ORIGINAL ARTICLE

Socio-economic Correlates of Body Mass Index, Blood Pressure and Contraceptive Use by Reproductive age-group Females

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Abstract

Background: Oral Contraceptive use, BP and BMI are strongly associated variables in terms of socio economic conditions. Oral Contraceptives are an important and widely accepted contraceptive modality used throughout the world. **Aim & Objective**: This study aims to examine the effects of socio-economic factors on Body Mass Index (BMI), Blood pressure (BP) and contraceptive use by reproductive age-group females of Uttarakhand. **Settings and Design**: This study utilizes nationwide data from the Fourth National Family Health Survey (NFHS-IV). **Methods and Material**: Information was collected from Indian Institute of Population Sciences (IIPS) Mumbai and 17,300 women of Uttarakhand were considered for this study. **Statistical analysis used**: For inter age-group comparisons of blood pressure, BMI and socio-demographic indicators, analysis of variance (ANOVA) technique has been used. **Results**: The variation in mean age at menarche was found to be significant ($p< 0.01$, ANOVA). The numbers of live births over the women's total lifetime were lower in the younger age groups ($p<0.01$, ANOVA). **Conclusions**: The important findings of present study were that the use of contraceptive tended to have increased BMI and elevated blood pressure, even though the magnitude of these was little (equal to 4% and 40% respectively).

Keywords

Body Mass Index; Blood Pressure; Contraceptives Oral; Analysis of Variance

Introduction

Oral Contraceptives are an important and widely accepted contraceptive modality used throughout the world (1). It is considered as safe and effective form of birth control method, which not only decreases unwanted pregnancies but also generates many non-contraceptive health benefits (2-4). Due to the presence of estrogen receptors in all constituent layers of the blood vessels, the effects of female sex hormones contained in contraceptives on the cardiovascular system has been subject of scientific interest (5).

Due to biological potency compared to estradiol (1,000 times more potent), intensifies the production of hepatic angiotensinogen, which, in its turn, causes elevation of blood pressure by the renin angiotensin-aldosterone system (RAAS) (6).

Studies in normotensive women have shown an increase in blood pressure associated with OCP (oral Contraceptive) use (7). (BMI) is perhaps the most commonly used measure for defining overweight, obesity and thinness in clinical practice and population surveys (8-11). Many epidemiological studies have directed that intake to Oral contraception may result to cause variations in systolic blood pressure (SBP), diastolic blood pressure and the prevalence of hypertension in various study designs (12-14).

This study aims to examine the socio economic corelates of Body Mass Index(BMI), Blood pressure (BP) and contraceptive use by reproductive age group women of Uttarakhand.

Aims & Objectives

1. To study prevalence of obesity and hypertension among females of reproductive age group.
2. To explore the effects of contraceptive practices on BMI and blood pressure among different age groups.
3. To study the association between the socio demographic variables with obesity and hypertension.

Material & Methods

Study type – A cross sectional observational study.

Study Area- This study utilizes nationwide data from the Fourth National Family Health Survey (NFHS-IV) (11). The survey was performed in urban and rural areas of the country.

Sampling Technique: A uniform sampling method was adopted in all districts of the country. A whole village was the primary sampling units for rural areas while for urban it was census enumeration blocks. Field research agencies from across the country were recruited and provided lists of sampling units for each selected state or union territories. NFHS-IV was designed to provide information on various demographic parameters, family welfare and health indicators at the state level and, for the first time, at a district level as well and therefore NFHS-IV sample size was increased as compared NFHS-III.

Study Population: Information was collected from 17,300 women of Uttarakhand. Due to missing and non-response information for different variables, sample size has variation at the time of analysis. The dataset contains interval-specific information on the outcomes of interest i.e. contraceptive use and about sterilization as well as on education; As a result, this study explores in detail a wider range of women's reproductive behaviors.

Study Duration – We retrospectively analyzed data from the national representative National Family Health Survey (NFHS-IV), collected during 2015-16.

Data collection tools and Measurements

a. **Blood pressure and anthropometry:** In NFHS-IV, clinical, anthropometric and biochemical evaluation was done. An automatic battery operated BP instrument was used for standardization of BP measurements. Only medical or paramedical personnel with specific training in study methodology were involved in the survey. Sitting BP was measured while the participant was sitting in a chair quietly for 5 min, three readings at 5-minute interval were obtained and the last two were averaged for the final BP measurement. In this study, we have categorized the hypertension in four groups according to JNC-8 (12)

In addition, body height and weight were measured by those health coordinators, who had some medical back-ground and were employed by IIPS for the supervision of data collection for biomarkers.

b. **Body Mass Index:** BMI is calculated by dividing weight (kilograms) by height (metres^2) (kg/m^2). According to WHO, BMI is categorized into the four categories described as.

