examined; their age, weight, height, blood pressure (BP), body mass index (BMI), and waist-hip-ratio (WHR) were recorded. Data were collected and processed according to the design and objectives of the study. No significant ($p>0.05$) difference in age and blood pressure were observed among the study groups. A significantly ($p<0.01$) excessive weight experience was observed in 2 years DMPA user compared with control. BMI was significantly ($p<0.01$) decreased in the 1 year group and rapidly increased in the 2 years group. Long term users had significantly ($p<0.01$) higher WHR compared to the short term users. The study concludes that- DMPA induced significant alterations in anthropometric parameters of the studied population; however, further study with a larger sample size is suggested for a general recommendation.

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Key words: Anthropometry, Depot medroxyprogesterone acetate (DMPA), Women

Introduction

Anthropometric parameters and their derived indices are frequently used by physicians and health workers as a valuable instrument to determine health and disease, to define nutritional status, to assess growth and development, to determine differences in body proportion between populations as well as to optimize diagnosis and treatment.[1-3] DMPA is a synthetic steroid similar to progesterone, a hormone normally produced by the ovaries each month as a part of the menstrual cycle and used as a long acting hormonal contraceptive method. DMPA was developed in 1954 by the Upjohn Company, USA for the treatment of endometriosis and habitual or threatened abortions. In the early 1960's it was noted that women receiving DMPA for premature labor, subsequently had a marked delay in return of fertility following delivery. This observation led to the development of DMPA as a fertility-regulating agent. In the mid 1960's, Upjohn recommended a contraceptive product license for DMPA in many countries.[4]

As the contraceptive use rate is gradually increasing in Bangladesh, information about anthropometry due to the effect of injectable contraceptives is very much essential for its logical administration. Unfortunately, only a few exclusive and comprehensive studies on the effect of DMPA on anthropometry have been undertaken. Therefore, this study was conducted to assess the effect of DMPA on anthropometric variables, such as body weight, height, BMI and WHR.

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DMPA is administered in a dose of 150 mg in 1 ml aqueous suspension. The injection is given in every 90 days into the deep gluteal or deltoid muscles, and one injection inhibits ovulation for at least 14 weeks.[5] It is estimated that 13 million women are currently using DMPA and the method is marketed in more than 90 countries worldwide.[6,7] Contraceptive methods including DMPA are reported to induce the anthropometric variables. In a one year study, Shah *et al.* (2009)[8] found that average weight gain in DMPA users was 1.5 kg. Pharmacia Upjohn in 1999 reported that weight gain in DMPA users was 2.5 kg in one year study period. Studies in both adults and adolescents have found that long-term use of DMPA had no unfavorable impact on blood pressure.[9] BMI is a better indicator of total body fat and correlates more closely with adverse effects of excess weight than body weight alone. Shah *et al*. (2009)[8] reported that one year DMPA user women had increased BMI of 0.52 kg/m^2. Harriel *et al.* (1995)[10] in a three months study on DMPA user described an increase in BMI of 0.5 kg/m.^{2}

Methods

A case control study was done taking 120 married women of age between 15 to 40 years as study subjects from Mymensingh town. This study was carried out in the Department of Biochemistry, MMC, and the subjects were collected from the Model Family Planning Clinic in Mymensingh Medical College Hospital, during the period from July 2010 to June 2011. The subjects were grouped as follows: 1) Control group (Group-I): Consisted of 30 healthy married women of reproductive age group. This group never used any hormonal contraceptive, 2) Study group (Group-II): Consisted of 90 healthy married women [sub-divided into three groups viz., Group-IIA (3 months), Group-IIB (1 year) and Group-IIC (2 years) DMPA users without any interruption].

Inclusion criteria: Women of reproductive age 15 to 40 years; healthy women at same age group were considered as control.

Exclusion criteria: Obesity, severe anaemia, hypertension and heart disease, diabetes mellitus, liver disease and pregnancy.

