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Oral Contraceptive Use Among Women in the Military and the General U.S. Population

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Abstract

Objective: To compare oral contraceptive (OC) use during a 12-month period among women aged 18–39 years in the U.S. military and the general U.S. population using data from the Military Health System Management Analysis and Reporting Tool (M2) and the National Health and Nutrition Examination Survey (NHANES), respectively.
Methods: OC use was age adjusted to the 2000 U.S. Census population. Comparisons between the military ($n = 83{,}181$) and the general population (unweighted $n = 360$), as well as between the military branches, were conducted overall and stratified by age, race/ethnicity, and marital status.
Results: OC use was higher in the military (34%) than in the general population (29%, $p < 0.05$). This difference increased with age and was most pronounced among Hispanics (military, 32.2%; general population, 19.8%). Within the military, OC use was highest in the Air Force (39%) and lowest in the Army (30%, $p < 0.05$).
Conclusions: These findings suggest that OC use differs between the military and the general population and within the military by service branch. Further studies that assess whether OC use is related to variations in health outcomes between these two populations and within the military are warranted.

Introduction

Oral contraceptives (OCs), first approved by the Federal Drug Administration in 1960, are the most common form of reversible hormonal contraception used in the United States.[1] Throughout the years, OC formulas have changed to reduce side effects and improve effectiveness. Most modern OCs contain low doses of both estrogen and progestin and prevent contraception mainly by suppressing ovulation but also by minimizing sperm migration and implantation.[2]

In addition to being an effective form of birth control, OC use has been associated with noncontraceptive health outcomes that are both beneficial and detrimental.[2] OC use increases menstrual regulation, shortens menses, minimizes menstrual cramping, and has been used to treat polycystic ovary syndrome (POS).[3] However, OC use has also been associated with increased risk of cardiovascular diseases (CVD), such as venous thromboembolism, especially among smokers.[4] With respect to cancer, the direction of the association between OC use and risk is site dependent. Most notably, OC use has been associated with risk reductions of endometrial[5–7] and ovarian cancers,[5,7–11] which grow more pronounced with length of use and dissipate after discontinuation. There is also accumulating evidence that OC use may decrease the risk of colorectal cancer.[5,12,13] In contrast, OC use has been associated with a borderline significantly increased risk of hepatocellular carcinoma (HCC)[14] and a significantly increased risk of cervical cancer in a pooled analysis.[15] It is speculated that OC use is only a cofactor in the presence of human papillomavirus (HPV).[16] There is also some evidence to suggest that current or recent OC use increases risk of breast cancer among young, premenopausal women,[17–20] although a similar increased risk has not been found among older, postmenopausal women.[19,21]

In a recent comparison, by our group, of cancer incidence rates among active duty military personnel and the general U.S. population, the only risk that significantly differed among both white and black women was that of breast cancer.[22] Breast cancer incidence was higher (19%–37%) in the military than in the general population. Several factors may account for this observed difference. First, active duty women are a selective group of individuals. Military medical standards preclude enlistment of women with certain diseases or conditions and require personnel to maintain high levels of

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physical fitness and undergo frequent routine medical examinations.[23,24] Second, environmental exposures[25] and lifestyle choices, including those pertaining to reproduction and OC use, likely differ between these two groups.

The benefits of OCs, namely, birth control and increased regulation of menstruation, may be more appealing to active duty women than women in the general population. Active duty women work in a predominantly male environment and often want to minimize physical differences.[26] Female military personnel need to be combat ready, and pregnancy and menstrual symptoms (e.g., abdominal pain, water retention) could interfere with daily duties. Once deployed, servicewomen often face unhygienic environments and have difficulties obtaining and disposing of menstrual supplies.[27] Additionally, active duty personnel are not required to pay a copayment for contraceptives,[28] making prescription medications, such as OC pills, more accessible.

To our knowledge, OC use in the military has not been estimated previously. We hypothesized that OC use would be higher in the military than in the general population because of a higher need or desire for birth control and menstrual regulation and higher accessibility to prescription medications. The purpose of this study was to compare use among active duty women based on prescription billing records to use among the general U.S. female population based on estimates from the National Health and Nutrition Examination Survey (NHANES) data. We also evaluated OC use by military branch.