Categorization of BMI

Status	BMI (Kg/m^2
Underweight	< 18.5
Normal	18.5 - 24.9
Overweight	25.0 - 29.9
Obese	≥30.0

Statistical Analysis: All women subjects are divided into six age groups. For inter-age-group comparisons of BMI, blood pressure and socio-demographic indicators, ANOVA is used. The relationships of BMI or systolic or diastolic blood pressure with contraceptive use and socio-demographic variables are examined by ANOVA with age as a covariant factor. All statistical analysis is conducted using SPSS (Version-24), and significance level is set as 5% throughout the study.

Results

Socio-Demographic Characteristics: As shown in (Table 1), all socio-demographic characteristics of the subjects, divided into six age groups. The mean age at menarche was lowest in the 15-19 age groups, the variation in mean age at menarche was found to be significant ($p < 0.01$, ANOVA). The numbers of live births over the women's total lifetime were lower in the younger age groups ($p< 0.01$, ANOVA). The total number of live births was lowest in 15-19 age group ($p< 0.01$, Bonferoni's multiple comparison test). Mean years of education were longest in the 15-19 age groups than in the other age groups ($p < 0.01$, ANOVA, and $p< 0.05$, Bonferoni's multiple comparison tests).

BMI and Blood Pressure: As shown in (Table 2), BMI had consistent increment according to age. ($p < 0.01$, Bonferoni's multiple comparison test). The proportion of pre-obese and obese categories (pooled) was highest in the 40+ age group, accounting for 32.3%, followed by 35-39 and 30-34, accounting for 29.6% and 25.6% respectively. In Table 3 Significant inter-group differences were seen for both types of blood pressure ($p < 0.01$ for both, ANOVA). Systolic and Diastolic blood pressure was highest in the 40+ age group than for the other age groups ($p < 0.01$, Bonferoni's multiple comparison test). The prevalence of Pre Hypertension, Hypertension-I and Hypertension-II, was highest among the 40+ age group, with respective proportion as 54%, 19.6% and 5.5% (Table 3).

Factors related to BMI and blood pressure: As shown in (Table 4), BMI, systolic blood pressure and diastolic blood pressure differed significantly with number of live births, highest year of education and age at menarche (ANOVA with age adjustment).

Discussion

In the present nation-wide cross-sectional study among females of reproductive age group (15-49 years), the use of OC was positively associated with SBP, DBP levels and body mass index. It has been observed that with increase in age a dramatic increase in over-weight and obesity is observed. In this study the prevalence of obesity, including pre-obese and obese categories were more in later age groups with relatively higher values recorded among the 30-39 age group (39.4%), 40-49 age group (51.1%) and 50-59 age group (48.5%). However in comparison to our study, prevalence of obesity is found to be less in 30-39 age group (26.9%) 40-49 age group (36%) and >50 age group (28.7%) and out of three above forty females, two females were obese or overweight which was statistically significant between all age groups.(8) Nagai et al. also observed high BMI of 25.0 to 27.4 kg/m2 in middle aged women (Nagai et al. 2010).

As the age advances rise in blood pressure is observed because of the stiffening of the walls of the aorta and arteries. Age was found to be an important risk factor for hypertension.(1) In our study, high mean systolic and diastolic BP was observed in more than 40 years women similar study done by other authors also observed that the highest mean value of systolic and diastolic BP both were among the 45-54 year age group females.(19, 21)

The important findings of present study were that the use of contraceptive tended to have increased BMI and elevated blood pressure, even though the magnitude of these was little (equal to 4% and 40% respectively), and socio demographic factors were associated BMI or blood pressure both. Some other covariates may intervening the association of oral contraceptive use and BMI and blood pressure that are beyond the scope of the current study.