All the subjects were clinically examined; their age, weight, height, blood pressure, and WHR were recorded. Each individual completed questionnaire concerning their occupation, drug history, history of recent or chronic illness etc. Data were collected by direct interview from study subjects and or from their attendant. Informed written consent was taken from all subjects.

The following anthropometric parameters were taken into consideration:

a) Weight and height

Weight was recorded to the nearest kilogram (kg) with the subject standing on the weighting mechine, when subjects were fasting, had an empty bladder, were wearing light clothing with empty pockets, and were not wearing shoes. The same weighting mechine was used for all woman's and the mechine was tested with a known set of weights for any error[11]. Height was recorded with the subject erect, bare footed, feet together, back and heels against the upright bar of height scale, head upright in Frankfort horizontal plane 'look straight ahead'. The height measuring equipment consisted of a vertical bar with a steel tape attached. Attached perpendicularly to the vertical bar was a horizontal bar which was brought down snugly on the examinee's head[12].

b) Blood pressure

Blood pressure was measured by sphygmomanometer. The sphygmomanometer cuff was placed around the upper arm with its lower edge about an

inch above the elbow. The diaphragm of the stethoscope was placed over the brachial artery on the medial half of the anterior elbow joint. The valve was slightly opened to slowly release the air. When the first pulse sound was heard, the systolic pressure was read. Air releasing was continued, and when the pulse sound suddenly disappeared, diastolic pressure was read[13].

c) Body mass index

Body mass index was calculated from the formula[14]; BMI= weight in kg / (height in meters)^2.

d) Waist and hip ratio

Waist circumference was measured to the nearest 0.1 cm in a horizontal plane at the midpoint between the lower margin of the last rib and the crest of the ileum when the subject stood with her feet 25–30 cm apart[15]. Hip circumference was also measured to the nearest 0.1 cm in a horizontal plane at the maximum point over the buttock at the level of the femoral greater trochanter by using a flexible nonstretch nylon tape[15]. The waist-to-hip ratio (WHR) has been used extensively in adults; however, studies published in the 1990s suggest that waist circumference alone may be a more useful and accurate tool in adults[16,17,18,19] and children [20,21.22].

All data were recorded systematically in a preformed data collection sheet. The collected data were processed and analyzed by computer software SPSS (Statistical Package for Social Science) version 17.0 to obtain the level of significance following the Analysis of Variance (ANOVA) technique by "F" variance test. Considering the single independent variable of this study, one-way ANOVA was performed in a descriptive manner to calculate the means, standard deviation and standard error. The mean differences among treatments were compared by Duncan's Multiple Range Test (DMRT) at 5% level of probability.

Results

The data relating to the age, body weight, blood pressure, BMI and WHR of control and study groups are presented in Table 1. For all these parameters, data in Table 1 represents the mean values, SD, level of significance and multiple comparison levels.

The mean age of control, 3 months, 1 year and 2 years grouped women were 28.00, 27.96, 26.50 and 27.06 years, respectively with no significant variations (Table 1). The SD values for mean age were: control 28.00±5.38, 3 months 27.96±4.91, 1 year 26.50±4.73 and 2 years 27.06±4.81.

The mean body weight data are presented in Table 1. DMPA influenced the body weight of the study subjects and control at 5% level of significance ($p< 0.05$). Mean body weights of the control, 3 months, 1 year and 2 years women were 48.63±7.81, 46.86±8.17, 46.00±11.11 and 52.10±6.71 kg, respectively. An increase of 3.47 kg weight was observed in 2 years DMPA user compared with control.

Use of DMPA did not have any significant effect on neither systolic nor diastolic blood pressure (Table 1). Mean systolic blood pressures were: control 110.00±10.08, 3 months 108.33±10.26, 1 year 111.66±7.46 and 2 years 108.33±9.40 and that of diastolic 72.66±6.91, 72.00±7.61, 74.33±8.58 and 71.00±7.35, respectively. A normal clinical range of systolic and diastolic BP was observed.