Materials and Methods

This study was based on nonidentifiable data and was approved by the U.S. Military Cancer Institute institutional review board.

Military data source

Information from the Military Health System Management Analysis and Reporting Tool (M2) was accessed to calculate OC use among active duty women. M2 encompasses multiple databases that include detailed demographic and clinical data. Two specific databases were accessed for this study: the Defense Enrollment Eligibility Reporting System (DEERS) and the Pharmacy Data Transaction Service (PDTS). DEERS includes demographic data for all people who are entitled under the law to TRICARE (Department of Defense health system) medical benefits. Active duty service members are automatically registered in DEERS. The PDTS includes detailed data for all prescriptions dispensed at military treatment facilities, retail pharmacies, and mail order pharmacies.

All active duty women between the ages of 18 and 39 years during fiscal year 2005 (October 1, 2004, through September 30, 2005) were identified in DEERS ($n = 83{,}181$). Older women were not included because OC use among older women is less common, and we wanted to limit the inclusion of perimenopausal and menopausal women. Data from PDTS were used to identify women with OC prescriptions during fiscal year 2005. A two-step process was followed to identify relevant prescriptions. First, prescriptions were limited to contraceptives (American Hospital Formulary Service [AHFS] Pharmacologic-Therapeutic Class: 681200). Second, product names were reviewed, and prescriptions for emergency contraceptives (e.g., Plan B® One Step, Women's Capital Corporation, Washington, DC) and nonoral contraceptives (e.g. Implanon®, Schering-Plough, Kenilworth, NJ, and Lunelle®, Pfizer, New York, NY) were excluded. Women who had at least one prescription during this 12-month period were categorized as OC users. Women with no identified prescriptions during this period were categorized as nonOC users.

General population data source

Survey results from the NHANES 2005–2006 were accessed to estimate OC use among the U.S. female population between the ages of 18 and 39 years (unweighted $n = 360$). To be comparable to the military data, a new variable, OC use in the past 12 months, was created. This variable was created by combining information from three NHANES questions: Have you ever taken birth control pills for any reason? Are you taking birth control pills now? How old were you when you stopped taking birth control pills? Never users and past users who stopped more than 1 year before interview were categorized as nonusers in the preceding 12 months. Current users and those who stopped <1 year before interview were categorized as users in the preceding 12 months.

Data analysis

Estimates of OC use were calculated using SAS software, version 9.1 (SAS Institute, Inc., Cary, NC). Direct age standardization was conducted using the 2000 U.S. Census population and five age groups: 18–19, 20–24, 25–29, 30–34, and 35–39 years. Estimates from NHANES were adjusted for the complex multistage sampling design using the survey procedures in SAS according to NHANES guidelines.[29] NHANES-based estimates that were based on an unweighted sample size of <30 or had a relative standard error (SE) of >30% were reported but were considered statistically unreliable or imprecise.[30] Two sample t tests were conducted to compare OC use between the two populations and within the military by service branch, overall and stratified by demographics. The degrees of freedom (df) for each t test were conservatively based on the smaller sample size being compared. Therefore, for the between-population comparisons, the degrees of freedoms were based on the NHANES data and were calculated using SUDAAN version 10.0 (RTI, Research Triangle Institute, Research Triangle Parts, NC) according to NHANES guidelines.[29] For comparisons within the military by service branch, the degrees of freedom was the smaller of the two sample sizes being compared minus 1. All reported p values were two sided, and the significance level was specified as $p < 0.05$.

Results

OC use in the military and the general U.S. population

Overall age-adjusted OC use was significantly higher among women in the military (34.4%) than in the general population (29.4%) (Table 1). When stratified by age, OC use was higher in the military among women aged ≥20 years. This difference increased with age and was significant among those aged 25–34. In contrast, among women aged 18–19 years, the prevalence was lower in the military (33.2% vs. 40.6%). In both populations, OC use decreased with age; however, the decrease was less dramatic in the military.