The present study has several demerits as well. On data part, lack of information is there regarding the use of duration of contraceptive use and therefore association is considered only. As a study of the cross-sectional design, could not be used to determine causation. Furthermore, Investigation of mechanism underlying the relationship between contraceptive use and BMI and SBP/DBP could not determine how the association may be affected by these factors. Despite these demerits, this study had several major merits. To our knowledge, this is the first reported study to assess the association between OC use and hypertension or pre-hypertension along with Body mass index in Uttarakhand State, India using nationally representative data. In future, there is much need of the studies regarding investigating the mechanisms underlying to explore the effect of OCs use on BMI and Blood pressure among society.

Conclusion

The important findings of present study were that the use of contraceptive tended to have increased BMI and elevated blood pressure, even though the magnitude of these was little (equal to 4% and 40% respectively), and socio demographic factors were associated BMI or blood pressure both.

Recommendation

The study can be further analyzed using primary data

Limitation of the study

This is cross sectional study so we were not able to measure few variables like duration of contraceptive use

Relevance of the study

Socio-demographic and epidemiological dynamics of a population changes over time. The associated outcome of key socio-demographic variables with contraceptive behavior of a population must also change accordingly. Keeping this in mind and ample scope for further research the present study is designed.

Authors Contribution

Concept (RS, SM, PG) Design & Definition of intellectual content (RS, SM), Data analysis (SM, PG), Statistical analysis (PG), Literature search & Manuscript preparedness (DR, D) Editing review (DR)

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References

1. Abebe SM, Berhane Y, Worku A, & Getachew A. Prevalence and associated factors of hypertension: A Cross-sectional Community based study in Northwest Ethiopia. PloS one, 2018 10(4), e0125210.
2. Benagiano G, Bastianelli, C, & Farris M. Contraception today. Annals of the New York Academy of Sciences, 2006, 1092(1):1-32.
3. Chasan-Taber L, Willett WC, Manson JE, Spiegelman D, Hunter DJ, Curhan G et al. Prospective study of oral contraceptives and hypertension among women in the United States. Circulation, 1996, 94(3):483-489
4. Cole, TJ, Bellizzi, MC, Flegal, KM, & Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: international survey. Bmj, 2000, 320(7244), 1240.
5. Cole, TJ, Flegal, KM, Nicholls D, & Jackson AA. Body mass index cut offs to define thinness in children and adolescents: international survey. Bmj, 2007, 335(7612), 194.
6. Collaborative Group on Epidemiological Studies on Endometrial Cancer. Endometrial cancer and oral contraceptives: an individual participant meta- analysis of 27276 women with endometrial cancer from 36 epidemiological studies. Lancet Oncol. 2015, 16:1061-1070.
7. Daniels K, & Abma JC. Current contraceptive status among women aged 15-49: United States, 2015-2017. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, 2018.

8. El-Hazmi M, & Warsy A. Relationship between age and the prevalence of obesity and overweight in Saudi population. Bahrain Medical Bulletin, 2002, 24(2):1-7.
9. Gallo MF, Lopez LM, Grimes DA, Carayon F, Schulz KF, & Helmerhorst FM. Combination contraceptives: effects on weight. Cochrane Database of Systematic Reviews, 2014, (1).
10. Havrilesky LJ, Moorman PG, Lowery WJ, Gierisch JM, Coeytaux RR, Urrutia, RP et al.Oral contraceptive pills as primary prevention for ovarian cancer: a systematic review and meta-analysis. Obstetrics & Gynecology, 2013, 122(1):139-147.
11. Indian Institute for Population Sciences (IIPS) and MoHFW. National Family Health Survey - 4. 2017. Available from: http://rchiips.org/nfhs/pdf/NFHS4/India.pdf . Accessed June 25, 2012 .
12. James PA, Oparil S, Carter BL, Cushman WC, Dennison-Himmelfarb C, Handler J et al. Evidence-based guideline for the management of high blood pressure in adults: report from the panel members appointed to the Eighth Joint National Committee (JNC 8). Jama, 2014, 311(5):507-520.
13. Lubianca JN, & Faccin CS. Oral contraceptives: a risk factor for uncontrolled blood pressure among hypertensive women. Contraception, 2003, 67(1):19-24.
14. Maguire K, Westhoff C. The state of hormonal contraception today: established and emerging non contraceptive health benefits. American journal of obstetrics and gynecology, 2011, 205(4):S4-S8.
15. Mishel JD. Oral contraception: past, present, and future perspectives. International Journal of Fertility, 1991, 36:7-18.
16. Nagai M, Kuriyama S, Kakizaki M, Ohmori-Matsuda K, Sugawara Y, Sone T et al. Effect of age on the association between body mass index and all-cause mortality: the Ohsaki cohort study. Journal of epidemiology, 2010, 1008030181-1008030181.
17. Oelkers WK. Effects of estrogens and progestogens on the renin-aldosterone system and blood pressure. Steroids, 1996, 61(4):166-171.
18. Shufelt CL, & Merz C NB. Contraceptive hormone use and cardiovascular disease. Journal of the American College of Cardiology, 2009, 53(3):221-231.
19. Singh S, Shankar R, & Singh GP. Prevalence and associated risk factors of hypertension: a cross-sectional study in urban Varanasi. International journal of hypertension, 2017.
20. Srisupandit S, Kumar TA, Egnerova A, Gomez-Alzuguray M, Perez-Paz M, Andolsek L, . & Wong PC. The WHO multicentre trial of the vasopressor effects of combined oral contraceptives: 1. Comparisons with IUD. Task force on oral contraceptives.1989.
21. Tabrizi JS, Sadeghi-Bazargani H, Farahbakhsh M, Nikniaz L, & Nikniaz Z. Prevalence and associated factors of prehypertension and hypertension in Iranian Population: The Lifestyle Promotion Project (LPP). PloS one, 2016. 11(10), e0165264.
22. US Preventive Services Task Force. Screening for obesity in children and adolescents: US Preventive Services Task Force recommendation statement. Pediatrics, 2010, 125(2):361-367.
23. Wei W, Li Y, Chen F, Chen C, Sun T, Sun Z, et al. Dyslipidaemia, combined oral contraceptives use and their interaction on the risk of hypertension in Chinese women. Journal of human hypertension. 2011;25(6), 364.