A highly significant ($p< 0.01$) variation was observed in BMI due to the effect of DMPA (Table 1). Significantly the highest mean BMI (23.73 kg/m^2) was noted from 2 years DMPA users, whereas other study groups including control showed statistically similar mean BMI. SD values for mean BMI were: control 21.73±2.61, 3 months 22.00±3.17, 1 year 20.93±4.40 and 2 years 23.73±2.72kg/m^2. A

tendency of increasing BMI was observed in the long-term DMPA users.

A mean total waist-hip ratio of 0.74±0.12, 0.78±0.11, 0.84±0.03 and 0.82±0.05 were observed in control, 3 months, 1 year and 2 years DMPA users, respectively with significant ($p< 0.01$) variation (Table 1). Long term users had significantly higher WHR compared to the short term users.

Table 1. DMPA on age, body weight, blood pressure, BMI and WHR in control and cases

Anthropometric variables	Group-I (Control) Mean±SD	Group-II (Case)			F value	P value
		Group-IIA (3 months) Mean±SD	Group-IIB (1 year) Mean±SD	Group-IIC (2 years) Mean±SD		
Age (year)	28.00±5.38a[z]	27.96±4.91a	26.50±4.73a	27.06±4.81a	0.64	.585
Body weight (kg)	48.63±7.81ab	46.86±8.17b	46.00±11.11b	52.10±6.71a	2.94	.036
Systolic BP (mmHg)	110.00±10.08a	108.33±10.26a	111.66±7.46 a	108.33±9.40a	0.82	.483
Diastolic BP (mmHg)	72.66±6.91a	72.00±7.61a	74.33±8.58a	71.00±7.35a	1.00	.392
BMI (kg/m^2)	21.73±2.61b	22.00±3.17b	20.93±4.40b	23.73±2.72a	3.81	.012
WHR	0.74±0.12c	0.78±0.11bc	0.84±0.03a	0.82±0.05ab	6.91	.000

P value reached by one way ANOVA.

[z] Same letters in a column indicate statistically similar performance and different letters represent significant difference by Duncan's Multiple Range Test (a>b>c).

Discussion

The prime purpose of this study was to test the hypothesis that exogenous application of DMPA may influence the anthropometry of recipient women. To infer our findings, we first discussed the results of the effect of DMPA on age, weight, blood pressure BMI and WHR by comparing with the relevant reports. Finally, we have summarized the overall achievements of this study.

Although the inclusion criteria of women age were 15-40 years, in maximum cases we found the age range between 19 to 35 years which in turn resulted non-significant age disparity. This homogeneity in age group might have logical impact on evaluation and interpretation of the overall results.

In our study, an increase in body weight was observed in the prolonged user of DMPA. Significantly ($p<0.05$) the highest body weight was observed in the 2 years DMPA users. However, the control group also had statistically similar weight performance. In a one year study Shah *et al.* (2009)[8] found that average weight gain in DMPA users was 1.5 kg. Pharmacia Upjohn in 1999 noted the effect of DMPA on weight gain and observed that weight gain was 2.5 kg in one year study period. This finding is somewhat different from our result; we found a significant increase in 3.47kg weight only in 2-year recipient women. Sang *et al.* (1995)[23] compared two groups of combined injectable contraceptive and found difference in mean weight gain of 1 kg. They concluded that the weight gain might be due to progestrogenic

effect which is responsible for increase in subcutaneous fat specially breast, thighs and hips, and fluid retention due to Mineralo Corticoid activity.

Weight gain is a major concern of women of all ages and a factor cited by many who discontinue hormonal methods of contraception. Although users of DMPA often report weight changes, few controlled clinical studies addressing this issue have been conducted in developed countries. Recent controlled studies in US and Thai women do not indicate that long-term use of DMPA causes an increase in body weight[24]. These studies, however, do not rule out the possibility that subgroups of DMPA users may be predisposed to weight gain.