Table 1. Prevalence of Oral Contraceptive Use Among Women in the U.S. Military and General Populations in a 1-Year Period

	Military[a]			*General population*[b]			
	n[c]	*Crude* % (SE)	*Age adjusted*[d] % (SE)	n[c]	*df*	*Crude* % (SE)	*Age adjusted*[d] % (SE)
Overall	83,181	36.8 (0.1)	34.4 (0.3)	360	15	29.8 (1.6)[e]	29.4 (1.6)[e]
Age, years							
18–19	10,459	33.2 (0.3)		90	15	40.6 (4.6)	
20–24	36,977	39.7 (0.2)		98	15	37.5 (2.4)	
25–29	20,135	39.7 (0.2)		86	15	32.2 (2.8)[e]	
30–34	9,945	34.4 (0.3)		53	15	25.6 (3.8)[e]	
35–39	5,665	26.2 (0.3)		33	15	19.9 (4.3)	
Married							
Yes	36,642	36.9 (0.2)	34.0 (0.4)	138	15	24.5 (2.2)[e]	24.7 (2.0)[e]
No	46,539	36.7 (0.1)	35.1 (0.4)	222	15	34.7 (2.4)	32.2 (2.5)
Race/ethnicity							
Non-Hispanic white	48,184	40.9 (0.1)	38.0 (0.4)	176	15	34.7 (2.6)[e]	34.1 (2.4)
Married	21,486	40.4 (0.2)	37.7 (0.5)	80	14	26.6 (3.2)[e]	29.6 (2.6)[e]
Not married	26,698	41.3 (0.2)	39.5 (0.6)	96	14	43.2 (4.1)	39.6 (3.7)
Non-Hispanic black	19,032	30.9 (0.2)	29.8 (0.4)	80	14	22.6 (1.7)[e]	21.9 (1.6)[e]
Married	8,134	30.9 (0.3)	30.0 (0.7)	13	8	20.2 (3.7)[e]	22.5 (6.6)
Not married	10,898	30.8 (0.2)	30.3 (0.6)	67	12	23.3 (2.1)[e]	21.7 (2.2)[e]
Hispanic	7,139	35.7 (0.3)	32.2 (0.9)	86	14	19.7 (2.9)[e]	19.8 (2.8)[e]
Married	3,516	35.3 (0.5)	31.8 (1.3)	38	12	19.7 (3.8)[e]	18.6 (3.4)[e]
Not married	3,623	36.1 (0.5)	33.5 (1.5)	48	13	19.7 (4.3)[e]	17.3 (4.6)[e]
Other	8,826	33.3 (0.3)	30.9 (0.8)	18	9	24.8 (6.9)	23.4 (6.6)
Married	3,506	35.6 (0.5)	32.8 (1.2)	7	5	21.3 (6.1)[e]	13.5 (5.0)[e,f]
Not married	5,320	32.0 (0.4)	30.3 (1.2)	11	7	28.6 (9.1)[f]	24.1 (8.0)[f]

[a]Military Health System Management Analysis and Reporting Tool (M2), October 1, 2004, through September 30, 2005.
[b]National Health and Nutrition Examination Survey (NHANES), 2005–2006.
[c]Unweighted sample size of OC users.
[d]Age adjusted using the 2000 U.S. Census population.
[e]In comparison to the proportion in the military $p < 0.05$.
[f]Not statistically reliable/precise; sample size <30 or relative SE >30%.
SE, standard error; df, degrees of freedom.

A larger difference in OC use by marital status was observed in the general population. OC use was significantly higher among women who were married in the military (34.0%) vs. the general population (24.7%) and nonsignificantly higher among unmarried women (35.1% vs. 32.2%).

In both populations, OC use was highest among non-Hispanic white women, with greater racial variation in the general population. OC use was higher in the military for all racial/ethnic groups; however, this finding was significant only among non-Hispanic black and Hispanic women. The difference between the two populations was greatest among Hispanics (military, 32.2%; general population, 19.8%). When simultaneously stratified by marital status and race/ethnicity, higher OC use in the military among non-Hispanic white women was confined to married women, whereas higher use in the military might not be dependent on marital status among Hispanic and non-Hispanic black women. Although the estimates were also higher in the military among the other race/ethnicity category stratified by marital status, the estimates from the NHANES data had relatively large standard errors and were considered potentially unreliable and imprecise.

