The Association Between Progestin-based Contraceptive Usage and Genital Inflammatory Immune Biomarkers for HIV Acquisition in Adolescent Females in Washington, DC

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Background

Unintended pregnancy in adolescents, which was reported to be about 50% of all adolescent pregnancies, can be prevented by variety of types of contraceptives. Previous research showed that the progestin-based contraceptive, Depot medroxyprogesterone acetate (DMPA), has been associated with enhanced HIV acquisition in adult women.[1,2,3] However, the impact have not been assessed in adolescent girls, a population bearing a disproportionate burden of both the HIV epidemic and often-unintended pregnancies. Currently, the data on immunological consequences of continued usage of progestin-based contraceptives on genital tract of adolescent girls in the United States is insufficient. Therefore, the objective of this study was to examine the genital inflammatory immune biomarkers associated with HIV acquisition following usage of three types of progestin-based contraceptives, levonorgestrel intrauterine device (LNG-IUD), subdermal etonogestrel (ETNG), and injectable DMPA, in adolescent girls.

Methods

Following IRB approval, 59 sexually active, HIV-negative adolescent girls (ages 15-19) were recruited from Children's National Medical Center and Medstar Washington Hospital Center in Washington, DC from 2017 to 2019. After contraceptive counseling, participants self-selected into different study arms: Control (condoms only), combined oral contraceptive pills (COC), LNG-IUD, ETNG and DMPA groups, which included 11, 14, 15, 11, and 9 participants per group at baseline, respectively. Vaginal swabs were collected at baseline prior to contraceptive use, and again at a 3-month follow-up visit. Vaginal secretions were tested for pro-inflammatory immune mediators, IL-6, TNF-α, IL-1α, IL-1β, IP-10, MIP-1α using ELISA. Biomarker data were then analyzed using Wilcoxon Rank Sum Test and Kruskal Wallis Test (SAS 9.4) to evaluate differences between visits across treatment groups. The comparison of Log-transformed biomarkers were analyzed by Graphpad Prism.

Demographic	Control	COC	IUD	Implant	Depo	P
N (%)	11 (100)	14 (100)	15 (100)	11 (100)	9 (100)	
Age						
15-17	4 (36.4)	11 (73.3)	13 (92.9)	4 (36.4)	5 (44.4)	0.0093
18-19	7 (63.6)	4 (26.7)	1 (7.1)	7 (63.6)	5 (55.6)	
Race						
Black	11 (100.0)	10 (66.7)	3 (21.4)	7 (63.6)	8 (88.9)	0.0051
White	0 (0.0)	3 (20.0)	8 (57.1)	2 (18.2)	0 (0.0)	
Other	0 (0.0)	2 (13.3)	3 (21.3)	2 (18.2)	1 (11.1)	
Regular Cycles Before Contraceptive						
Yes (%)	10 (100.0)	10 (66.7)	8 (57.1)	10 (90.9)	7 (77.8)	0.0773
Age at first sexual encounter						
12-14	4 (36.4)	2 (13.3)	1 (7.1)	1 (9.1)	2 (22.2)	
15-17	6 (54.6)	12 (80.0)	12 (85.7)	7 (63.6)	7 (77.8)	0.3005
18-19	1 (9.1)	1 (6.7)	1 (7.1)	3 (27.3)	0 (0.0)	
Lifetime sexual partners						
1	3 (27.3)	8 (53.3)	11 (78.6)	3 (27.3)	5 (55.6)	
2-4	5 (45.5)	3 (20.0)	2 (14.3)	6 (54.6)	3 (33.3)	0.1814
5+	3 (27.3)	4 (26.7)	1 (7.1)	2 (18.2)	1 (11.1)	
Alcohol Use						
Never	7 (63.6)	11 (73.3)	8 (57.1)	5 (45.5)	6 (66.7)	
1-3 drinks/month	4 (36.4)	3 (20.0)	3 (21.4)	5 (45.5)	1 (11.1)	0.4720
1+ drinks/week	0 (0.0)	1 (6.7)	3 (21.4)	1 (9.1)	2 (22.2)	
Smoking Status						
Never	9 (81.8)	15 (100.0)	14 (100.0)	8 (72.7)	8 (88.9)	
Past	0 (0.0)	0 (0.0)	0 (0.0)	1 (9.1)	0 (0.0)	0.2456
Current	2 (18.2)	0 (0.0)	0 (0.0)	2 (18.2)	1 (11.1)	