Product information provided by the Upjohn Company (manufacturer of DMPA) describes average weight gain of 2.5 kg after 1 year of use.[25] An early collaborative study of DMPA use among 3857 women in the USA reported a mean weight gain of approximately 2.3 kg after 1 year, 3.7 kg after 2 years, and 6.3 kg after 4 years.[26] Another early trial among 138 women in Calcutta reported mean weight gains above 4.0 kg at 1 year and above 6.0 kg at 2 years.[27] A more recent WHO multicentre phase-III clinical trial of DMPA reported a mean weight gain of 1.5 kg per year.[28]

DMPA interfered or integrated with lipids, so, the phenomenon of the increasing of body weight was reported. Similar observations were reported by other researchers.[29,30] The previous authors reported the reasons why the use of DMPA can lead to weight increase. Initially, it was suggested that DMPA increases serum lipids and consequently increases the weight[31]. Another explanation is that being a steroid contraceptive, it leads to a weight gain because of its anabolic effects and fluid retention[32]. However, a study performed in Thai women does not support this theory, and it was suggested that weight increase depends on fat deposition, higher appetite[33]. Our results conflict with the study by Pelkman *et al.* (2001)[34] in which DMPA did not cause weight gain in young women over a 3 months period. However, the differences could be explained by the length of follow-up investigation.

Blood pressure (both systolic and diastolic) had non-significant ($p>0.05$) differences. Studies in both adults and adolescents have found that long-term use of DMPA had no unfavorable impact on blood pressure[9]. Likewise, in 1-year clinical trials by the WHO and the US multicenter study reported no clinically significant blood pressure trends.[9,35] These findings have consistency with our results.

In addition to weight, BMI was calculated because it is a better indicator of total body fat and correlates more closely with adverse effects of excess weight than body weight alone. We found significantly ($p<0.01$) highest BMI in prolonged DMPA users. The mean BMI increase in 2 years DMPA users was $2kg/m^2$. Shah *et al*. (2009)[8] reported that one year DMPA user women had increased BMI of 0.52 $kg/m.^2$ Harriel *et al*. (1995)[10] in a three months study on DMPA user described an increase in BMI of 0.5 kg/m^2; in his another study increase BMI after three months of DMPA use was 0.15 $kg/m.^2$ Our findings mostly correlate with the above mentioned results.

The waist to hip ratio is an important tool that helps to determine overall health risk; in case of female, WHR 0.80 or below, 0.81 to 0.85 and 0.85 or more indicate low risk, moderate risk and high risk, respectively[36]. We found significantly ($p<0.01$) highest WHR in 1 year DMPA user. This implies that DMPA administration induced an increase in WHR but the increment was within the moderate risk level.

There have been many reports regarding the effects, safety and efficacy of injectable contraceptives including DMPA, yet there is still considerable confusion and uncertainty. Results are not consistent between studies in most cases. Our results also have shown somewhat agreement and disagreement with the available literatures. This is perhaps due to discrepancy in methodologies, study duration, design of research and sample sizes etc.

Conclusion

The use of injectable contraceptive including DMPA is gradually increasing in Bangladesh. Information on anthropometric changes due to the effect of DMPA is very much essential for its cautious administration. There have been many reports regarding the effects, safety and efficacy of injectable contraceptives including DMPA, yet there is still considerable confusion and uncertainty. Results are not consistent between studies in most cases. Our results also have shown somewhat agreement and disagreement with the available literatures. This is perhaps due to discrepancy in methodologies, study duration, design of research and sample sizes etc. In this study anthropometric status was assessed by estimating of age, body weight, blood pressure, BMI and WHR. The study concludes that- DMPA induced significant alterations in anthropometric parameters, such as body weight, BMI and WHR, but no effect was observed in blood pressure. This is a case control study done in a particular location. For a precise conclusion, further comprehensive study with large population is recommended.

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