OC use in the military by branch of service

Variation in OC use was observed by military branch of service (Table 2). Overall, OC use was lowest in the Army (29.9%) and highest in the Air Force (38.8%). This finding was consistent regardless of stratification by demographic characteristics. OC use was 34.9% in the Navy and 35.2% in the Marines.

Discussion

OC use was significantly higher in the military (34.4%) than in the general population (29.4%). This difference increased with age and was most pronounced among Hispanics. Within the military, OC use was highest in the Air Force (39%) and lowest in the Army (30%) ($p < 0.05$).

In support of our findings, other evidence indicates that OC use is higher in the military. In 2003, Powell-Dunford et al.[31] estimated that 84% of female active duty U.S. Army personnel had a desire for temporary amenorrhea. Another study found 66% of female cadets at the U.S. Army Military Academy stated that their menstrual symptoms interfered with their physical activities,[32] suggesting a strong desire for temporary amenorrhea. There is also a clear incentive for the military to encourage OC use. The single greatest threat to female troops and the primary reason they were evacuated during the Persian Gulf conflict was pregnancy.[33] Pregnancy in the field can tie up medical and evacuation resources and decreases available troop numbers. A Navy publication even described how temporary amenorrhea in the field can be achieved

Table 2. Prevalence of Oral Contraceptive Use Among Women in the U.S. Military,[a] by Service Branch,[b] in a 1-Year Period