Tables

TABLE 1 : SOCIO DEMOGRAPHIC CHARACTERISTICS OF THE SUBJECTS

Variables	Age (Years)	N	Mean(SD)	Statistical Significance*	Multiple comparison analysis of age groups
Total children ever born	15-19	47	1.04(0.20)	*p<0.01*	15-19 years< all other ages, *p<0.01*
	20-24	1209	1.54(0.71)		20–24 years< all other ages, *p<0.01*
	25-29	2222	2.11(0.96)		25-29years< 30-34 years, *p<0.01*
	30-34	1907	2.59(1.13)		30-34 years< 40+ years, *p=0.041*
	35-39	743	2.51(1.08)		35-39 years< all other ages, *p<0.01*
	>40	125	2.22(1.02)		40+ years< all other ages except 30-34 *p<0.01*
Highest year of Education	15-19	3140	4.72(1.69)	*p<0.01*	15-19 years<all other ages, *p<0.01*
	20-24	2849	4.15(1.80)		20–24 years<40+ years,*p=0.032*
	25-29	2403	4.32(1.49)		25-29years<30-34 years, *p=0.041*
	30-34	1788	4.40(1.53)		30-34 years< 40+ years,*p=0.030*
	35-39	1441	4.43(1.53)		35-39 years<all other ages, *p<0.01*
	>40	1864	4.26(1.48)		40+ years< all other ages except 30-34 *p<0.01*
Age at menarche	15-19	3167	13.97(4.61)	*p<0.01*	15-19 years<all other ages, p<0·001
	20-24	3048	14.52(5.80)		20–24 <all other ages, p<0·001
	25-29	21	14.48(1.86)		25-29years< all other ages, p<0·001

**Statistical Significance among age group is examined by one-way ANOVA with multiple comparison analysis by Bonferoni's method*

TABLE 2 PREVALENCE OF OBESITY FOR THE SUBJECT FEMALES

Age	BMI(kg/m²)**		Underweight		Normal		Pre Obese		Obese		Total	
(Years)	N	Mean(SD)	N	%	N	%	N	%	N	%	N	%
15-19	3219	19.81(3.21)	1064	33.1	2002	62.2	132	4.1	21	0.7	153	4.8
20-24	3056	20.91(3.55)	676	22.1	2070	67.7	246	8	64	2.1	310	10.1
25-29	2744	21.84(4.01)	434	15.8	1814	66.1	406	14.8	90	3.3	496	18.1
30-34	2285	22.67(4.18)	296	13	1406	61.5	479	21	104	4.6	583	25.6
35-39	2129	23.14(4.52)	253	11.9	1247	58.6	472	22.2	157	7.4	629	29.6
40+	3392	23.41(4.95)	430	12.7	1867	55	781	23	314	9.3	1095	32.3