Table 1: Demographic Information

Results

Thirty-four participants provided both baseline and follow-up samples: 6 participants for control (condom only), 7 for COC, 9 for LNG-IUD, 7 for ETNG and 5 for DMPA. Participants differed by race and age distribution among contraceptive groups (Table 1). Statistically significant differences in median biomarker levels between Baseline and follow-up visit were only observed for TNF-α, decreasing from the baseline visit compared to the follow-up visit, in the COC arm (Figure 1, p = 0.046).

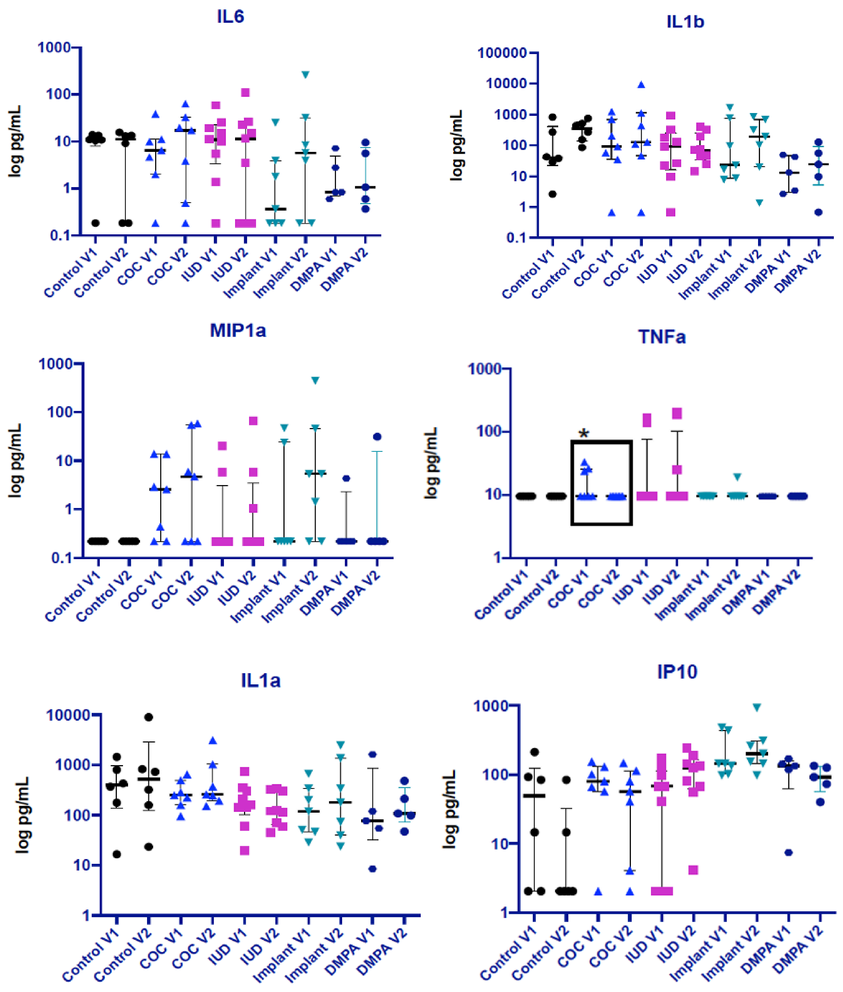

Figure 1: Comparison of Log-Transformed Median Biomarker Levels by Visit and Treatment Group

Conclusions

The study indicated that usage of progestin-based contraceptives may not play a significant role in increasing inflammation when compared to contenders. Consequently, the study suggests that progestin-based contraceptives do not impact inflammatory genital immune biomarkers associated with HIV susceptibility. However, we demonstrate the need of future research studies in this with larger sample size and longer follow-up period to evaluate safe and effective contraceptives in adolescent girls to prevent unintended pregnancies and HIV transmission.

References

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