	Army			*Navy*		
	n[c]	*Crude* % (SE)	*Age adjusted*[d] % (SE)	n[c]	*Crude* % (SE)	*Age adjusted*[d] % (SE)
Overall	24,510	31.0 (0.2)[e,f,g]	29.9 (0.4)[e,f,g]	21,022	38.1 (0.2)[e,h]	34.9 (0.5)[e,h]
Age, years						
18–19	2,898	24.9 (0.4)[e,f,g]		3,031	37.2 (0.5)[g,h]	
20–24	10,408	33.1 (0.3)[e,f,g]		9,839	41.1 (0.3)[e,g,h]	
25–29	5,949	34.8 (0.4)[e,f,g]		4,833	39.8 (0.4)[e,g,h]	
30–34	3,315	30.0 (0.4)[e,f,g]		2,079	33.8 (0.6)[e,g,h]	
35–39	1,940	25.0 (0.5)[e]		1,240	25.8 (0.6)[e]	
Married						
Yes	10,830	31.6 (0.3)[e,f,g]	29.3 (0.6)[e,f,g]	7,979	37.5 (0.3)[e,h]	34.4 (0.8)[e,h]
No	13,680	30.6 (0.2)[e,f,g]	30.5 (0.6)[e,f,g]	13,043	38.5 (0.3)[e,h]	35.1 (0.8)[e,h]
Race/ethnicity						
Non-Hispanic white	11,821	34.6 (0.3)[e,f,g]	33.3 (0.7)[e,f,g]	11,879	42.6 (0.3)[e,h]	38.9 (0.8)[e,h]
Married	5,232	35.2 (0.4)[e,f,g]	32.8 (1.0)[e,f]	4,465	41.1 (0.5)[e,h]	38.6 (1.2)[h]
Not married	6,589	34.2 (0.3)[e,f,g]	34.6 (1.1)[e,f]	7,414	43.5 (0.4)[e,h]	39.6 (1.1)[e,h]
Non-Hispanic black	7,750	28.3 (0.3)[e,f]	27.7 (0.6)[e]	4,531	30.4 (0.4)[e,h]	29.0 (0.9)[e]
Married	3,443	28.3 (0.4)[e,f,g]	27.9 (1.1)[e]	1,667	30.1 (0.6)[e,h]	29.0 (1.6)[e]
Not married	4,307	28.3 (0.4)[e,f]	28.4 (0.9)[e]	2,864	30.7 (0.5)[e,h]	29.4 (1.3)[e]
Hispanic	2,637	32.1 (0.5)[e,f,g]	28.8 (1.4)[e]	1,803	36.9 (0.7)[e,h]	32.4 (2.5)
Married	1,233	31.4 (0.7)[e,f,g]	27.9 (1.9)[e]	892	37.0 (1.0)[e,h]	32.6 (4.4)
Not married	1,404	32.7 (0.7)[e,f]	30.6 (2.3)[e]	911	36.8 (1.0)[e,h]	33.0 (3.4)
Other	2,302	25.0 (0.5)[e,f,g]	24.6 (1.2)[e,f]	2,809	37.5 (0.6)[e,h]	32.7 (1.6)[e,h]
Married	922	27.9 (0.8)[e,f,g]	26.6 (1.9)[e,f]	955	38.8 (1.0)[e,h]	34.7 (2.5)[h]
Not married	1,380	23.4 (0.6)[e,f,g]	22.9 (1.8)[e,f]	1,854	36.8 (0.7)[e,g,h]	31.5 (2.3)[e,h]
	Marine			*Air Force*		
	n[c]	*Crude* % (SE)	*Age adjusted*[d] % (SE)	n[c]	*Crude* % (SE)	*Age adjusted*[d] % (SE)
Overall	4,848	38.2 (0.4)[e,h]	35.2 (1.4)[e,h]	30,416	41.8 (0.2)[f,g,h]	38.8 (0.4)[f,g,h]
Age, years						
18–19	1,277	39.5 (0.9)[f,h]		2,964	37.8 (0.5)[h]	
20–24	2,308	39.0 (0.6)[e,f,h]		13,454	45.3 (0.3)[f,g,h]	
25–29	770	37.3 (1.1)[e,f,h]		7,959	44.5 (0.4)[f,g,h]	
30–34	343	38.0 (1.6)[f,h]		3,890	39.6 (0.5)[f,h]	
35–39	150	26.4 (1.8)		2,149	28.5 (0.5)[f,h]	
Married						
Yes	1,847	38.8 (0.7)[e,h]	35.4 (2.0)[h]	15,102	41.4 (0.3)[f,g,h]	38.2 (0.7)[f,h]
No	3,001	37.8 (0.5)[e,h]	34.9 (2.1)[e,h]	15,314	42.1 (0.3)[f,g,h]	40.4 (0.7)[f,g,h]
Race/ethnicity						
Non-Hispanic white	3,018	42.1 (0.6)[e,h]	38.4 (2.0)[h]	19,749	44.3 (0.2)[f,g,h]	40.9 (0.6)[f,h]
Married	1,073	42.0 (1.0)[h]	38.4 (2.8)	10,057	43.4 (0.3)[f,h]	40.7 (0.8)[h]
Not married	1,945	42.1 (0.7)[e,h]	39.1 (3.2)	9,692	45.3 (0.3)[f,g,h]	43.3 (1.0)[f,h]
Non-Hispanic black	620	30.0 (1.0)[e]	29.7 (2.6)	5,961	35.7 (0.4)[f,g,h]	34.0 (0.9)[f,h]
Married	277	32.4 (1.6)[e,h]	32.5 (4.3)	2,688	35.9 (0.6)[f,g,h]	34.5 (1.5)[f,h]
Not married	343	28.3 (1.3)[e]	27.5 (3.6)	3,273	35.6 (0.5)[f,g,h]	34.6 (1.3)[f,h]
Hispanic	771	35.2 (1.0)[e,h]	32.8 (3.6)	1,810	41.5 (0.7)[f,g,h]	38.3 (2.4)[h]
Married	320	35.1 (1.6)[e,h]	35.4 (4.9)	1,030	39.8 (1.0)[f,g,h]	38.1 (3.3)[h]
Not Married	451	35.2 (1.3)[e]	35.2 (6.1)	780	43.9 (1.2)[f,g,h]	40.2 (3.8)[h]
Other	439	35.1 (1.3)[e,h]	32.7 (4.4)	2,896	40.3 (0.6)[f,g,h]	37.3 (1.5)[f,h]
Married	177	40.9 (2.4)[h]	36.8 (6.5)	1,327	41.5 (0.9)[f,h]	37.9 (2.3)[h]
Not Married	262	32.0 (1.6)[e,f,h]	29.7 (6.4)	1,569	39.3 (0.8)[f,g,h]	40.2 (2.7)[f,h]