**Statistical significance among age groups was examined by one-way ANOVA (p<0·01) with multiple comparison analysis by Bonferoni's method (15-19<all other age groups, p<0·01; 20-24<all other age groups, p<0·01; 25-29<all other age groups, p<0·01; 30-34<all other age groups, p<0·01).*

TABLE 3 : MEAN (SD) BLOOD PRESSURE AND PREVALENCE OF HYPERTENSION FOR THE SUBJECT FEMALES

Age	Systolic BP		Diastolic BP		Normal		Pre Hypertension		Hypertension 1		Hypertension 2	
(Years)	(mmHg)*		(mmHg)!									
	N	Mean(SD)	N	Mean(SD)	N	%	N	%	N	%	N	%
15-19	3145	110.27(10.11)	1064	73.08(8.02)	2324	73.90%	789	25.1	60	1.9	15	0.5
20-24	3003	111.31(10.56)	676	74.64(8.18)	2044	68.10%	915	30.5	110	3.7	16	0.5
25-29	2687	112.35(10.88)	434	76.16(8.33)	1641	61.10%	997	37.1	139	5.2	19	0.7
30-34	2242	114.98(11.96)	296	78.43(8.89)	1177	52.50%	998	44.5	195	8.7	34	1.5
35-39	2094	118.08(13.56)	253	80.51(9.46)	878	41.90%	1080	51.6	269	12.8	72	3.4
40+	3344	121.69(15.83)	430	81.81(9.81)	1189	35.50%	1805	54	656	19.6	184	5.5

**Statistical significance among age groups was examined by one-way ANOVA (p<0·01) with multiple comparison analysis by Bonferoni's method (15-19<all other age groups, p<0·01; 20-24<30-34 years, p=0·012; 20-24<35-39 years, p<0.01; 0-24<40+years, p<0.01;25-29years<30-34years, p<0.01, 25-29 years<35-39years, p<0·01,25-29<40+, p<0·01, 30-34<all other age groups, p<0·01,35-39<all other age groups, p<0·01).*

!Statistical significance among age groups was examined by one-way ANssOVA (p<0·01) with multiple comparison analysis by Bonferoni's method (15-19<all other age groups, p<0·01;20-24<all other age groups, p<0·01;25-29<all other age groups, p<0·01; 30-34<all other age groups, p<0·01;35-39<all other age groups, p<0·01).

TABLE 4 MEAN (SD) OF BMI AND DIASTOLIC AND SYSTOLIC BLOOD PRESSURES BY SOCIO-DEMOGRAPHIC VARIABLES

Socio-Demographic Variables	BMI			Systolic BP(mmHg)*			Diastolic BP (mmHg)!		
	N	Mean(S.D.)	Significance	N	Mean(S.D.)	Significance	N	Mean(S.D.)	Significance
Total children ever born									
≥3	14002	21.74(4.20)	*p<0.01*	13739	114.02(12.56)	*p<0.01*	137337	76.72(9.20)	*p<0.01*
<3	2823	22.53(4.76)		2778	118.32(14.77)		2778	80.18(9.63)	
Highest year of education									
0	3364	21.97(4.36)	*p<0.01*	3302	117.62(14.03)	*p<0.01*	3302	79.46(9.47)	*p<0.01*
>5	2078	22.02(4.32)		2053	116.39(13.92)		2053	78.80(9.20)	
5-8	2639	21.78(4.36)		2588	114.40(12.71)		2588	77.20(9.25)	
8-10	2889	21.45(4.07)		2846	113.09(12.44)		2845	75.33(9.22)	
10-12	2759	21.45(4.02)		2712	113.32(12.24)		2711	75.66(9.13)	
12+	3096	22.51(4.56)		3016	113.61(12.25)		3016	76.95(9.18)	
Age at menarche									
10-12	458	20.85(4.25)	*p<0.01*	142	117.04(13.89)	*p<0.01*	142	74.33(8.72)	*p<0.01*
13	1778	20.33(3.32)		1737	110.28(9.68)		1736	73.09(7.91)	
14	2360	20.28(3.28)		2321	110.90(10.64)		2321	73.80(8.30)	
15+	1617	20.36(3.46)		1588	111.13(10.39)		1587	73.87(7.95)	

**Statistical significance was analysed by ANOVA with age as a covariant; !Statistical significance was analysed by ANOVA with age as a covariant; ns: not significant*