[a]Military Health System Management Analysis and Reporting Tool (M2), October 1, 2004, through September 30, 2005.
[b]Other service branches (e.g., Coast Guard) were not included.
[c]Unweighted sample size.
[d]Age adjusted using five age groups based on the 2000 U.S. Census population.
[e]In comparison to the proportion in the Air Force, $p < 0.05$.
[f]In comparison to the proportion in the Navy, $p < 0.05$.
[g]In comparison to the proportion in the Marines, $p < 0.05$.
[h]In comparison to the proportion in the Army, $p < 0.05$.
SE, standard error.

through continuous OC use: "a woman can go directly from one pack of pills into the next, skipping the 'week off.' She won't have a period."[34] Therefore, these findings together indicate that there is the desire or need among female military personnel and the military to use OCs. Additionally, women in the military may be healthier than women in the general population because of health requirements at enlistment, physical fitness training, and medical surveillance.[23,24] Higher OC use in the military might, therefore, result from a lower percentage of women with medical contradictions to their use (e.g., CVD and severe obesity), a higher percentage of women who are at risk of pregnancy, and a higher percentage of women who are actively seeking birth control.

There are limitations to this study that need to be addressed. First, OC use was ascertained differently in the military and in the general U.S. populations. Within the general U.S. population, ascertainment was based on self-reported questionnaire data, and within the military, it was based on prescription medical billing records. The possibility of differential misclassification of OC use, therefore, might significantly affect our results. Having a prescription and taking a medication are not necessarily equivalent. However, previous studies in the general population comparing self-reported OC use with medical records have indicated high agreement (percent agreement = 90%, kappa = 0.78), especially for recent use, as was assessed in the current analysis.[35,36] A recent survey also estimated that 8% of Military Health System beneficiaries had at least one unclaimed prescription at military pharmacies during a 12-month period.[37] The most common reason for failing to claim a prescription was no perceived need for the prescription. Therefore, it is likely that unclaimed OC prescriptions are less common. Even assuming that 8% of the OC prescriptions were unclaimed and, therefore, not taken, OC use in the military would remain higher than in the general U.S. population.

Second, many of the general population estimates were based on small sample sizes and thus were imprecise. We chose not to combine NHANES surveys to increase precision because the age-adjusted rate of OC use among 18–39-year-olds varied over time: 27.1% in the 2001–2002 survey and 28.0% in the 2003–2004 survey. If data from these earlier surveys had been included, a larger difference in OC use would have been observed between the military and the general population, potentially exaggerating the difference between the two populations. Furthermore, the 2005–2006 survey represented the calendar period most comparable to the military data.

Third, limitations in the data restricted us from conducting a more thorough comparison of hormonal contraception type and dose. Although a wide range of OC formulas are available and different formulas can affect health outcomes,[38–40] we were unable to explore differences in OC type or brand because these data are not collected by the NHANES surveys. Data on other methods of hormonal contraception are also limited in NHANES. For example, no information on time since last use of "injectables to prevent pregnancy" (i.e., Depo-Provera, Upjohn, Kalamazoo, MI) in NHANES prevented comparison with use in the military. Therefore, we were not able to take into consideration how possible variations in use of other contraceptive methods, particularly other hormonal methods, might impact OC use. Larger variations in OC use between the two populations were observed among blacks and Hispanics. Previous studies[41–43] in the general population have observed higher rates of Depo-Provera use among minority groups. Based on the current data, we cannot determine if minorities in the military also have a higher preference for other hormonal methods or if the use of these other methods varies between the two populations.

Finally, there is the possibility of residual confounding by age, although the impact was estimated to be minimal. When the nonstratified data were reanalyzed using single year age categories for adjustment, the overall inferences remained similar. In fact, among active duty military personnel the single age adjusted estimate of OC use rose to 35.1% and decreased to 26.7% in the general population.

In conclusion, these findings suggest that OC use differs between women in the military and in the general U.S. population and within the military by service branch. These findings provide incentive to conduct in-depth studies to investigate the relationship between hormonal contraception and variations in health outcomes between these two populations and within the military.

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Disclosure Statement

The authors have no conflicts of interest to report.

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